# Appendix E
# Biological Resources, Including Section 7 Consultation

# BIOLOGICAL ASSESSMENT

**Department of Energy**
Washington, DC 20585

February 17, 2011

Ken Sanchez
Assistant Field Supervisor
Endangered Species Program
US Fish and Wildlife Service
Sacramento Fish and Wildlife Office
2800 Cottage Way-Suite W-2605
Sacramento, CA 95825

Subject: Request for Consultation under Section 7 of the Endangered Species Act

Dear Mr. Sanchez:

The U.S. Department of Energy (DOE) is preparing an environmental impact statement for a Federal loan guarantee to Topaz Solar Farms, L.L.C. (the Applicant) to support construction of the proposed Topaz Solar Farm Project in San Luis Obispo County, California (the Project). Enclosed is a Biological Assessment (BA) to initiate formal consultation under Section 7(a)(2) of the Endangered Species Act (ESA).

As described in the enclosed BA, the proposed action may affect, and is likely to adversely affect the San Joaquin kit fox through direct and/or indirect effects to populations and habitat, despite the probability that the Project would likely result in a long-term beneficial effect on local kit fox populations. Although unlikely, the proposed action could also adversely affect vernal pool fairy shrimp and longhorn fairy shrimp during construction or operation of the facility. We have also determined that the Project may affect, but is not likely to adversely affect, the mountain plover.

Finally, the proposed action may affect the Bald Eagle and the Golden Eagle, which are protected by the Bald and Golden Eagle Protection Act (16 U.S.C. §§ 688-688d). However, the effects on these species are expected to be discountable, or insignificant. Therefore, we conclude that the proposed action is not likely to adversely affect these species.

As you know, the Applicant and the DOE have been working closely with the U.S. Fish and Wildlife Service, as well as the California Department of Fish and Game, to develop a number of conservation measures that avoid, minimize and mitigate impacts to the above listed species. We request your concurrence with the above determinations.

Please contact me at 202-287-5387, or email me at angela.colamaria@hq.doe.gov, if you have questions or require additional information regarding this consultation request.

Printed with soy ink on recycled paper

Sincerely,

Angela Colamaria
NEPA Document Manager
Loan Programs Office

Enclosure: BA for the Topaz Solar Farm Project

cc: Kate Symonds, U.S. Fish and Wildlife Service

# Biological Assessment

**for the**

# Topaz Solar Farm Project

California Valley
San Luis Obispo County
California

Prepared for

**Topaz Solar Farms LLC**
1111 Broadway, 4th Floor
Oakland, California 94607

Presented to

**U.S. Department of Energy**
Loan Programs Office
Environmental Compliance Division
1000 Independence Avenue, S.W., LP-10
Washington, DC 20585

by

**ALTHOUSE AND MEADE, INC.**
**BIOLOGICAL AND ENVIRONMENTAL SERVICES**
1602 Spring Street
Paso Robles, California 93446
(805) 237-9626

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# Definitions

| | |
|---|---|
| **TSF:** | Topaz Solar Farm; name of the proposed project. |
| **TSF Project or Project:** | Topaz Solar Farm Project or Project; used generically to describe the proposed project (as described in Section 2.2 of this document), without distinction between the various proposed project alternatives. |
| **Proposed Action:** | The TSF Project. |
| **Project Site:** | An approximately 10,000 acre area that encompasses Option A, Option B, and Alternative 3B.1 layouts. |
| **Option A:** | The southernmost of the two originally proposed TSF Project options with a final fenced Project area of up to approximately 4,100 acres within Study Area A. |
| **Option B:** | The northernmost of the two originally proposed TSF Project options with a final fenced Project area of up to approximately 4,000 acres within Study Area B. |
| **Alternative 3B.1:** | The preferred Project alternative, with a final Project footprint of approximately 3,520 acres within Study Area A. |
| **Study Area A:** | An approximately 7,800 acre area that encompasses the Option A and Alternative 3B.1 layouts. |
| **Study Area B:** | An approximately 6,300 acre area that encompasses the Option B layout. |
| **Action Area:** | An Action Area includes all areas affected directly or indirectly by the TSF Project (Proposed Action). |
| **Lead Agency:** | The lead federal agency, which for the TSF Project is the Department of Energy. |
| **Cooperating Agency:** | An agency which is invited by a federal Lead Agency to cooperate in the preparation of an environmental impact statement. For the TSF Project, the U.S. Army Corps of Engineers is a Cooperating Agency. |

*Regulatory Abbreviations*

**BA**: Biological Assessment
**EIR**: Environmental Impact Report
**CEQA**: California Environmental Quality Act
**NEPA**: National Environmental Policy Act
**ESA**: Endangered Species Act
**Eagle Act**: Bald and Golden Eagle Protection Act
**MBTA**: Migratory Bird Treaty Act
**USFWS**: United States Fish and Wildlife Service
**CDFG**: California Department of Fish and Game
**CNDDB**: California Natural Diversity Database
**CNPS**: California Native Plant Society
**USACE**: United States Army Corps of Engineers
**NRCS**: Natural Resource Conservation Service
**BLM**: Bureau of Land Management
**DOE**: U.S. Department of Energy
**CRP**: Conservation Reserve Program
**MDBM**: Mount Diablo Base Meridian
**APM**: Applicant Proposed Measure

*Technical Abbreviations*

**PV**: Photovoltaic
**MW**: Megawatts
**kV**: Kilovolts; 1000 volts
**AC**: Alternative Current
**PCS**: Power Conversion Stations
**PVCS**: Photovoltaic Combining Switchgear houses
**M&M**: Maintenance and Monitoring Facility
**PV Array**: A block of photovoltaic panels
**PV Module**: An individual solar panel
**GIS**: Geographic Information Systems
**GPS**: Global Positioning System

*Species Abbreviations*

**BNLL**: Blunt-nosed Leopard Lizard
**NEAS**: Nelson's Antelope Squirrel
**GIKR**: Giant Kangaroo Rat

# 1.0 Introduction

This Biological Assessment (BA) provides information regarding wildlife species that are currently listed, candidate, or are proposed for listing under the federal Endangered Species Act, as amended (ESA), that occur on lands associated with the proposed Topaz Solar Farm (TSF) project (TSF Project or Project). Topaz Solar Farms, LLC (Applicant) conducted comprehensive botanical and wildlife surveys on potential Project lands from March 2008 through November 2010. For information regarding all biological surveys and analyses for the potential Project lands, including common species and species of special concern at the state level, please refer to the *Final Biological Report for the Topaz Solar Farm* (Althouse and Meade, Inc. 2010c) and the *2010 Biological Report Technical Appendix, Volumes 1, 2, 3* (Althouse and Meade, Inc. June 2010b), and *Volume 4* (Althouse and Meade, Inc. September 2010d).

There are two proposed Project Options being evaluated in the Environmental Impact Statement (EIS) (U.S. Department of Energy 2011, in prep.): Option A and Option B. Alternative 3B.1 is a Project alternative that was developed by the Applicant at the request of the County of San Luis Obispo (County) during the Environmental Impact Report (EIR) process in response to input provided by local, state, and federal agencies that requested a smaller alternative footprint be evaluated. Alternative 3B.1 is being evaluated as a Project alternative, along with the other Project alternatives, in the Final Environmental Impact Report (FEIR) for California Environmental Quality Act (CEQA) review and in the Final Environmental Impact Statement (FEIS) for National Environmental Policy Act (NEPA) review (refer to Section 2.2 for a full description of the Topaz Solar Farm Project, and Sections 11.0 and 12.0 for Project figures and maps).

The "Project Site", defined in the EIS as an approximately 10,000 acre area, has been divided into two overlapping study areas, Study Area A (totaling approximately 7,800 acres) and Study Area B (totaling approximately 6,300 acres), within which the TSF Project could be developed (refer to Figure 1, Section 11.0). Option A and Alternative 3B.1 layouts are within Study Area A, and the Option B layout is within Study Area B. For each of the three Project layouts, all components of the facility would be fenced, and small areas of roads and electrical collection system would link fenced areas. Both the County in its CEQA process, and the U.S. Department of Energy (DOE) in its NEPA process, are evaluating TSF Project footprints of up to 4,100 acres within these two study areas. This BA evaluates Alternative 3B.1 as the preferred alternative, with a reduced Project acreage of approximately 3,520 acres. These proposed Project footprints are as follows:

- **Option A** would involve the development of approximately 4,100 acres within Study Area A.
- **Alternative 3B.1** would involve the development of approximately 3,520 acres within Study Area A.
- **Option B** would involve the development of approximately 4,000 acres within Study Area B.

This BA is prepared in accordance with the requirements set forth in section 7 of the ESA and its implementing regulations (16 U.S.C. § 1536, 50 CFR §§ 402, *et seq*.), and with the ESA consultation guidance contained in the Endangered Species Act Consultation Handbook (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998).

## 1.1 Purpose Statement

This BA is submitted to the U.S. Department of Energy (DOE) as the lead federal agency (Lead Agency) for the TSF Project, pursuant to section 7 of the ESA. The purpose of this BA is to provide the best available scientific and commercial data to facilitate section 7 consultation with the United States Fish and Wildlife Service (USFWS) and subsequent preparation of a Biological Opinion, with requested Incidental Take Statement, for the Topaz Solar Farm Project. This consultation covers listed species that may be affected by the Project, as outlined below in Section 1.2. It also encompasses consultation for other federal agencies, such as the U.S. Army Corps of Engineers (USACE), that may be issuing permits or approvals for the Project.

Under the federal ESA, formal agency consultation is conducted through the section 7 process when a proposed project may affect federally listed species or designated critical habitat. Incidental take can be authorized through the section 7 process for ESA listed species. Additionally, section 7 consultation may be necessary for species proposed for listing under the ESA. The lead agency must confer with the USFWS if a project is likely to jeopardize the continued existence of a proposed or candidate species, or its critical habitat (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998). However, a federal agency may choose to formally confer on effects to proposed or candidate species even if jeopardy is not likely. A formal conference can be converted to a formal consultation and used to authorize incidental take if the species becomes listed under the ESA prior to implementation of the Project.

For the TSF Project, the Incidental Take Statement in the Biological Opinion is expected to include one federally-listed, candidate, or proposed species known to occur in the potential Project areas: San Joaquin kit fox (refer to Section 1.3 for a summary of effects determinations).

The federal Bald and Golden Eagle Protection Act (16 U.S.C. §§ 688-668d, enacted by 54 Stat. 250) (Eagle Act) was modified in 2009 to include mechanisms for authorizing limited "take" of bald and golden eagles, where "take" (as defined specifically in the Eagle Act, and which includes "disturb") would occur from otherwise lawful activities (74 FR 46835). Thus, the bald and golden eagle are analyzed in this BA to determine if the TSF Project would "disturb" these species and/or require a permit for take under the Eagle Act. As is explained in Sections 1.3, 6.5 and 6.6, it is not expected that the TSF Project would "disturb" the bald eagle or the golden eagle, and the TSF Project is not expected to require a take permit for these species.

In this document, DOE will be referred to as the Lead Agency for the proposed Topaz Solar Farm Project. The Applicant submitted a Part I application to DOE for a loan guarantee on March 29, 2010, and submitted a Part II application on August 10, 2010. The purpose and need for agency action is to comply with DOE's mandate under Title XVII of EPAct 2005 by selecting eligible projects that meet the goals of the Act. DOE is

using the NEPA process to assist in determining whether to issue a loan guarantee to the Applicant to support the TSF Project.

The Applicant is applying to the U.S. Army Corps of Engineers (USACE) for a Clean Water Act (CWA) Section 404 permit. The USACE is expected to issue an appropriate permit for the TSF Project and has agreed to be a Cooperating Agency under the NEPA for the TSF Project.

This BA has also been prepared in coordination with the California Department of Fish and Game (CDFG) because the Applicant intends to seek incidental take authorization from CDFG for the San Joaquin kit fox, a species which is listed as threatened under the California Endangered Species Act. This incidental "take" authorization is expected to be obtained through the California Fish and Game Code Section 2081 incidental "take" permit process.

## 1.2 Species Considered in this Document

The Project (described and defined in Section 2.0) could potentially affect four species listed, candidate, or proposed for listing under the ESA, as well as two species of raptor that are protected by the Eagle Act. The Mountain Plover is no longer proposed for listing, so it is not being included by FWS in the consultation

- San Joaquin kit fox (*Vulpes macrotis mutica*): ESA Endangered
- Longhorn fairy shrimp (*Branchinecta longiantenna*): ESA Endangered
- Vernal pool fairy shrimp (*Branchinecta lynchi*): ESA Threatened
- Giant kangaroo rat (*Dipodomys ingens*): ESA Endangered (addressed in Appendix A)
- Bald eagle (*Haliaeetus leucocephalus):* ESA De-listed, Eagle Act
- Golden eagle (*Aquila chrysaetos*): Eagle Act

This BA analyzes direct and indirect effects of the TSF Project to these species. Section 5.0 provides detailed discussions of the six species listed above. We discuss general species biology, survey methods and survey results for the Action Area (as defined in Section 3.0). Section 6.0 provides an individual effects analysis for each species, with supporting documentation. Conservation measures designed to avoid or minimize potential adverse effects of the Project, and which could potentially result in beneficial effects, are considered in Section 7.0, as is required for the section 7 ESA consultation process.

Three years of comprehensive botanical surveys were conducted on the TSF Project lands, from March 2008 through July 2010. No ESA-listed, candidate or proposed plant species were detected, and none are expected to be present.

Appendix A provides a summary of the surveys and other scientific information developed regarding eight other federally-listed species reported from the region that were not detected within or near the Action Area and for which the TSF Project would have "No Effect" for ESA purposes. Appendix B contains the San Joaquin Kit Fox

Conservation and Monitoring Plan (Althouse and Meade, Inc. June 2011) prepared for the TSF Project.

The Action Area does not include any designated or proposed critical habitat for federally listed species. Therefore this BA does not include specific analyses regarding federally-designated critical habitat.

## 1.3 Summary of Effects Determinations

Based on the analysis contained in this BA, the San Joaquin kit fox occurs in the Action Area, and the proposed TSF Project may adversely affect San Joaquin kit fox through direct and/or indirect effects to individuals, populations and habitat, despite the probability that the TSF Project would result in a long-term beneficial effect on local kit fox populations (refer to Sections 5.1 and 6.1).

The vernal pool fairy shrimp and longhorn fairy shrimp are large vernal pool branchiopods that are listed under the federal ESA and occur within the Action Area. The vernal pool fairy shrimp occurs on proposed conservation lands, and the longhorn fairy shrimp occurs in the Alternative 3B.1 Action Area. Ephemeral pools that support these species were identified and mapped during protocol survey efforts. All pools known or otherwise determined to contain listed fairy shrimp that are within the Alternative 3B.1 Action Area will be avoided and protected with a 250-foot buffer. Although unlikely, construction and operation of the Project could adversely affect listed fairy shrimp. Additionally, management and maintenance activities conducted on proposed conservation lands could adversely affect listed fairy shrimp (refer to Sections 5.2, 5.3, 6.2 and 6.3). It is our understanding that the USFWS has determined the Project would not adversely affect listed fairy shrimp because they determined that the measures identified in this BA (including avoidance of all wetlands that are known to be or could be occupied by listed vernal pool fairy shrimp species and a biological monitor onsite during construction and operation to assure these measures are carried out) are rigorous and conclusive and indicate that adverse effects are not reasonably foreseeable and thus are not likely to occur.

The TSF Project could potentially affect the bald and golden eagle. However, the potential adverse effect would be discountable (i.e., extremely unlikely to occur and essentially not expected to occur) and insignificant (i.e., will not reach a scale where "disturbance" or "take" occurs) due to factors outlined in Sections 6.4 and 6.5. Thus, the TSF Project would not "disturb" or "take" bald or golden eagles within the meaning of the Eagle Act.

The mountain plover was proposed for listing by the USFWS at the time this section 7 consultation was initiated. On May 11, 2011 the USFWS determined it was not warranted to list the mountain plover as threatened, and withdrew its proposal to do so. The TSF Project is not likely to adversely affect mountain plover because of the large amount of remaining habitat in the region.

A summary of effects determinations is provided in Table 1.

Conservation measures designed to avoid, minimize, and compensate for these potential effects have been incorporated into the TSF Project to ensure that the Project would not appreciably reduce the numbers or distribution of populations of these species. Further,

Applicant Proposed Measures (APMs) to preserve, monitor, and manage habitat and populations of listed and proposed species within the Action Area, and the acquisition and/or conservation in perpetuity of additional lands in eastern San Luis Obispo County, would contribute to the long-term survival and recovery of these species. Conservation measures for each species are described in Section 7.0.

TABLE 1. SUMMARY OF EFFECTS DETERMINATIONS.

| Species | Listing Status | Effects Determination |
|---|---|---|
| San Joaquin kit fox | ESA Endangered | May Affect<br>Likely to Adversely Affect |
| Longhorn fairy shrimp | ESA Endangered | May Affect<br>Likely to Adversely Affect* |
| Vernal pool fairy shrimp | ESA Threatened | May Affect<br>Likely to Adversely Affect* |
| Giant kangaroo rat | ESA Endangered | May Affect<br>Not Likely to Adversely Affect |
| Mountain Plover | ESA<br>Previously Proposed<br>Threatened | May Affect<br>Not Likely to Adversely Affect |
| Bald eagle | Eagle Act | No Disturbance or Take<br>under Eagle Act |
| Golden eagle | Eagle Act | No Disturbance or Take<br>under Eagle Act |

* It is our understanding that the USFWS has determined the Project would not adversely affect listed fairy shrimp because they determined that the measures identified in this BA (including avoidance of all wetlands that are known to be or could be occupied by listed vernal pool fairy shrimp species and a biological monitor onsite during construction and operation to assure these measures are carried out) are rigorous and conclusive and indicate that adverse effects are not reasonably foreseeable and thus are not likely to occur.

### *1.3.1 Summary of Applicant Proposed Measures*

The following list of conservation measures have been incorporated into the TSF Project as Applicant Proposed Measures for federally-regulated species that could potentially be affected by construction and operation of the Project. The San Joaquin Kit Fox Conservation and Monitoring Plan included in Appendix B of this BA contains the full text of SJKF conservation measures.

**A. San Joaquin Kit Fox**

- Perimeter fencing around solar arrays would be constructed to provide a 5 to 6 inch gap at the bottom, for the entire length of the fence, for kit fox passage into and through the TSF Project. No interior fences within the perimeter fencing would be present.
- Construction activities would be adjusted to avoid active dens, as determined by pre-construction surveys.
- Escape dens would be located both inside and outside the Project fences. Artificial den placement would be more than 25 feet from any Project components to avoid disturbing dens if repair of project components is necessary.
- Artificial dens capable of supporting kit fox pairs and pups would be installed at a rate of one two-chambered pupping den and at least four escape dens in every section (or square mile) of the Project.
- Solar arrays would be mounted on steel posts with the lower edge of modules approximately 18 inches above the ground to allow kit foxes to see under the arrays.
- The ground under and between the solar arrays would be vegetated with a dominant cover of grasses and herbs to promote a more natural habitat that supports kit fox prey. Vegetation height would be controlled by pulse grazing sheep. In certain locations and instances, grazing may be impractical as a vegetation management option. For example, where Project access roads occur outside fenced areas there may be difficulties containing livestock while still allowing vehicular access along unfenced roads. Control of weeds already widespread at Topaz may consist of mowing along roadsides. Mowing would be necessary along roadsides located outside fenced PV arrays, as a normal maintenance operation. In addition, mowing may take place to reduce vegetation height near structures, as required by Cal Fire, if grazing is determined to be impractical for the targeted and frequent nature of this requirement.[1] Mowing would reduce vegetation height to no less than 2 inches. Pre-construction surveys shall be used to identify canid or badger dens. Dens will be flagged and avoided.
- Invasive weeds would be monitored and controlled according to the Project Vegetation Management Plan.
- Cross fencing and wildlife wire fencing would be removed from corridors outside of the solar arrays, where feasible (refer to Appendix B).
- All exterior lighting would be placed or shielded to avoid lighting open space and solar array areas. No permanent night lighting would be allowed, except for the

[1] San Luis Obispo Condition of Approval #95h contains the following requirement regarding vegetation height: "Vegetation at the Project site shall be managed to maintain dry fuel at a height of 4 to 12 inches, less than 1,050 pounds per acre, measured after grasses have cured. Any landscaped shrubs and trees will be spaced and trimmed to meet the requirements of California Public Resources Code (PRC) 4290, reducing the potential for spread of fire in landscaped vegetation adjacent to structures. To address the Defensible Space requirements of PRC 4291 within 30 feet of buildings and equipment enclosures (e.g. PCS and PVCS boxes), grassland vegetation will be reduced to a height of no more than 4 inches during the dry season (April through October)."

Project's Solar Energy Learning Center, substation, operations and maintenance facility and PG&E switching station.

- All new power poles will be outfitted with raptor perch discouragers. Keeping raptors from perching on power poles will minimize the potential for electrocution, as well as preventing raptors from using power poles to hunt kit fox and other sensitive small mammal species.
- The Project would reduce cropland production that regularly disturbs the land by plowing, seeding, harvesting, and spraying; these activities presently endanger kit fox within the Action Area.

**B. Longhorn Fairy Shrimp and Vernal Pool Fairy Shrimp**

- Known and probable locations of federally-listed fairy shrimp pools would be avoided. A 250-foot radius setback would be established to protect vernal pool hydrologic regimes at such known and probable locations.
- Vernal pools would be protected during construction by installation of orange fencing placed at the setback boundary between the vernal pool and TSF Project areas.
- Natural drainage patterns would be preserved.
- Prior to, during and after the construction phase, use of pesticides or herbicides by the applicant would be in compliance with all local, State, and Federal regulations.

**C. Bald Eagle and Golden Eagle**

- An Avian and Bat Protection Plan and Bird Monitoring and Avoidance Plan will be implemented to guide Project design, construction and operation such that avian mortality at the TSF Project is minimized.
- The TSF Project perimeter fence would be designed to closely surround the solar arrays and other project components, which leaves the maximum possible amount of preserved habitat surrounding the TSF Project.
- If lands adjacent to the TSF Project are approved as compensatory mitigation land for SJKF by the regulatory agencies, the land would be managed as habitat for SJKF, including the discontinuation of cropping. Conversion of cropland to grassland protected in perpetuity would increase prey abundance and foraging potential for bald and golden eagles.
- All new construction of Project overhead collection system lines will utilize the Hendrix Spacer Cable System. The Hendrix Spacer Cable System is designed to minimize avian electrocutions and open air collisions by birds and bats. All

cables have a covering that limits the electrical charge on the surface such that phase to phase or phase to ground contact by wildlife will not result in lethal electrical charges. The "spacers" that are installed to maintain line separation allow for a compact line system that is easily detected by birds and bats in flight, thus significantly reducing collisions. Also, the compact line configuration allows for power pole designs that have a reduced cross-arm width of one foot which minimizes the dangerous practice of cross-arm perching and nesting by raptors.

- All new construction of power poles and the substation will incorporate at least one of the following avian protection measures:
    - Avian-safe separations between energized conductors or energized hardware and neutral or grounded hardware and equipment as per the APLIC (2006) guidelines. The APLIC (2006) recommended separation for eagles is 60 inches.
    - Where design constraints prohibit these separation distances between energized conductors or energized hardware and neutral or grounded hardware and equipment (including the pole itself), insulating covers will be installed to prevent electrocutions from wires or other components.

## 1.4 Informal Consultation History

*April 1, 2009*: The Service met with the Topaz Solar Farm team in Sacramento to discuss Project concept and federally listed species which have the potential to occur on or near the Project.

*April 6, 2010*: Topaz Solar Farm team attends a meeting in Fresno with the California Department of Fish and Game (CDFG) and the Service. Meeting topics include project design and regulatory process.

*May 26, 2010*: The Service met with the Topaz Solar Farm team in Sacramento to discuss biological resources findings and the regulatory process.

*July 21, 2010*: Topaz Solar Farm team attends a meeting with the Service in Sacramento to discuss the proposed San Joaquin Kit Fox Mitigation Plan and other listed species.

*Sept. 16, 2010*: The Service and the Topaz Solar Farm team participated via conference call to discuss proposed options for off-site land mitigation for kit fox other listed species.

*Oct. 18-19, 2010:* The Service and CDFG toured the proposed Topaz Solar Farm and proposed mitigation lands with the Topaz Solar Farm team.

*Dec. 14, 2010*: Topaz Solar Farm team has meeting/telephone call with the Service, DOE, and CDFG regarding a full range of section 7 consultation issues, including potential compensation lands, at the Service office in Sacramento.

*Dec. 17, 2010*: Service staff tour the project site with the Topaz Solar Farm team.

*Jan. 18, 2011:* Topaz Solar Farm team conference call with the Service, CDFG, the County of San Luis Obispo (County) Planning Department, the County's project consultants (Aspen Environmental Group), and DOE.

*Jan. 26, 2011:* The Service, the County, and its project consultants (Aspen Environmental Group), and DOE participated in a conference call with the Topaz Solar Farm team.

*Feb. 1, 2011:* The Topaz Solar Farm team met with managers from the Service's Sacramento Fish and Wildlife Office and the Pacific Southwest Regional Office in Sacramento to discuss the project.

*Feb. 17, 2011:* DOE provided the Service with the final biological assessment with a request to initiate formal section 7 consultation for the Topaz Solar Farm Project and the interrelated PG&E Reconductoring Project.

*Feb. 18 – Present*: Conference calls and coordination continued among the Service, Topaz Solar Farm team, DOE, and CDFG, and included updates and clarifications to the project description.

# 2.0 Project Information

## 2.1 Location of Project

The TSF Project is located in the northern Carrizo Plain area of San Luis Obispo County, California. The TSF Project is situated northwest of California Valley, east of Bitterwater Road, straddling State Route 58 within the La Panza NE and California Valley United States Geological Survey (USGS) 7.5 minute quadrangles. Elevation varies from approximately 2,000 to 2,080 feet above mean sea level. Figures and maps of the Action Area are included in Sections 11.0 and 12.0.

## 2.2 Project Background

The purpose of DOE's Proposed Action is to comply with its statutory mandate to select and fund eligible projects that meet the goals of the Energy Policy Act of 2005 (EPA 2005), as amended by the American Recovery and Reinvestment Act (ARRA) of 2009. The Energy Policy Act of 2005 established a federal loan guarantee program for eligible energy projects with two principal goals to "encourage commercial use in the U.S. of new or significantly improved energy related technologies" and to "achieve substantial environmental benefits."

DOE proposes to provide a loan guarantee to Topaz Solar Farms LLC to finance the construction and startup of the Topaz Solar Farm in eastern San Luis Obispo County, California. DOE also proposes to provide a loan guarantee to High Plains Ranch II LLC (HPR II), a wholly owned subsidiary of SunPower Corporation Systems to finance the construction and startup of the California Valley Solar Ranch (CVSR) Project, located approximately 4 miles to the east of the TSF, also in the northern Carrizo Plain. A common feature of both projects is to upgrade and increase the electrical transmission

capacity of the existing PG&E Morro Bay-Midway 230 kilovolt (kV) transmission line from the proposed Solar Switching Station at the point of interconnection of the Topaz Solar Farm Project in San Luis Obispo County to the existing Midway Substation in Kern County, California (PG&E Reconductoring Project).

## 2.3 Project Description

The Proposed Action includes:

1) construction and operation of the 550 MW Topaz Solar Farm where the solar array complexes and facilities will be located (Alternative 3B.1);

2) the 5-acre substation to step up electricity generated by the solar generation facility to 230kV;

3) the 6.3-acre Solar Switching Station adjacent to the substation and connected by 200-foot connection lines, which transfers electricity from the TSF to an existing Pacific Gas and Electric (PG&E) transmission line; and

4) the preservation, enhancement, and maintenance of on- and off-site conservation lands to support a regional strategy for the conservation of the San Joaquin kit fox in the Carrizo Plain.

The fenced solar array complexes, facilities, and Solar Switching Station, ("Project Area") encompass approximately 3,520 acres. In addition, the Project Area includes Stewardship Lands. Stewardship Lands are comprised of about 1,015 acres outside of the fenced areas and the permanent and temporary impact areas, which will be the subject of applicant conservation measures that are designed to conserve the kit fox (Table 2). These Stewardship Lands are adjacent to the fenced areas and will provide movement corridors, refuge and other habitat for kit fox that utilize the kit fox features within the fenced areas. Among other plans, Topaz will implement the San Joaquin kit fox Conservation and Monitoring Plan (Appendix B), the Habitat Restoration and Revegetation Plan (Appendix D), the Vegetation Management Plan (Appendix E), and a Wildfire Management Plan (in preparation) that will be developed and implemented to maximize the use of these areas by kit fox. However, for operational reasons, the Applicant is not placing the Stewardship Lands under a conservation easement and those lands will not be included in the 12,147-acre land compensation package that has been proposed to the Service.

One of the activities associated with Project implementation is to provide compensatory mitigation for fill impacts to jurisdictional waters of the U.S., as determined by the U.S. Army Corps of Engineers (Corps) and the Regional Water Quality Control Board (RWQCB) through the restoration of a portion of the main drainage that passes through the Project. This area is approximately 20 acres in size (refer to BR Map 1, Section 12.0).

For the purposes of this Project Description, all impacts to land within the proposed fenced solar arrays or impacted by Project components (such as roads and electrical lines) outside the fences are considered to be permanent impacts. Land located within an approximate 100-foot buffer surrounding Project fences and other components (485 acres) may be temporarily impacted during construction, but will be restored to its

original condition after construction is finished, so these are classified as temporary impacts that will no longer be disturbed post construction (Table 2). The lands proposed for off-site permanent conservation encompass approximately 12,147 acres for the TSF and 7.16 acres for the Solar Switching Station (PG&E).

TABLE 2. TOPAZ SOLAR FARM ACREAGES (ALTERNATIVE 3B.1).

| Proposed Action Area | Acreage |
|---|---|
| Fenced Areas, including solar panels, substation and Solar Switching Station | 3,500 |
| Proposed Roads and Electrical Lines outside Fences | 20 |
| Stewardship Lands (Excluding 100-foot Buffer Around Project Components and Corps/RWQCB mitigation site) | 815 |
| Temporarily Impacted Areas (100-foot Buffer Around Project Components within Stewardship Lands) | 485 |
| Corps/RWQCB compensatory mitigation site | 20 |
| Total 3B.1 Project Action Area (sum of previous 5 lines) | 4,840 |
| TSF Conservation Land Action Area | 12,147 |
| PG&E Conservation Land Action Area | 7.16 |

Key components of the Proposed Action include:

- Installation of over nine million PV solar modules manufactured by First Solar Inc. within approximately 460 arrays, and associated electrical equipment (e.g. Power Conversion Stations, PV Combining Switchgear houses), an electrical substation and the Solar Switching Station;
- Operations and Maintenance (O&M) facility (11,250 square feet [sq. ft.]);
- Solar Energy Learning Center (900 sq. ft.), either new construction or through payments to the County for maintenance of the existing Simmler Community Center, approximately 4 miles from the Action Area;
- Placement of most medium-voltage feeder lines underground;
- Approximately 9 miles of above-ground medium-voltage (34.5 kV) collector lines;
- Construction of approximately 23 miles of access roads utilizing existing agricultural roads to the extent feasible;
- Construction of three at-grade road crossings through on-site federal jurisdictional drainages to provide access to construct and maintain the Topaz Solar Farm;
- Restoration of portions of the main on-site drainage to Soda Lake as compensation for permitted "fill" of jurisdictional waters of the U.S;
- A leach field and septic system located adjacent to the O&M facility to support the domestic sanitary needs of employees and visitors during operation;

- Four temporary construction staging areas of approximately 10 acres each located within the proposed fenced PV arrays. These will accommodate temporary construction offices, parking, material laydown, and storage area; and
- Perimeter fencing around solar arrays will be constructed to provide a 5 to 6 inch gap at the bottom, for the entire length of the fence, for kit fox passage into and through the TSF Project.
- In the Proposed Action area, up to 83 miles of fencing will be removed or improved for wildlife passage, including approximately 12,000 feet of existing cyclone barrier fencing to be removed from Section 27. No interior fences within the perimeter fencing will be present.

### *2.3.1 Proposed construction schedule*

The Topaz Solar Farm is anticipated to be constructed sequentially in up to six overlapping phases; each phase is anticipated to last less than one year starting in 2011. The construction of the PG&E Solar Switching Station and associated tower work is expected to be completed within the first phase. The Topaz Solar Farm is expected to begin generating electricity as early as fall 2012 and be fully online by early to mid-2015. Operations and maintenance of the TSF are anticipated to occur for 30 years.

### *2.3.2 Site preparation*

Project Area preparation involves improvement of approximately 23 miles of on-site construction access roads with gravel or other road stabilization material, installation of drainage crossings, setup of construction staging areas, storm-water management work, preparation of land areas for array installation, and other activities needed before installation of the solar arrays can begin. This work will involve trimming of grassland vegetation, agricultural disking, harrowing, and/or rolling of PV array areas, selected compacting and grading, and setup of modular offices and other needed facilities. For the majority of the Project Area, the ground under the PV arrays will not require grading, except for areas that are greater than three percent slope. Preparing the ground beneath PV arrays will begin by trimming existing vegetation as close to the ground as possible by mowing or grazing. An agricultural tool, such as a disk, harrow or cultipacker, will then be used to loosen and smooth the top one to three inches of soil. Finally, a smooth steel drum roller, or similar equipment, will be used to bring the top four to six inches of soil to the appropriate compaction value. Beneath the compacted surface of the soil, the soil will remain at the existing level of compaction, allowing small mammal dens and burrows to remain or reform. Depending on the moisture level of the soil at the beginning of construction, some water may need to be added to the soil one to two days before compaction occurs.

### *2.3.3 Construction and installation*

This phase involves installation of the PV solar modules and all the necessary electrical equipment to make the Project Area operational. Preparation of the ground under the arrays and improvement of the construction access roads will continue throughout the majority of the construction process. PV modules will be mounted on steel support structures and driven into the ground to a depth of four to seven feet below grade. Once mounted, the low edge of the modules will be approximately 1.5 feet above grade, while

the rear high edge will be approximately 5.5 feet above grade. The solar arrays have no moving parts for sunlight tracking and utilize no water during operation. Equipment used for system installation will include 4x4 forklifts, ATV vehicles, truck-mounted pile drivers, and pick-up trucks. Trenches will be dug for the underground AC (alternating current) and DC (direct current) cabling, and the foundations for the inverter enclosures and transformers will be prepared. Equipment used for trenching includes small backhoes, small sheepsfoot rollers, and 5 cubic yard dump trucks.

The construction workforce is estimated to be 400 workers on average for the approximately three-year construction period, with a peak of approximately 500 workers. Shuttle buses will bring the construction workforce to the TSF Project Area from the surrounding communities.

### *2.3.4 Operations and maintenance*

The Topaz Solar Farm facility is expected to be operational by mid-2015 and will require 15 permanent employees. While the TSF will largely be self-sufficient upon completion of construction, periodic monitoring and maintenance activities will be required. Key elements of the maintenance and monitoring include monitoring and reporting the performance of the facility, conducting preventative and corrective maintenance, maintaining vegetation density and height, receiving students and other visitors, and maintaining the security of the facility. The Project will operate continuously, seven days a week, during daylight hours.

All exterior lighting will be placed or shielded to avoid lighting open space and solar array areas. No permanent night lighting will be allowed, except for the Solar Energy Learning Center, substation, switching station, and monitoring and maintenance facility. Maintenance and repair, as well as limited construction activities for the TSF Project will be conducted during daylight and dusk hours with limited temporary task lighting only as necessary.

The Project has a minimum expected lifetime of at least 30 years, with possible subsequent equipment replacement and repowering. After its productive lifetime, the TSF Project will be decommissioned in accordance with all local, state, and federal policies. The majority of the facility components are recyclable, and the land will remain as grassland habitat.

### *2.3.5 PG&E solar switching station*

The PG&E Solar Switching Station will be constructed within the TSF Project Area by PG&E to interconnect the TSF with the existing PG&E Morro Bay–Midway double-circuit 230 kV transmission line. The Solar Switching Station will encompass 6.3 acres with a buffer zone and will be enclosed by a fence that will not be permeable to San Joaquin kit fox movement with a 4 inch gap along the bottom of the fence. Two new double-circuit lattice steel towers (LSTs) and four tubular steel poles (TSPs) will be installed to interconnect PG&E's 230 kV line to the Solar Switching Station. The two LSTs will be located within or adjacent to the existing PG&E transmission line ROW. The four TSPs will be located on either side of the new Solar Switching Station. Night lighting will be installed at the switching station for security purposes. This Switching Station is further described in the revised PG&E Biological Assessment (ICF

International 2011). The Solar Switching Station and associated tower work will be addressed in the Biological Opinion for the Topaz Solar Farm.

### *2.3.6 PG&E Reconductoring*

The PG&E Reconductoring Project is an interrelated action to the TSF Project in the Final EIS because the reconductoring is necessary to accommodate the final 150 megawatts of the TSF Project and other projects in the region. We understand the Service has addressed the impacts of the PG&E reconductoring in the Biological Opinion for the California Valley Solar Ranch (CVSR) Project and, through its incorporation of the impacts and analysis of the Reconductoring there, will be incorporating it into its environmental impacts and jeopardy analysis of the Topaz Biological Opinion. The Reconductoring Project is described in the revised PG&E Biological Assessment (ICF International 2011).

## 2.4 Proposed Conservation Package

The Applicant proposes to implement a conservation package to fully mitigate for impacts to the San Joaquin kit fox. The conservation package is outlined in detail in the San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse and Meade, Inc. June 2011) included in Appendix B of this document, and is based on intensive research and field survey programs conducted on more than 10,000 acres of land. The conservation package is composed of off-site land preservation for kit fox coupled with a variety of cutting-edge on-site enhancements designed to enable the Project to become inhabited by kit fox.

The Applicant has secured more than 12,000 acres of lands in the northern Carrizo Plain to be protected and managed in perpetuity for kit fox and other sensitive biological resources (BR Map 7, Section 12.0). These lands are composed of annual grasslands and croplands strategically situated around the TSF Project where land preservation would provide certainty in maintaining the movement corridor for kit fox and other animals moving into or out of the northern Carrizo Plain.

Stewardship Lands encompass approximately 815 acres of land to be owned by Topaz Solar Farms LLC that is composed of interstitial areas and movement corridors between fenced array areas of the Project (Figure 6 in Section 11.0). Stewardship Lands are not included in the Project's proposed off-site conservation lands, will not be covered by a conservation easement or managed according to the Habitat Management and Monitoring Plan (HMMP), but will be restored and maintained by the Applicant according to the Project Habitat Restoration and Revegetation Plan (HRRP) and Vegetation Management Plan (VMP), which are included in Appendix E.

Securing existing annual grasslands for permanent conservation and management according to approved management guidelines would enhance vegetative conditions of the lands, where current management practices often prescribe intensive grazing and other activities that reduce suitability for kit fox. Securing existing croplands for

permanent conservation and management provides an opportunity to actively pursue significant increases in habitat suitability by eliminating farming activities that are detrimental to current kit fox habitation.

The TSF Project arrays would be surrounded by a perimeter fence designed for kit fox passage. The perimeter fence passages would be five to six inches in height, which would prevent coyotes from entering the Project. Escape dens and artificial natal dens would be installed inside and outside of the perimeter fence for kit fox use. A VMP and a HRRP will be implemented to enhance and manage vegetation height to create conditions within the TSF Project suitable for kit fox.

The overall goal of the conservation package offered by the Applicant is to provide the USFWS with a scientifically-based approach to endangered species conservation that utilizes a diverse suite of land preservation opportunities, on-going genetic research on local kit fox populations, and an opportunity to study kit fox interactions with solar development that can be used to inform future projects and management issues in kit fox habitat.

# 3.0 Action Area

The TSF Project is the "Proposed Action" for purposes of this section 7 consultation. The Action Area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). As specifically requested by the USFWS, this BA focuses on the Alternative 3B.1 Project layout, and includes baseline information on proposed conservation lands.

The Action Area encompasses all areas that may be directly or indirectly affected as a result of construction and operation activities for the Proposed Action, and the broader area that, while outside and adjacent to the construction zone, may be directly or indirectly affected by vibrations, noise, dust, or movement associated with the Proposed Action. The Action Area also includes areas that may be affected by prescribed management and maintenance activities on offsite conservation lands.

The Action Area for the Proposed Action consists of an Alternative 3B.1 Action Area (Figure 6, Section 11.0) and a Conservation Lands Action Area (refer to map of conservation lands, BR Map 7, Section 12,0), with a total size of approximately 16,987 acres.

- Alternative 3B.1 Action Area includes lands within and adjacent to the solar generation facility and switching station, including the temporarily-impacted buffer lands within 100 feet of any structure, facility component, or fence; the USACE/RWQCB compensatory mitigation site; and Stewardship Lands in the spaces outside and between fenced array areas. This is an area of approximately 4,840 acres.
- Conservation Lands Action Area includes approximately 12,147 acres of conservation lands adjacent to and near the TSF Project in San Luis Obispo County.

- The PG&E Reconductoring Project is considered an Interrelated Action in the Final EIS for the reasons described above, and is not included in the Alternative 3B.1 Action Area defined in this BA (refer to Section 8.0 for more information on Interrelated Actions). Instead, it is fully evaluated in a separate Biological Assessment (ICF International 2011) and in the Biological Opinion for the CVSR Project.

## 3.1 Environmental Baseline

The Action Area is generally characterized by tree-less level terrain and low rolling hills and plain with ephemeral swales. The Action Area is primarily used for agricultural production of grain, and as rangeland for cattle. It has been disturbed by dry-land farming and by ranching activities. Farming practices consist of a rotational program where fields are farmed for one year then plowed bare for a year to conserve soil moisture. At any one time some of the land is plowed bare, some is planted to grain, and some is left fallow. Areas that are left un-tilled for several years or more support naturally recruited annual grasslands. The primary crops grown within the Action Area are barley and oats. These grains are dry-farmed crops sown in the fall or winter and harvested for grain or used as cattle feed. Broad-leaf herbicides are sprayed on the crops by crop duster or ground spray rigs to control non-crop plants. Agricultural fields are described as cropland habitat in this report.

Fields that are plowed in the summer or fall and left unplanted through the following spring and summer tend to grow agrestal weeds. Some of these plants are native to the area, but most are naturalized (non-native, naturally recruiting) annual herbs and grasses. Early in the spring, vegetation is short, which allows establishment of ground squirrel den complexes and easy foraging by predators and grazing ungulates. If rainfall totals are average or above, as was the case in 2007-2008 and 2009-2010, fields left fallow more than one season become densely vegetated with annual grasses and forbs that can reach three feet in height. Tall dense vegetation limits use of these areas by some wildlife. With less than average rainfall, as in the winter of 2008-2009, vegetation in fallow fields and annual grasslands is typically less than two feet in height.

Every other year croplands are plowed in the late winter or early spring to reduce weeds, but are not sown. From mid spring into summer the plowed ground typically hosts an abundant growth of bindweed, an introduced perennial herb with a deep persistent taproot that sprouts green leafy growth year after year. Bindweed provides summer forage for pronghorn antelope. Common reptiles, small mammals, and birds may forage in plowed fields, but the lack of cover increases the likelihood of predation and reduces food supply.

Portions of the Action Area were removed from farming rotation in the 1980's when the landowners voluntarily entered portions of their land into the Conservation Reserve Program (CRP). The CRP is a federal program administered by the U.S. Department of Agriculture Farm Service Agency, which provides landowners with annual rental payments, cost-sharing assistance, and technical assistance to remove land from annual tilling practices in order to minimize water run-off and sedimentation, and increase wildlife habitat value. CRP contracts are signed for periods of 10 to 15 years. The

Natural Resources Conservation Service (NRCS) provides landowners with technical assistance regarding conservation planning and practice implementation.

Lands within the Action Area that are in the CRP are managed as rangelands for cattle. Rangelands are described in this report as annual grasslands since species composition is similar to typical annual grassland habitats in the region. Annual grassland habitats within the Action Area are variable with respect to dominant species due to different topography, soils, grazing regimes, and farming history.

Anthropogenic habitat within the Action Area is associated with residential compounds and other facilities. All existing roads are dirt ranch roads, with the exception of gravel-based access roads from Highway 58 to Sections 4 and 27.

## 3.2 Habitat Type Descriptions

A map of habitat types occurring within the Alternative 3B.1 Action Area is included as BR Map 1 in Section 12.0. Seven habitat types are described within this Action Area. Ephemeral wetland depressions, previously described and mapped within the Project Site, were completely avoided by the Alternative 3B.1 Action Area, and are therefore not included in this discussion. Locations of ephemeral wetland depressions can be reviewed in Althouse and Meade, Inc. (2010c).

### *3.2.1 Cropland*

Land in varying stages of dry-farm production constitutes approximately 3,740 acres (77 percent) of the Alternative 3B.1 Action Area. The cropland habitat designation includes fields planted to grain and fields left bare during rotation. Farming on the parcels utilizes a summer fallow program. Summer fallow is the practice of idling farmland and removing weeds for up to 14 months to allow soil moisture to increase. Barley and oats, non-irrigated grain crops planted in alternate years, are harvested for grain and then the stubble is used for cattle grazing. Herbicides are regularly used to control weeds in planted fields. Cropland habitat supports few native plant species, and is generally low quality wildlife habitat. In addition, the farming methods employed on active grain fields likely result in routine wildlife mortality.

Although wildlife use of the cropland habitat is limited, several species are regular inhabitants. Ferruginous hawk is a sensitive raptor that winters in the region, and was observed roosting on the bare ground croplands within the Action Area. Deer mice (*Peromyscus maniculatus*) occur in fallow grain fields, notably along fence-lines. Mammals such as kit fox and badger may forage for squirrels and other rodents that live in the habitat. San Joaquin kit fox were photographed by motion detecting camera moving regularly along a fence line on bare cropland field adjacent to annual grasslands in Section 21 in spring 2008. Farm fields are used as resting and feeding areas for pronghorn antelope and as late season grazing habitat when bindweed (*Convolvulus arvensis*), a preferred forage plant, becomes common.

### *3.2.2 California annual grassland*

Annual grasslands comprise approximately 1,100 acres (23 percent) of the Alternative 3B.1 Action Area. The annual grassland habitat is a dry seasonal habitat consisting of low-lying annual grasses and forbs. It is dominated by non-native and native annual

grass species, with varying percentages of native and introduced forbs. This habitat type is ubiquitous throughout the State of California where cultivation and grazing for the past century or more has converted native annual or perennial grasslands to annual grasslands. Throughout its range the California annual grassland habitat type takes on many forms, and the Action Area likewise contains several forms depending upon the land use history. The Conservation Reserve Program (CRP) lands within the Action Area (Sections 4 and 34) have been untilled for at least 20 years and generally show significant recovery in terms of native forb diversity and abundance. Some areas, such as Section 28, were removed from farming more recently. These grasslands are predominantly composed of introduced annual grasses and support a lower diversity of native forbs and grasses.

Early season vegetation in all grasslands within the Action Area is dominated by redstem filaree (*Erodium cicutarium*), an introduced species. CRP lands develop large areas of native annual fescue (*Vulpia microstachys*) with significant patches of soft chess brome (*Bromus hordeaceus*) and introduced annual fescue (*Vulpia myuros*). In addition, native wildflowers such as *Layia platyglossa*, *Lupinus bicolor*, *Castilleja* ssp., and *Lasthenia gracilis* are common to abundant. Other native forbs common in the CRP grasslands are *Microseris* ssp., *Uropappus lindleyi*, *Stebbinsoseris heterocarpa*, *Lotus humistratus* and *Calandrinia ciliata*.

Fallow agricultural fields that have recently reverted to annual grasslands tend to be dominated by introduced annual grasses such as wild oats (*Avena fatua*), soft chess brome, introduced annual fescue, and foxtail barley (*Hordeum murinum*). Common and sometimes abundant native wildflowers include the native Great Valley phacelia (*Phacelia ciliata*) and several species of fiddleneck (*Amsinckia menziesii*, *A. lycopsoides*, and *A. tessellata*).

### *3.2.3 Vernal pool*

Numerous vernal pools occur within and near the Alternative 3B.1 Action Area. An area in the eastern end of Section 4 contains a vernal pool complex that supports listed fairy shrimp. This area was avoided by the Project and included in proposed conservation lands. Vernal pools within the Action Area occur in topographic depressions that are not in drainages and do not, under normal circumstances, experience flow of water. They occur in shallow loamy soil up to 8 inches deep over an abrupt textural change to clay at 6 to 8 inches depth. A continuous, cemented hardpan was not encountered during pits excavated as part of wetland delineation, although exposed bedrock of marine sedimentary mudstone and sandstone is visible in a streambed adjacent to these vernal pools, at approximately 24 to 36 inches depth. The Carrizo Soil Survey identifies Pinspring, a soil map unit component mapped across the Action Area, as having a sandy loam horizon weakly cemented by silica at 30 to 39 inches depth. A backhoe pit was not excavated to avoid unnecessary damage to sensitive vernal pool habitat and surrounding upland during the wet season, but would be required to determine whether the exposed layer observed in the streambed is bedrock or cemented soil.

Vegetation typically consists of several species from a suite of plant species strongly affiliated with vernal pools in the region, including hair grass (*Deschampsia danthonioides*), water starwort (*Callitriche marginata*), water pygmyweed (*Crassula aquatica*), mousetails (*Myosurus minimus, M. sessilis*), woolly marbles (*Psilocarphus*

*brevissimus*, *P. chilensis*), inch-high rush (*Juncus uncialis*), pillwort (*Pilularia americana*) and alkali plagiobothrys (*Plagiobothrys leptocladus*). Many of these pools also support another species of woolly marbles (*P. oregonus*), toad rush (*Juncus bufonius*), wandering speedwell (*Veronica peregrina*), loosestrife (*Lythrum hyssopifolia*), and adobe allocarya (*Plagiobothrys acanthocarpus*), but these species also occur in other mesic habitat types in the Action Area and do not have a high fidelity to vernal pool habitat. Not all vernal pools within the Action Area have all species listed here, but vernal pools we mapped had at least two species with high fidelity to vernal pool habitat in the region (meaning they typically occur in vernal pools and not in other habitats).

Vernal pool habitat includes several pools that have not been farmed for 20 years or more in Sections 4 and one in Section 34, as well as a few additional pools that have been regularly disturbed by farming activities in the last two years, in Sections 20 and 32. Pools in Section 20 were planted with barley in 2010; pools in Section 32 were fallow two years then plowed in 2010. Despite plowing and planting activities in 2009-2010, these pools support *Psilocarphus* spp., *Plagiobothrys leptocladus*, *Myosurus* spp., *Crassula aquatic*, and *Callitriche marginata*. Cultivated barley is generally absent from within vernal pools because it does not tolerate long periods of inundation, although it may be present around the upper margins.

Vernal pools within the Action Area also had strong indication of wetland hydrology via biotic crusts, algal mats, and oxidized rhizospheres, as well as clear indication of hydric soils. Many vernal pools within the Action Area support fairy shrimp (*Branchinecta* spp.) and many other aquatic invertebrates including seed shrimp, backswimmers, and *Daphnia*. A few of the larger pools also support breeding Western spadefoot toads.

Adjacent upland habitat surrounding undisturbed vernal pools supports a variety of wildflowers and grasses, including *Vulpia microstachys*, *Bromus madritensis* ssp. *rubens*, *Erodium cicutarium*, *Lasthenia gracilis*, *Microseris douglasii* ssp. *tenellus*, and *Castilleja* ssp. In farmed vernal pools, surrounding vegetation is predominantly cultivated barley and/or oats.

Classification of vernal pools has been addressed through several approaches, at several scales, ranging from a system based solely on landform to a system presented in the Manual of California Vegetation based on geographic region, type of aquatard, and indicator species, to the recently developed vernal pool vegetation classification system, which identifies three orders of plant communities based on studies of how species co-occur (Solomeshch et al, 2007; Solomeshch and Barbour, 2008; Sawyer and Keeler-Wolf, 1995). Sawyer and Keeler-Wolf (1995) initially identified eight vernal pool groups from an ecosystem approach. In the 1995 edition of the Manual of California Vegetation, the authors note the difficulties associated with classifying vernal pools. Vernal pools in the Action Area lack *Downingia*, a common vernal pool plant, and do not fit well with any of the descriptions under the Sawyer Keeler-Wolf scheme. Species composition is most similar to San Diego mesa claypan vernal pools or San Jacinto valley vernal pools. However, geographic location, soil conditions, and species diversity vary. Also, presence of an abrupt increase in clay content and shallow bedrock/weakly cemented hardpan are more similar to Northern claypan vernal pools, but species composition described in the Manual for this alliance is not consistent with our observations within the Action Area, with only one of the described species for this alliance observed.

Using the Solomesch and Barbour key (2008), vernal pools within the Action Area clearly meet diagnostic criteria for vernal pool vegetation, with seven of the listed diagnostic species regularly occurring in vernal pools within the Action Area. Vernal pools occurring within the Action Area best fit the *Lasthenia fremontii-Downingia bicornuta* group of alliances (in spite of the fact that neither species named in the alliance title occur in the Action Area) due to freshwater conditions, absence of spikerush, and presence of *Deschampsia danthonioides* and *Psilocarphus brevissimus*. The association occurring in the Action Area has not been classified and does not key any further than group of alliances in the Solomesch-Barbour key because the appropriate combination of species and substrate are not an option in this key.

Vernal pools observed in the Action Area do not fit any of the described alliances or vernal pool "types" very well, and do not match criteria for vernal pool habitats listed as sensitive natural communities by the California Natural Diversity Database (CNDDB).

### *3.2.4 Natural non-wetland pool*

Naturally occurring pools that do not meet wetland criteria due to absence of hydric soils and/or non-dominance of hydrophytic vegetation occur within the Action Area, specifically in Sections 4, 20, 32 and 34. Some hydrophytic plant species such as *Plagiobothrys leptocladus*, *Plagiobothrys acanthocarpus*, and *Psilocarphus oregonus* are present in low quantities but do not form dominant cover. Upland species are present in equal or greater quantities, including such species as *Plagiobothrys canescens*, *Chamomilla suaveolens*, *Erodium cicutarium*, and *Microseris douglasii* ssp. *douglasii*. In Section 20, cultivated barley, while stunted, continues to grow as one of the dominant species in the non-wetland pools observed, whereas in vernal pools in Section 20, this saturation-intolerant species is absent. Despite lacking dominance of hydrophytic vegetation, in years with above average rainfall, some of these naturally occurring non-wetland pools provide habitat for common aquatic invertebrates, and larger pools provide potential breeding habitat for spadefoot toads.

### *3.2.5 Anthropogenic non-wetland pool*

Use of unpaved roads during the wet season has generated many ruts and depressions within the roadways that, while not meeting criteria for wetlands due to lack of hydric soils and/or non-dominance of hydrophytic vegetation, do provide poor quality habitat for aquatic invertebrates and spadefoot toads in wet years. These pools are separated from naturally occurring non-wetland pools because they are more transitory in nature, with pools being created or enlarged during the wet season and eliminated during regular road maintenance in the dry season. Some hydrophytic species, such *Plagiobothrys acanthocarpus* and *Psilocarphus oregonus*, are present in low quantities but do not form dominant cover and often form less than five percent total cover. Upland species are present in equal or greater quantities, including *Chamomilla suaveolens* and *Lepidium nitidum* var. *nitidum*.

### *3.2.6 Agricultural reservoir*

Two agricultural reservoirs, one in Section 20 and one in Section 28, hold water and are indicated on the habitat map in Section 12.0. The reservoir in Section 20 filled with rainwater to several feet deep in 2010, and was used by Western spadefoot toads as a

breeding pool. Insufficient water was present in 2008 and 2009 for spadefoot toad breeding. In Section 28, the westernmost reservoir held a few inches of rainwater in winter 2010 and was filled by a well in April 2010. Pacific chorus frog, Western toad, and Western spadefoot toad larvae were detected during aquatic amphibian dip-net surveys.

### *3.2.7 Anthropogenic*

All portions of the Action Area that are heavily influenced by human development are mapped and described as anthropogenic habitat. Anthropogenic habitat includes abandoned and occupied ranch compounds and other structures within the Action Area, specifically in Sections 22, 27 and 28. Several of the ranch compounds are liberally planted with ornamental trees and shrubs, which create areas of tree canopy and shrub understory that are otherwise entirely lacking in the vicinity. A variety of bird species utilize the vegetated portions of the anthropogenic habitat for nesting, wintering, and general foraging. Migrant species such as warblers, hummingbirds, and orioles find temporary refuge as well.

## 4.0 Federally Listed Species

We reviewed records of federally listed species reported from the two USGS quadrangles that contain the Alternative 3B.1 Action Area, as well as the surrounding ten USGS quadrangles. Records that were reviewed came from the California Natural Diversity Database (CNDDB), the USFWS, and the California Native Plant Society (CNPS) On-line Inventory of Rare and Endangered Plants of California. The designated search area encompasses approximately 735 square miles (470,400 acres) of land, and is consistent with typical search area requirements by the USFWS and California Department of Fish and Game (CDFG). The search area includes the following twelve USGS 7.5 minute quadrangles: La Panza NE, California Valley, La Panza, La Panza Ranch, Holland Canyon, Packwood Creek, Shale Point, Las Yeguas Ranch, Simmler, Chimineas Ranch, Branch Mountain, and Los Machos Hills. Additional species were added to the list from our knowledge of the area, and from review of museum specimen data and other private consultant survey reports from the region.

Figure 4 in Section 11.0 depicts the current GIS data for federally-listed species and critical habitat mapped in the vicinity of the Action Area by the CNDDB and USFWS. Biological Resource Maps indicating locations of listed species detected within and near the Action Area are provided in Section 12.0.

This BA includes detailed information regarding federally listed species that occur within the Action Area. Potentially suitable habitat was present within the Action Area for several federally listed species that were surveyed for and subsequently found not to be present (Althouse and Meade, Inc. 2010c). Additionally, potentially suitable habitat for several federally listed species reported from the region was determined not to be present within the Action Area. A total of eight federally listed species that do not occur within the Action Area and would not be affected by the TSF Project are addressed in Appendix A, which is incorporated herein by reference.

## 4.1 Federally Listed Species that May Be Affected by the TSF Project

Two species listed under the federal ESA were detected within the Alternative 3B.1 Action Area: the San Joaquin kit fox (*Vulpes macrotis mutica*) and longhorn fairy shrimp (*Branchinecta longiantenna*). Project construction and operation could potentially affect these species.

Bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) (both non-nesting) were occasionally detected foraging within the Alternative 3B.1 Action Area, but were not found to be nesting there. Since bald eagles were delisted from the ESA in 2007, the Eagle Act, as implemented by the USFWS, provides the primary legal protection for this species. The golden eagle, although never listed under the ESA, is also governed by the Eagle Act. These species, therefore, are addressed in this document as species of federal regulatory concern.

Three additional species were detected on the proposed conservation lands but do not occur within the Alternative 3B.1 Action Area: Vernal pool fairy shrimp (*Branchinecta lynchi*), mountain plover (*Charadrius montanus*), and giant kangaroo rat (*Dipodomys ingens*). Management and maintenance activities conducted on the conservation lands could potentially affect these species.

In sum, a total of seven wildlife species regulated by the ESA and Eagle Act were detected within the Action Area, and therefore the TSF Project may affect these species (Table 3). Species accounts are provided for all six species in Section 5.0, and individual effects determinations are outlined in Section 6.0. Section 7.0 provides detailed discussions of conservation measures and Applicant Proposed Measures to benefit these listed species. No designated critical habitat for listed species is present within the Action Area.

TABLE 3. FEDERALLY LISTED SPECIES THAT MAY BE AFFECTED Seven wildlife species are listed in this table that are governed by the ESA or Eagle Act, and which were detected within the Action Area and may be affected by the TSF Project.

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within Action Area? | Critical Habitat Within Action Area? |
|---|---|---|---|---|---|---|---|
| 1. | **San Joaquin Kit Fox** *Vulpes macrotis mutica* | Endangered/ Threatened G4T2T3/S2S3 Special Animal | December – July | Annual grasslands or grassy open stages with scattered shrubby vegetation. Needs loose textured sandy soil and prey base. | Yes. Suitable foraging and denning habitat is present within the Action Area. | Yes 3B.1 and Conservation Lands | No |
| 2. | **Longhorn Fairy Shrimp** *Branchinecta longiantenna* | Endangered/None G1/S1 Special Animal | Rainy Season | Small clear water depressions in sandstone, and clear to turbid clay/grass bottomed pools in shallow swales. | Yes. Suitable aquatic habitat is present in ephemeral pools within the Action Area. | Yes 3B.1 | No |
| 3. | **Vernal Pool Fairy Shrimp** *Branchinecta lynchi* | Threatened/none G3/S2S3 Special Animal | Rainy Season | Clear water sandstone depression pools, grassed swale, earth slump, or basalt flow depression pools. | Yes. Moderate to poor quality aquatic habitat is present in ephemeral pools in grassy swales within Action Area A. | Yes Conservation Lands | No |

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within Action Area? | Critical Habitat Within Action Area? |
|---|---|---|---|---|---|---|---|
| 4. | **Giant Kangaroo Rat** *Dipodomys ingens* | Endangered/ Endangered G2/S2 Special Animal | Spring - Summer | Sandy loamy soil on level and gently sloping ground with annual grasses, forbs, and scattered shrubs. sw SnJV | Yes. Potentially suitable habitat may be present within the Action Area. However, intensive burrow transect surveys and a kangaroo rat burrow and scat measurement study determined all kangaroo rat precincts within the Action Area were created and inhabited by the common and widespread Heermann's kangaroo rat (*Dipodomys heermanni*). Giant kangaroo rat does not occur within the Action Area. | Yes Conservation Lands | No |
| 5. | **Mountain Plover** *Charadrius montanus* | Formerly Proposed Threatened/None G2/S2? SSC | November - February (Wintering) | Short grasslands, plowed fields, etc. Winters locally, does not nest in SLO County. | Yes. Winters in the Carrizo Plain National Monument, and potentially suitable habitat occurs within the Action Area. | Yes | No |

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within Action Area? | Critical Habitat Within Action Area? |
|---|---|---|---|---|---|---|---|
| 6. | **Golden Eagle** *Aquila chrysaetos* | Eagle Act Protected/ none G5/S3 SSC Fully Protected | March 15 through August 15 | Nests in large, prominent trees in valley and foothill woodland. Requires adjacent food source. | Yes. Potential nesting on power towers, few perches at abandoned ranch sites, and foraging habitat are present within the Action Area. | Yes<br>No nests on-site | No |
| 7. | **Bald Eagle** *Haliaeetus leucocephalus* | Eagle Act Protected / Endangered G4/S2 Special Animal (Nesting and Wintering) | March 15 through August 15 | Nests within 1 mile of water in tall live tree with open branches. | Yes. Migrant or transient bald eagles do occasionally forage on Carrizo Plain. Suitable nesting habitat is not present within the Action Area or near vicinity. | Yes<br>No nests on site<br>Winter transient only | No |

# 5.0 Species Accounts

Species accounts for the six species listed in Tables 1and 3 above are contained herein. Appendix A includes an evaluation of eight other federally listed species that were found not to be present in the Alternative 3B.1 Action Area despite the presence of potentially suitable habitat or that, after biological evaluation, did not have potentially suitable habitat in the Alternative 3B.1 Action Area.

## 5.1 San Joaquin Kit Fox

*Listing Status*: The San Joaquin kit fox (*Vulpes macrotis mutica)* is listed as endangered under the federal Endangered Species Act, and threatened under the California Endangered Species Act.

*Species Biology:* The San Joaquin kit fox (SJKF) is a small, tan colored fox with large ears that are set close together, slim body with long slender legs, narrow nose, and long, bushy tail tapering slightly toward the tip. San Joaquin kit foxes inhabit grasslands and scrublands, many of which have been extensively modified agricultural mosaics of row crops, irrigated pastures, orchards, vineyards, and grazed annual grasslands. Oak woodland, alkali sink scrubland, and vernal pool and alkali meadow communities also provide habitat for kit foxes. Dens are scarce in areas with shallow soils because of the proximity to bedrock, high water tables, or impenetrable hardpan layers. Kit foxes are active year-round and are primarily nocturnal. Dens are used for housing and protection. One fox may use several dens, particularly during the summer months. Females may change natal and pupping dens one or two times per month. Kit foxes construct their own dens, but they can also enlarge or modify burrows constructed by other animals, such as ground squirrels, badgers, and coyotes. They also den in human-made structures, such as culverts, abandoned pipes, and banks in roadbeds. Most dens, especially natal and pupping dens, have at least two entrances (Brown et al. 2006).

The TSF Project is located near the Carrizo Plain National Monument core SJKF population, which is one of three core populations in California. All three core populations are geographically distinct, and together with about a dozen smaller satellite populations comprise the entire SJKF metapopulation (USFWS 1998).

*Survey Methods:* Presence of San Joaquin kit fox in the 9,700-acre Study Area was examined by two scat detection dog surveys, one conducted in 2009 and one conducted in 2010, by Dr. Debbie Smith and Alice Whitelaw of Working Dogs for Conservation Foundation (Smith and Whitelaw 2010; Smith and Whitelaw 2011), and DNA analysis by Dr. Jesus Maldonado and Tammy Henry at the Center for Conservation and Evolutionary Genetics, Smithsonian Institution (Maldonado 2010, Maldonado 2011, in prep.). The 2011 reports, drafts of which are provided in Appendix D, are incorporated herein by reference. A total of 64.19 miles (103.31 kilometers) of transects were surveyed in 2009, and 67.13 miles (108.04 km) were surveyed in 2010 using dogs trained to locate kit fox scat. The 2010 surveys included an additional 10.9 miles (17.55 km) of surveys outside of the Study Area to inspect potential mitigation lands. Survey routes for both 2009 and 2010 were determined by Dr. Smith to provide complete coverage of the

Study Area, and detect scat of every kit fox that utilized the property during the eight day survey period.

In 2009, the survey was separated into two parts, one in August and September 2009 and one in November 2009. Scat locations were determined with hand held GPS units. A total of 414 kit fox scats were detected. One-hundred fifty-three (153) fresh scats (eight days old or less) were collected and sent to the genetics laboratory at the Smithsonian Institution, National Zoological Park in Washington, D.C. for analysis. Coordinates of each scat sample collected were entered into a GIS map of the Project Site.

A repetition of the kit fox scat survey was conducted in November 2010 to track the baseline kit fox population. The 2010 survey was not separated over time as in 2009. Since the 2009 scat surveys were completed for different portions of the Study Area a few months apart, the August/September 2009 survey likely included many kit fox pups that had not yet dispersed, while the November 2009 survey likely occurred after some pups had either dispersed or died. November is a more appropriate time of year to determine a baseline number of resident kit fox because dispersal and early mortality are more likely to have occurred and breeding foxes are not yet sequestered in their dens (Cypher et al. 2000, Smith 2010 pers. comm.). A November survey from year to year is more likely to have lower variability, can be more easily repeated, and provides a better picture of how many resident foxes are supported. In addition, because the 2009 survey was necessarily split between August and November, the calculation of population size using the capture-recapture methodology could not be performed since a split study period is not consistent with statistical assumptions of that analysis. A one bout scat survey allows calculation of population size.

In addition to scat surveys, daytime visual surveys were conducted concurrently with other biological surveys which primarily consisted of gathering information on recent signs of kit fox activity. Occupied dens or dens showing sign of recent activity were mapped in the field using hand-held Garmin GPS units. Data gathered on areas of kit fox use during other biological surveys were used to direct focused surveys for natal dens. Kit fox dens identified in the field were categorized as either "Known Den" or "Natal Den". In one instance, a natal den was identified, and then the fox family moved to another den, which was subsequently labeled a "Post-natal Den". Where observations of the foxes were insufficient to determine natal versus post-natal, it was identified as a natal den. All kit fox known dens and natal dens are indicated on BR Map 3, Section 12.0.

Motion-detecting cameras (Cuddeback® Digital Expert 2006) were installed at various locations within and around the Action Area to identify and document wildlife. Eleven cameras were placed at 33 locations in 2009 and 2010. Cameras were active from April 2 to July 20, 2009. Cameras for the 2010 season were installed on January 15 and were in place through July 8. The primary target was San Joaquin kit fox, which was photographed twenty-three times, with detections at six locations.

*Survey Results*: There is a high variation in habitat quality for kit fox utilization in the 9,700 acre Study Area, ranging from good to poor. Areas in the northwest portion of the Study Area, consisting of Sections 17, 18, 19, 20, 21, 29 and portions of Sections 7 and 8, are poor quality. These parcels have been in cropland production for about 70 years.

Better quality habitat occurs in the eastern and southern portions of the Study Area consisting of all or portions of Sections 15, 16, 22, 26, 27, 28, 34, 35, 4 and 5. These areas contain habitat that has not been cropped for up to 25 years. Sections 34 and 35 had relatively low abundance of kit fox prey, possibly due to grazing practices that reduce the naturalized seed crop. Sections 4 and 5 had low small mammal abundance that is partially attributable to a shallow to moderately deep bedrock layer (25 to 100 cm) that causes water to perch and flood burrows. These conditions seem to limit small mammals from being able to establish populations on these Sections despite the absence of tilled agriculture for more than 25 years. Although prey abundance was low on Sections 4 and 5, several kit fox dens were detected there. Section 16 is improving grassland habitat following the end of crop production in 2006, and Section 15 contains good grassland habitat. The location of kit fox sign is consistent with habitat quality in the Study Area.

Both the 2009 and 2010 scat studies found evidence of kit fox predominately on eastern and southern areas of the Study Area (BR Maps 2a and 2b, Section 12.0). Other portions of the Study Area had fewer detections (one or more scats), and Sections 7, 16, 17 and 18 in the northern and western portion of the Study Area had no detections in 2009. In 2010, there were no detections in Sections 7, 8, 16, 17, 18 19, 20, 21, 22, 28, and 29.

The 2009 scat surveys were conducted from August 18 through September 1, and from November 11 through 21. The August survey period occurred during a time when annual population numbers tend to be high, and when family groups are still together prior to dispersal (Brian Cypher, pers. com. 2010; Maldonado 2010).

A total of 18 individual kit foxes were detected within the 9,700-acre Study Area in the 2009 survey. Genetic analysis found that all 18 foxes were significantly related to other foxes in the Study Area. The genetic analysis allows potential family groups to be described. A potential family group was found centered near Section 22 that consisted of eight individuals (two parents and six offspring). We observed this family during the spring and summer surveys, and observed at least three pups with parents in 2009. Local residents said there were four pups with this family in 2009, although we observed only three. Kit fox can have six pups in a litter (Cypher et al., 2000), and in some conditions as many as nine (Table 5.3 in Cypher 2010b), although average litter size on the Carrizo can be only two (White and Ralls 1993). However, additional individuals could have been previous year pups, including a helper offspring that is still part of the family group assisting with pups.

A second family group was detected in the southern portion of the Study Area. This group had nine related individuals with two different matings by one male fox. Three of these individuals were also strongly related to the first family group. One mother was detected in Section 26, and another mother in Section 5. Offspring are likely from the same father, who was detected in Section 4. Another group of four individuals was related to the second family group through a male fox. The high degree of relatedness suggests that the number of foxes detected in the Study Area includes offspring prior to dispersal.

Of these 18 foxes occurring within the Study Area in 2009, three were detected ten or more times, eight were detected five to nine times, and seven were detected one to four

times. There were no detections of transient foxes that were not related to the residents. The foxes that were detected only one to four times may have most of their home range outside the Study Area.

In 2009, 14 individual kit foxes were detected within and adjacent to TSF Project Alternative 3B.1 (BR Map 2a). The 2009 scat detections in Alternative 3B.1 were in the southern two-thirds of the Project, with no detections in the Project area north of the high-voltage power lines along Tracy Lane. Scat survey detections in 2010 were in the southern third of the Study Area with the exception of one detection along Tracy Lane above Section 27. Other scat detections were east of Alternative 3B.1 in Sections 34 and 35 (BR Map 2b). The northwest portion of the Study Area, where active croplands are dominant, had no detections of kit fox. The survey results demonstrate that kit fox utilize the Study Area, with most activity occurring in the southern and eastern portions.

Since the end of the 2009 scat survey, we found the remains of two kit fox (cause of mortality unknown) within the Study Area, located in sections 33 and 27. Kit fox juvenile survival reported for the Carrizo Plain is 64 percent, ranging from 50 percent to 74 percent for the years 1989 – 1991 (Cypher 2010). In Lokern, a wide range of juvenile survival has been documented ranging between 20 percent and 81 percent (Cypher et al. 2000). Factors contributing to kit fox survival include precipitation amounts and prey availability (Cypher et al. 2000, Cypher 2010).

The 2010 scat survey of the Study Area was conducted from November 2 through November 17, 2010. The November 2010 survey detected 63 fresh kit fox scats and 199 old scats. Results for individual genetic identity determined seven individual kit fox were represented by the 63 fresh scat samples from the Study Area (Maldonado 2011, in prep.). Four females and three males were detected. Three individuals found in 2009 were detected again in 2010; two still in the Study Area and one fox moved to a potential mitigation property east of the Study Area that was included in the scat survey area. The two foxes from the Study Area were highly related, and are likely brother and sister. Both of these foxes (TZ01 and TZ02) and one more fox (TZ24) were detected in 2010 within the proposed solar array areas of the Alternative 3B.1 layout; the other four foxes were detected within the Study Area, but outside of the proposed solar array areas (BR Map 2b). Of the seven foxes occurring within the Study Area in 2010, two were detected ten or more times, two were detected five to nine times, and three were detected one to four times. The three foxes detected within the proposed solar array areas were found four, six, and seven times. These foxes were all detected in the southern portion of the Alternative 3B.1 project layout in Sections 4 and 5.

The 2010 scat survey found less than half the number of scat as were found in 2009, reflecting the time of the year (November) that the survey was conducted (the 2010 survey did not include an August to September survey). Results of the genetic analysis will provide additional information regarding individual relatedness (Maldonado 2011, in prep.). The kit fox population within the Study Area in November 2010 was seven, with three foxes occurring within the proposed fenced solar array areas (Alternative 3B.1). These numbers, which are equivalent to up to three pairs in the Study Area and one pair within the fenced solar array area, are consistent with the indicated two to three family groups detected in the Study Area in 2009, and will be used to establish the baseline kit fox population.

The 2010 survey results support the conclusion that many of the kit fox individuals detected in 2009 were pups and relatives of two to three pairs that since have dispersed or died. Seven kit fox were detected in November 2010 that represent the kit fox population in the Study Area following pup dispersal and/or mortality. The 2010 kit fox population within the Alternative 3B.1 layout is three individuals.

## 5.2 Longhorn Fairy Shrimp

*Listing Status*: The longhorn fairy shrimp (*Branchinecta longiantenna*) is listed as endangered under the federal Endangered Species Act; it has no state listing status.

*Species Biology*: "Longhorn fairy shrimp have been observed in few known pools, generally located on the eastern edge of the Central Coast Mountain Region. Specifically, longhorn fairy shrimp have been observed in sandstone depression pools west of Tracy, California, as well as in claypan pools around the borders of Soda Lake in San Luis Obispo County and in alkaline grassland and Valley Saltbush Scrub pools located on The Nature Conservancy's Preserve in the Soda Lake area (USFWS 1994). Longhorn fairy shrimp have appeared in pools from late December to mid-May in basins filled by winter and spring rains, with required water temperatures ranging from 10-18 $^{o}$C (sandstone pools) to 10-29 $^{o}$C (claypan pools). However, little is known regarding the specific water chemistry (TDS, alkalinity, and/or pH) required for hatching and surviving for extended periods of time. It has been assumed that, like other Central Valley endemics, larvae of longhorn fairy shrimp hatch soon after winter and spring rains fill the pools with water temperatures at approximately 10 $^{o}$C, and require temperatures to remain at approximately 15-20 $^{o}$C to attain maturity. If conditions are optimal, maturation is reached in 23 days, but more typically requires 43 days. If pools remain for an extended period of time, longhorn fairy shrimp have been observed in pools for up to 147 days (Eriksen and Belk 1999)." (*Excerpted from Advantage Environmental Consultants 2010).*

*Survey Methods*: Protocol surveys for listed vernal pool branchiopods began in the 2008 dry season (Helm Biological Consulting, LLC 2008). Wet season surveys were conducted during the 2008-2009 wet season by Advantage Environmental Consultants, LLC (AEC 2009). A second dry season survey conducted in 2009 covered additional lands added to the Project since the 2008 survey (Helm Biological Consulting, LLC 2009). An additional wet season survey was conducted in 2009-2010 by Advantage Environmental Consultants, and a 2010 dry season survey was conducted by Helm Biological Consulting, LLC. Detailed methods for each survey are provided in the original reports, which are included in the 2010 Biological Report Technical Appendix, Volume 2 (Althouse and Meade, Inc. 2010b). Fairy shrimp surveys covered all of the 10,000 acre Project Site. All locations of listed fairy shrimp pools are indicated on BR Map 5 in Section 12.0.

*Survey Results*: The longhorn fairy shrimp was detected in two pools that are included within the Alternative 3B.1 Action Area. The pools are both located in the south half of Section 20, a farm field in active cultivation with dry-farmed grain. The pools are not supported by groundwater, but are filled by direct rainfall and surface sheet-flow. Section 20 was included in the 2008-2009 fairy shrimp protocol survey area. Ephemeral pools in the active farm field were not detected in 2008-2009 due to the low rainfall year

that resulted in no inundation. Also, the pools were plowed and the ground was left bare through the season which effectively made the pools undetectable. In March 2010 while conducting other biological surveys, Althouse and Meade, Inc. biologists found several pool complexes with standing water in the south half of Section 20. A new barley crop was approximately six inches tall around the margins of the pools. Unidentified fairy shrimp were visually detected in three pools. AEC sampled the pools on March 23, 2010. Two of the pools contained *B. longiantenna* and the third pool was dry. This pool is situated between the two *B. longiantenna* pools and is mapped as potential habitat for listed fairy shrimp. Because two pools in Section 20 and one in Section 19 were found late in the wet season, the protocol was not fully implemented and presence or absence of listed fairy shrimp was not verified. These pools are all mapped as potential habitat.

The 2010 protocol dry season survey conducted by Helm Biological Consulting sampled all 56 pools that were either not sampled or were found not to contain fairy shrimp during the 2010 wet season survey conducted by AEC. *Branchinecta* cysts were detected in 31 pools. Dry season sampling identifies cysts to genus, not to species; therefore it is unknown if the fairy shrimp in the 31 pools identified during the 2010 dry season survey are common or listed species. BR Maps 5 in Section 12.0 indicates the locations of all 31 pools with unidentified fairy shrimp, and provides a 250-foot buffer around each pool that is consistent with USFWS standard listed fairy shrimp pool setbacks.

### 5.3 Vernal Pool Fairy Shrimp

*Listing Status*: The vernal pool fairy shrimp (*Branchinecta lynchi*) is listed as a threatened species under the federal Endangered Species Act; it has no state listing status.

*Species* Biology: "The vernal pool fairy shrimp has been observed in a variety of vernal pools from December to early May in the Central Valley of California, and to the central and southern Coast Ranges from Solano County to Ventura County, California (USFWS 1994). They are also found in disjunct populations in the South Coast Mountains Region in a wide variety of habitats. Habitats include sandstone outcrops in Contra Costa and Santa Barbara counties, but the more typical habitat is small swales, earth slumps, or basalt-flow depression basins with a grassy or muddy bottom (Eriksen and Belk 1999). Vernal pool fairy shrimp inhabit vernal pools that vary in size from 0.56 $m^2$ (1.84 $ft^2$) to over 10 ha (24.71 acres) and have low to moderate total dissolved solids (TDS) and alkalinity, and neutral pH. Vernal pool fairy shrimp mature rapidly and can reach reproductive age in 18 days under optimal conditions, however, 41 days is more common. Vernal pool fairy shrimp are the shortest lived fairy shrimp, with a maximum lifespan of 139 days (mean = 90 days) (Eriksen and Belk 1999)." (*Excerpted from Advantage Environmental Consultants 2010*).

*Survey Methods*: Protocol surveys for listed vernal pool branchiopods began in the 2008 dry season (Helm Biological Consulting, LLC 2008). Wet season surveys were conducted during the 2008-2009 wet season by Advantage Environmental Consultants, LLC (AEC 2009). A second dry season survey conducted in 2009 covered additional lands added to the project since the 2008 survey (Helm Biological Consulting, LLC 2009). An additional wet season survey was conducted in 2009-2010 by Advantage Environmental Consultants, and a 2010 dry season survey was conducted by Helm Biological Consulting, LLC. Detailed methods for each survey are provided in the

original reports, which are included in the 2010 Biological Report Technical Appendix, Volume 2 (Althouse and Meade, Inc. 2010b). Fairy shrimp surveys covered all of the 10,000 acre Project Site. All locations of listed fairy shrimp pools are indicated on BR Map 5 in Section 12.0.

*Survey Results*: The vernal pool fairy shrimp was detected in 11 pools within the Conservation Lands Action Area. It was only found in true vernal pools. All of the 11 *B. lynchi* pools are located in Section 4, adjacent to the southeast edge of the Project. Four of the vernal pools in Section 4 contained both *B. lynchi* and *B. lindahli*, a common species. All of the vernal pools in Section 4 are filled directly by rainwater or by surface sheet-flow; they are not connected or supported by groundwater sources.

The 2010 protocol dry season survey conducted by Helm Biological Consulting sampled all 56 pools that were either not sampled or were found not to contain fairy shrimp during the 2010 wet season survey conducted by Advantage Environmental Consultants, LLC. *Branchinecta* cysts were detected in 31 pools. Dry season sampling identifies cysts to genus, not to species; therefore it is unknown if the fairy shrimp in the 31 pools identified during the 2010 dry season survey are common or listed species. BR Map 5 in Section 12.0 indicates the locations of all 31 pools with unidentified fairy shrimp, and provides a 250-foot buffer around each pool that is consistent with USFWS standard listed fairy shrimp pool setbacks.

### 5.4 Mountain Plover

*Listing Status*: The mountain plover (*Charadrius montanus*) was listed under the federal Endangered Species Act as Proposed Threatened. On May 11, 2011, the Service withdrew its proposal to list the mountain plover as threatened because they determined listing was not warranted. It is also designated as a Species of Special Concern by the California Department of Fish and Game, but is not listed under the California Endangered Species Act.

*Species Biology*: The mountain plover, although fairly well studied on its breeding grounds, continues to be poorly understood during migration and throughout its wintering range. The Mountain Plover Conservation Plan (Andres and Stone 2009) presents a current overview of the species, its ecology and conservation issues. The Carrizo Plain National Monument Approved Resource and Management Plan and Record of Decision (U.S. Department of the Interior, Bureau of Land Management April 2010) provides a good overview of the status of wintering mountain plovers in the Carrizo Plain, and a description of habitat availability. Knopf and Rupert (1995) conducted telemetry studies on the Carrizo Plain and Pixley National Wildlife Refuge, and Knopf (1998) studied the diets of wintering mountain plovers in California.

The mountain plover is a small migratory North American shorebird that utilizes a variety of short-grass habitats on nesting and wintering grounds. They nest in the Midwest, from southern Canada south to New Mexico and the northern tip of Texas. California appears to be the primary wintering area for mountain plovers, although they are known to winter across the southern United States and northern Mexico east into Texas.

The United States Geologic Survey online species account reports that wintering mountain plover populations are not well understood (http://www.mbr-pwrc.usgs.gov/bbs/grass/a2810.htm). The proportion of the species that overwinters in Mexico is not known (AOU 1983). Limited data has not allowed a projection of trends in wintering populations. Declines have been reported for some portions of southern California (Garrett and Dunn 1981), however winter population trends are not currently known. Although the population structure of mountain plovers is poorly studied, Andres and Stone (2009) estimated that about half of the total population of 18,000 plovers winters in California.

In California, mountain plovers are reported to utilize heavily grazed pastures, non-native annual grasslands, burned fields, fallow fields, plowed fields (usually without furrows), alkaline flats (within valley sink scrub communities) and coastal prairies (Andres and Stone 2009; Knopf and Rupert 1995). In the Carrizo Plain they are most often associated with barren alkali flats, non-native annual grasslands, recently burned fields, and agricultural lands. Barren areas created by active kangaroo rat warrens are also important. The Bureau of Land Management (BLM) reports the "maximum theoretical extent" of mountain plover habitat within the Carrizo Plain National Monument is 69,000 acres, of which a variable proportion contains suitable vegetation structure in any particular year (BLM 2010a). Surveys by BLM have noted that the mountain plovers do not occupy all suitable habitat within the Monument (Sharum undated). Knopf and Rupert (1995) reported the potentially suitable habitat in the Carrizo Plain consists of approximately 201 square kilometers (49,670 acres) of land (85.6% grassland, 11.5% agricultural land, and 2% alkali surfaces). Suitability of available habitat varies from year to year, and throughout the season, due to rainfall and climate patterns that promote or inhibit vegetation growth. Mountain plovers preferentially forage and roost in areas with very little vegetation, typically less than one inch in height. Telemetry research by Knopf and Rupert (1995) indicates the Carrizo Plain wintering mountain plovers preferentially use native habitats (grasslands, alkali surfaces) over agricultural land. In addition, the plovers preferentially use burn areas and alkali barrens within grasslands (as opposed to vegetated areas). Agricultural lands have long been known to harbor mountain plovers in the Central Valley of California. Although the literature is vague, mountain plovers appear to prefer fields that have been recently harvested and grazed (creating a flat surface with little vegetation), while freshly plowed fields are used on occasion. The use of freshly plowed fields by mountain plovers has been correlated with a lack of available native habitat in the San Joaquin Valley (Knopf and Rupert 1995).

The Carrizo Plain regional mountain plover wintering population likely consists of at least a few hundred individual birds each year. Recent BLM annual single-day roadside surveys detected a low count of 57 mountain plovers (2008) to a high count of 591 (2009). They concluded that annual wintering population variability in the Carrizo Plain is likely due to factors other than habitat suitability, such as breeding range, food resources, environmental contamination, and availability of alternate wintering areas (BLM 2010a). Mountain plovers are highly nomadic in winter, but seem to be present somewhat consistently in the vicinity of Panorama Road and San Diego-Simmler Road in the Carrizo Plain National Monument, from October through March. Telemetry research indicates that once the plovers arrive on the Carrizo Plain in late fall, their individual daily movements are highly variable through the winter as they relocate to find new

foraging and roosting areas, remain for a number of days, and move again (Knopf and Rupert 1995). In this study most birds moved less than one kilometer per day. However, infrequent long-range movements over the Temblor Range into the southern San Joaquin Valley were detected. These movements were sufficient to conclude that year to year site fidelity is low in mountain plovers, and further that the "Carrizo Plain and San Joaquin populations are biologically sympatric, as may be the entire Central Valley population." (Knopf and Rupert 1995, pg. 749). Low year to year site fidelity is consistent with a species that is dependent upon micro-habitat variables that fluctuate dramatically from year to year due to rainfall and other mechanisms. Movement among the wintering mountain plover population in California suggests that the birds seek out micro-habitat niches over a wide area, and remain where conditions are preferable.

Grassland habitat within the Action Area is poorly suited to use by mountain plovers due to vegetation height. Mountain plovers prefer bare ground or vegetation less than two inches in height. Most of the grasslands within the Action Area are simply too overgrown. The grassland portions of Sections 4 and 34 were, however, observed to have vegetation heights of two inches or less in February 2010, and were at that time moderately suitable for use by mountain plovers. These two Sections contain annual grasslands which have not been farmed in at least 20 years and which are grazed every three years. They are dominated by filaree (*Erodium cicutarium*) in the winter months prior to spring growth of annual grasses and forbs. None of the grassland habitat in the Section 21 or 28 is suitable for use by mountain plovers due to the vegetation structure that is present. Croplands within the Action Area are plowed in the fall or early winter after first rains and left fallow through the winter. They are plowed again just prior to sowing to remove early season weeds. In the winter-plowed condition they have an uneven surface of loose dirt clods, which is not a preferred ground condition for mountain plover. We consider cropland habitat within the Action Area to be poor quality habitat for mountain plovers, particularly in light of the proximity of preferred habitat that is available in the Carrizo Plain National Monument.

*Survey Methods*: Winter bird surveys conducted from November 2009 through January 2010 throughout the Project Site utilized a focused survey method in which surveyors walked representative habitat types, and also inspected homesteads, power lines, and fence lines. Winter bird surveys conducted in February 2010 utilized a non-random transect survey method in which biologists covered parallel belts of land in north-south orientation across annual grasslands and croplands within the Action Area and elsewhere in the Project Site. For a detailed description of bird survey methods please refer to Sections 7.2.5 and 7.2.6 of the *Final Biological Report for the Topaz Solar Farm* (Althouse and Meade, Inc. 2010c). Locations where mountain plovers were observed are indicated on BR Maps 7 in Section 12.0.

*Survey Results*: We observed mountain plovers foraging within and adjacent to the Action Area on four occasions between January and March 2010, with a high count of 17 birds observed in the eastern end of Section 35 in March, outside the Action Area. Three of the four observations were from the same approximate location in Section 35 (two from the same day); the fourth observation was from the south end of Section 34 just outside the Action Area boundary. No observations were made of mountain plovers in the Action Area.

## 5.5 Golden Eagle

*Listing Status*: The Golden eagle (*Aquila chrysaetos*) is a California Species of Special Concern. It is not listed under the California Endangered Species Act or the federal ESA. Golden eagles are designated a Fully Protected species by the California Department of Fish and Game. The primary federal legislation governing golden eagles is the Bald and Golden Eagle Protection Act. Golden eagles are also protected by the Migratory Bird Treaty Act (MBTA).

*Species Biology*: Golden eagles occur throughout the western United States, Alaska, and large portions of Canada and Mexico. They occupy nearly all habitats in the western U.S., including deserts, grasslands, woodlands, and all but the densest forests where hunting is impractical (Johnsgard 1990). Highly adaptable, golden eagles readily occupy habitats where basic needs are met. These basic needs include suitable nesting sites (typically large trees or cliffs), dependable food supplies, and large open areas for foraging.

California supports both wintering and nesting golden eagle populations. In winter, regional populations increase with the influx of northern breeders that migrate south. Occupied wintering habitats often contain a mix of adult and sub-adult birds. Golden eagles do not form large wintering congregations in California, as is reported for bald eagles in Alaska and elsewhere, however they can be abundant in some regions. As the nesting season commences, territorial behaviors limit the number of golden eagles in a particular area. Territory size of a breeding pair is highly variable, depending upon the resources available. Average breeding territories reported in Southern California are approximately 36 square miles. In Northern California, territories are approximately 48 square miles (Johnsgard 1990). One of the highest densities reported for the species is from the vicinity of the Altamont Pass Wind Energy Resource Area east of the San Francisco Bay near Livermore, where at least 44 pairs were documented in an area of approximately 317 square miles (Hunt 1998). The eagle density was thus one pair every 7.3 square miles. In less productive environments, or where potential nest sites are scarce, breeding territories of up to 60 square miles are reported (Johnsgard 1990).

The Carrizo Plain region, extending from the southern tip of the Carrizo Plain National Monument to the extreme northern end of the plain north of the Action Area, and including portions of both the Temblor Range and the Caliente Range, is approximately 500,000 acres (781 square miles) in size. Based on estimated average territory sizes for Southern and Northern California, this area could support between 16 and 22 breeding pairs if sufficient nesting sites and prey availability are present.

*Survey Methods*: A 2010 aerial survey for golden eagle nests in the TSF Project region was conducted by Brian Latta, Executive Director, The Bird Group (Latta 2010). Methods of the survey conform to the newly published Interim Golden Eagle Technical Guidance (Pagel 2010). In one location, the Beartrap Condor critical habitat area, aerial survey is not permitted and nest searches were conducted on foot. The survey area covered approximately 448,647 acres of land in the Carrizo Plain. Detailed methods are provided in the original report, included in the 2010 Biological Report Technical Appendix, Volume 2 (Althouse and Meade, Inc. 2010b). All active and non-active

golden eagle nests identified during the aerial surveys are indicated on BR Map 6 in Section 12.0.

*Survey Results*: Final results from two complete aerial survey passes determined 12 golden eagle territories are located within the approximately 448,647 acres of land in the Carrizo Plain survey area. The aerial survey did not determine how many eagles were present at the time of the survey, however observations of at least one adult on two of the three non-active territories suggest 11 to 12 pairs were present. Twenty-two golden eagle stick nests were located, nine of which were active and contained chicks. Two nests showed signs of recent activity but were not active. The remaining 11 nests are likely alternate nests not used this year. Seven of the 12 golden eagle territories contained nests within ten miles of the Action Area. Only four of these territories contained active golden eagle nests that are located within 10 miles of the Action Area. The closest active golden eagle nest to the Action Area is approximately 7.3 miles southeast, in the foothills of the Caliente Range west of Soda Lake. No golden eagle nests are located within the Action Area.

Golden eagles forage periodically within the Action Area year-round. In winter, we observed adult and sub-adult golden eagles regularly utilizing habitats within the Action Area for hunting, loafing, and occasional night roosting. From late winter and through spring, adult golden eagles were seldom observed. Presumably, they move into mountainous areas where there is better nesting habitat. Un-mated sub-adult golden eagles are present in and near the Action Area through the spring, where they hunt ground squirrels, feed on carrion, and occasionally utilize trees in abandoned ranch compounds as night roosts.

### 5.6 Bald Eagle

*Listing Status*: The bald eagle (*Haliaeetus leucocephalus)* is delisted from the federal ESA, and is listed as endangered under the California Endangered Species Act. The bald eagle is designated a Fully Protected species by the California Department of Fish and Game. The primary federal legislation governing bald eagles is the Bald and Golden Eagle Protection Act. Bald eagles are also protected by the MBTA.

*Species Biology*: Bald eagles are wide ranging migrants that typically nest within one mile of water. In San Luis Obispo County, there is an increasing nesting population of reintroduced bald eagles at Lake Nacimiento, and recent records of a nest at Santa Margarita Lake and possibly Lopez Lake and Whale Rock Reservoir. Adults and young are wide ranging and often migratory. Preferred prey is fish, although they will occasionally hunt water fowl, small mammals, and will scavenge carrion. Migrating or transient bald eagles will hunt ground squirrels and other prey, or feed on carrion, on the Carrizo Plain during the non-breeding season.

*Survey Methods*: Winter bird surveys conducted from November 2009 through January 2010 throughout the Project Site utilized a focused survey method in which surveyors walked representative habitat types, and also inspected homesteads, power lines, and fence lines. Winter bird surveys conducted in February 2010 utilized a non-random transect survey method in which biologists covered parallel belts of land in north-south orientation across annual grasslands and croplands within the Action Area and elsewhere

in the Project Site. For a detailed description of bird survey methods please refer to Sections 7.2.5 and 7.2.6 of the *Final Biological Report for the Topaz Solar Farm* (Althouse and Meade, Inc. 2010c).

*Survey Results*: A bald eagle was observed in the vicinity of the Action Area in February 2008 (DFG 2008c). We observed an adult bald eagle along Bitterwater Road at the west edge of Section 18 adjacent to the Alternative 3B.1 Action Area in March 2009. A sub-adult bald eagle was observed in Section 32 of the Action Area in February 2010. These and other observations in the region suggest bald eagles occasionally forage on the Carrizo Plain during the non-breeding season; however, no breeding habitat is present. The closest nesting location to the Action Area is most likely at Santa Margarita Lake, approximately 25 miles west.

# 6.0 Effects Determinations

Potential effects associated with major construction projects on threatened and endangered species include both direct and indirect effects, which can be either adverse or beneficial. Direct effects are results of the TSF Project, including but not limited to such effects as displacement, loss of habitat and mortality of individuals (adverse effects), or increased quantity of suitable habitat (beneficial effect). Indirect effects are those caused by the TSF Project that are reasonably certain to occur and may include but are not limited to effects such as disturbance to individuals and habitat degradation (adverse) or habitat improvement (beneficial). Effects may be temporary (short-term), for example during the construction phases, or permanent (long-term), such as effects arising from operation and maintenance of the facility for the life of the Project.

Cumulative effects, those arising from the total impact of development, management, and use of surrounding lands are discussed separately in Section 9.0.

Based on review of the best scientific and commercial data available, we determined that the TSF Project would not jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat.

## 6.1 San Joaquin Kit Fox

The Topaz Solar Farm San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse and Meade, Inc. June 2011) was prepared specifically to address potential Project effects and mitigation strategies for this species. This plan is included in Appendix B, and the information contained in the Plan is considered an integral part of this BA.

*Direct Effects*: The San Joaquin kit fox occurs within the Action Area. The TSF Project may result in direct impacts to San Joaquin kit fox. Potential direct effects of the TSF Project on kit fox include displacement, a change in habitat quantity, and mortality of individuals. Displacement would be a direct adverse effect. Change in habitat quantity would be either a beneficial or adverse effect. The Project intends to convert existing croplands (poor quality and dangerous habitat for SJKF) to annual grassland habitat (increase in higher quality habitat), which would be a potentially beneficial effect if SJKF occupy the facility after construction is complete. Absent conservation land, the TSF Project would have an adverse effect on SJKF habitat quantity if, in spite of converting

croplands to grasslands, SJKF do not occupy the completed solar facility. Direct mortality could occur due to construction activities, including vehicle strikes.

Direct effects can also be described in terms of short-term and long-term effects. Potential short-term direct effects are those that may result during the construction phases, but which would cease after completion of the Project. These may include temporary displacement of foxes from portions of the Action Area where they are known to be present, changes in daily movement and hunting patterns of individual foxes, removal of potential denning sites, and potential injury or death to individual kit foxes due to construction equipment. Potential long-term direct effects are those that would persist for the life of the Project, and may include change in habitat quantity in the area which could alternatively result in: 1) a decrease in kit fox numbers utilizing the Action Area, 2) maintenance of kit fox numbers using the Action Area, or 3) an increase in kit fox numbers using the Action Area. A decrease in kit fox numbers would result if rodent populations decrease in the Project's solar array areas or the surrounding grasslands, if active burrows and dens are filled, or if foxes do not den near solar arrays. An increase in kit fox numbers utilizing the Action Area could occur if release from current farming operations creates usable habitat, if foxes adjust to solar arrays and take up residence within the array fences, if vegetative cover in the solar arrays is sufficient to support and increase rodent prey, and if array fencing provides a refuge to kit foxes from predation. The goal of the SJKF Conservation and Monitoring Plan is to facilitate the latter scenario. Kit foxes have successfully utilized other modified habitats (Cypher 2010).

*Potential short-term direct effects of the Project:*

- Ground disturbance includes limited grading, smoothing ground surface, driving support rods, assembling arrays, and trenching
- Potential for SJKF harm from construction equipment
- Potential exclusion from work area during project construction
- Potential displacement of denning foxes

*Potential long-term direct effects of the Project:*

- Could create safe haven for SJKF, resulting in increased population
- Vegetative cover, as managed by the Applicant according to an approved vegetation management plan and habitat restoration and revegetation plan, could increase prey abundance for SJKF
- End of farming within the solar array and several mitigation parcels would open many square miles for SJKF use and increase prey abundance
- Conservation easements on adjacent parcels could result in agricultural uses less disturbing to SJKF, such as grazing instead of dry farming
- SJKF movement would not be blocked
- Project kit fox enhancement measures, such as:
    - Artificial dens – as per Endangered Species Recovery Program (ESRP) guidelines
    - Escape dens, which might also be used by other species, such as burrowing owl

- Fencing that allows kit fox passage and mostly excludes coyote and red fox

*Indirect Effects*: The Carrizo Plain supports one of three core populations of San Joaquin kit fox. Potential indirect effects of the Project could include reduction in habitat quality following construction due to infrastructure (buildings, inverter pads, posts), reduction in use of grassland/grazing land due to the presence of the solar arrays, and change in movement patterns across the Project's array areas.

We investigated whether the presence of the Project would significantly alter movement patterns of kit fox as they disperse from the core population area into other areas. The kit fox recovery plan identifies three core areas: Carrizo Plain, Western Kern County, and Ciervo-Panoche area. A recovery action identified in the kit fox recovery plan is to "protect and enhance corridors of movement of kit foxes through the Salinas-Pajaro Region and from the Salinas Valley to the Carrizo Plain and San Joaquin Valley." Although kit fox dispersal paths are not well understood, nor is the dispersal range well documented, we expect that the northern Carrizo Plain movement corridors are important. A few kit foxes have been detected in the Shandon area, San Juan Creek, and north of the Action Area on Pinole Ranch. Kit fox are present along Bitterwater Valley Road and in the Bitterwater Valley, although it is not known how many of these foxes are resident, or whether they more frequently connect with closer fox populations to the east, rather than the Carrizo population to the south.

Movement opportunity around the Project would continue to be present after the Project is built, and open space areas on site would have improvements to enhance kit fox movement and survival. Thousands of acres of land near the Project would be conserved in perpetuity, thereby preserving the movement corridors east and west of the Action Area. On-site improvements would include removal of some existing fencing in open space areas that currently inhibit kit fox movement, and installation of escape dens. Examples of existing fencing that would be removed from the Project site include approximately 12,000 feet of cyclone fence around the former Arco solar farm site within Section 27. Array perimeter fencing would include a 5 to 6 inch gap at the base for the entire length, allowing kit fox passage. Escape dens would also be provided both outside and inside of the array areas.

*Effects Determination*: **May Affect, Likely to Adversely Affect**. This is the appropriate effects determination in light of the potential for short-term adverse effects, including a low potential for incidental take during construction, even though the overall long-term effect of the Project on kit fox is expected to be beneficial.

## 6.2 Longhorn Fairy Shrimp

The TSF Project would avoid all vernal pools within the Action Area that contain or could potentially contain longhorn fairy shrimp. The Project would establish a permanent minimum setback of 250 feet from the edge of all pools containing or potentially containing longhorn fairy shrimp, as depicted on BR Map 5 in Section 12.0. Protection measures would be implemented as part of the APMs (refer to Section 7.3) to

ensure Project construction, operation and subsequent maintenance activities do not result in adverse effects to listed fairy shrimp or their habitat.

Vernal pools in cropland habitats that are included in the Action Area would no longer be subjected to adverse farming effects and would be protected from TSF Project-related activities by implementing applicant-proposed buffers. The Project could, therefore, result in a beneficial effect to longhorn fairy shrimp.

*Direct Effects*: We do not anticipate any short-term or long-term direct adverse effects of the Project on longhorn fairy shrimp at known pool locations. Potential short-term direct effects such as vehicles driving over dry vernal pools, would not occur due to implementation of APMs, as outlined in Section 7.3. Direct beneficial effects could occur upon conversion of croplands containing vernal pools to passive solar facilities managed for grassland habitat and associated vernal pools.

Direct adverse effects could potentially occur to longhorn fairy shrimp if they are identified in pools within the Action Area not previously identified as containing listed species. However, extensive protocol level surveys consisting of wet and dry season sampling mapped all potential habitat and completed definitive presence/absence surveys. Therefore, the potential for the TSF Project to adversely affect longhorn fairy shrimp is extremely low.

*Indirect Effects*: Sheetflow that feeds pools in Section 20 would not be changed by construction of the TSF Project. Applicant proposed 250-foot buffers and elimination of farming would protect and improve habitat in and around the vernal pools. Reduction of farming operations upslope would lessen the potential for sediment transport into the pools. We do not anticipate indirect effects of the TSF Project would reduce the quality of existing pool habitat for longhorn fairy shrimp.

*Effects Determination*: **May Affect, Likely to Adversely Affect**. This is the appropriate effects determination because, although the likelihood is extremely low, the TSF Project could potentially result in adverse effects to longhorn fairy shrimp. However, it is our understanding that the USFWS has determined the Project would not adversely affect listed fairy shrimp because they determined that the measures identified in this BA (including avoidance of all wetlands that are known to be or could be occupied by vernal pool species and a biological monitor onsite during construction and operation to assure these measures are carried out) are rigorous and conclusive and indicate that adverse effects are not reasonably foreseeable and thus are not likely to occur.

### 6.3 Vernal Pool Fairy Shrimp

The Project would avoid all vernal pools within the Action Area that contain or could potentially contain vernal pool fairy shrimp. The Project would establish a permanent minimum setback of 250 feet from the edge of all pools containing or potentially containing vernal pool fairy shrimp, as depicted on BR Map 5 in Section 12.0. Protection measures would be implemented as part of the APM's (refer to Section 7.3) to ensure Project construction, operation and subsequent maintenance activities do not result in adverse effects to listed fairy shrimp or their habitat.

Vernal pools in cropland habitats that are included in the Action Area would no longer be subjected to adverse farming effects and would be protected from Project-related

activities by implementing applicant-proposed buffers. The Project could, therefore, result in a beneficial effect to vernal pool fairy shrimp.

*Direct Effects*: We do not anticipate any short-term or long-term direct adverse effects of the Project on vernal pool fairy shrimp at known pool locations. Potential short-term direct effects such as vehicles driving over dry vernal pools, would not occur due to implementation of APM's, as outlined in Section 7.3. Direct beneficial effects could occur upon conversion of croplands containing vernal pools to passive solar facilities managed for grassland habitat and associated vernal pools.

Direct adverse effects could potentially occur to vernal pool fairy shrimp if they are identified in pools within the Action Area not previously identified as containing listed species. However, extensive protocol level surveys consisting of wet and dry season sampling mapped all potential habitat and completed definitive presence/absence surveys. Therefore, the potential for the TSF Project to adversely affect vernal pool fairy shrimp is extremely low.

*Indirect Effects*: Long-term indirect effects such as permanent modification of the hydrological regime that maintains vernal pools containing listed fairy shrimp are not anticipated because of APM's that would provide vernal pool buffers. Vernal pools in the southern end of the Option A Action Area are rain-filled and are not dependent upon drainage flows or groundwater for inundation. Applicant proposed setbacks allow sufficient room for pools to fill naturally. We do not anticipate indirect effects of the Project would reduce the quality of existing pool habitat for the vernal pool fairy shrimp.

*Effects Determination*: **May Affect, Likely to Adversely Affect**. This is the appropriate effects determination because, although the likelihood is extremely low, the Project could potentially result in adverse effects to vernal pool fairy shrimp. However, it is our understanding that the USFWS has determined the Project would not adversely affect listed fairy shrimp because they determined that the measures identified in this BA (including avoidance of all wetlands that are known to be or could be occupied by vernal pool species and a biological monitor onsite during construction and operation to assure these measures are carried out) are rigorous and conclusive and indicate that adverse effects are not reasonably foreseeable and thus are not likely to occur.

## 6.4 Mountain Plover

The Carrizo Plain mountain plover wintering population, consisting of approximately several hundred individuals, accounts for less than a tenth of the statewide wintering population of approximately 9,000 individuals. The primary wintering habitat in the Carrizo Plain is within the National Monument and is protected in perpetuity. The abundance of mountain plovers in the Carrizo region does not seem to be limited by amount of available wintering habitat.

The TSF Project could result in a loss of some potential winter foraging habitat. Loss of a few hundred acres of potential winter foraging habitat within the Action Area would constitute a discountable and insignificant adverse effect to mountain plover in light of the large area of potentially suitable wintering habitat in the nearby Carrizo Plain National Monument.

*Direct Effects*: We do not anticipate any short-term or long-term direct adverse effects of the Project on mountain plover that would be above a level of discountable and insignificant.

*Indirect Effects*: Potential indirect effects of the Project could include disruption of foraging patterns within the Action Area. This type of effect would be considered discountable and insignificant because the birds would reasonably be expected to move to off-site suitable foraging grounds.

*Effects Determination*: **May Affect, Not Likely To Adversely Affect**. This is the appropriate effects determination because the Project is not expected to reduce the reproduction numbers or distribution of the wintering mountain plover population in the Carrizo Plain region.

## 6.5 Golden Eagle

Golden eagles forage within the Action Area throughout the year. The Action Area provides moderate quality foraging habitat for golden eagles during the winter season. There are no golden eagle nests, either active or inactive, within the Action Area (Latta 2010). Trees associated with abandoned ranch compounds are very poorly suited for golden eagle nest construction. The PG&E towers that pass through the Action Area could be utilized for nesting purposes by golden eagles; red-tailed hawks and ravens presently nest on the towers within the Action Area. There are no cliff faces or other suitable nesting areas on site.

The Project would result in a loss of approximately 3,520 acres of suitable golden eagle foraging habitat within the Action Area, consisting of annual grassland and cropland habitats within the Project perimeter fencing. Additionally, the Project would have some medium-voltage collection system lines that would be designed to not present a danger for electrocution or collision by raptors. This would be accomplished by utilizing design features recommended by the Avian Power Line Interaction Committee (APLIC 2006) which provides species-specific minimum horizontal and vertical spacing guidelines that would eliminate the potential for electrocution by bridging the gap between conductors. In addition, avian flight diverters are recommended to prevent collisions with power lines. Section 7.4 provides a detailed outline of proposed conservation measures.

*Direct Effects*: The Project would result in an insignificant loss of moderate quality foraging habitat and would not substantially interfere with normal breeding, foraging or sheltering behavior. The loss of habitat would be insignificant because it represents an extremely small fraction of the suitable golden eagle foraging habitat in the region. Thus, the TSF Project would not result in either "disturbance" or "take" of golden eagles, as defined in the Eagle Act. The potential for construction and operation of the proposed solar facility to result in "take" of golden eagles, as defined by the Eagle Act, is discountable. Construction and operation activities may affect golden eagles, but would not "disturb" golden eagles to the extent the Project would cause injury, decrease in productivity, or nest abandonment.

*Indirect Effects*: Construction of the proposed Project could affect golden eagle foraging activities due to operation of equipment and general human presence in the area. However, the level of use of the Action Area by golden eagles is moderately low and

large areas of suitable foraging habitat are present in the vicinity. Therefore, any indirect effects of the Project would be insignificant.

*Effects Determination*: **Discountable and Insignificant, No Take Anticipated**. The Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "Disturb" is defined by the Service in regulations at 50 CFR § 22.3 as: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

The TSF Project may affect the golden eagle, but would not substantially interfere with its normal breeding, feeding or sheltering behavior. Therefore, the potential adverse effect would be discountable (i.e., extremely unlikely to occur and essentially not expected to occur) and insignificant (i.e. will not reach a scale where "take" occurs) due to factors explained above. The TSF Project would not "take" or "disturb" golden eagles, as defined in the Eagle Act.

## 6.6 Bald Eagle

The Action Area provides low quality foraging habitat for bald eagles during the winter season; nesting habitat is not present within or near the Action Area. The Project would result in a loss of approximately 3,520 acres of suitable golden eagle foraging habitat within the Action Area, consisting primarily of annual grassland and cropland habitats within the project perimeter fencing. Additionally, the Project would have some medium-voltage collection system lines that would be designed to not present a danger for electrocution or collision by raptors. This would be accomplished by utilizing design features recommended by the Avian Power Line Interaction Committee (APLIC 2006) which provides species-specific minimum horizontal and vertical spacing guidelines that would eliminate the potential for electrocution by bridging the gap between conductors. In addition, avian flight diverters are recommended to prevent collisions with power lines. Section 7.4 provides a detailed outline of proposed conservation measures.

*Direct Effects*: The Project would not result in direct effects, either adverse (loss of suitable habitat or mortality) or beneficial (increase in habitat quality), to bald eagles. The level of use of the Action Area by bald eagles is very low. The affected habitats are annual grasslands and croplands that are marginally suitable for use as winter foraging habitat. Loss of these habitats within the Action Area would have an insignificant adverse effect on bald eagles. The potential for the Project to result in "take" of bald eagles, as defined under the Eagle Act, is discountable. Construction and operation activities may affect bald eagles, but would not "disturb" bald eagles to the extent the Project would cause injury, decrease in productivity, or nest abandonment.

*Indirect Effects*: Construction of the proposed Project, if conducted during the winter season, could affect bald eagle foraging activities due to operation of equipment and general human presence in the area. However, the level of use of the Action Area by bald eagles is very low in general, and is temporally restricted to the wet season when

construction activities may be less intensive due to muddy conditions. Therefore, any indirect effects of the Project would be discountable.

*Effects Determination:* **Discountable and Insignificant, No Take Anticipated**. The Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb." "Disturb" is defined by the USFWS in regulations at 50 CFR 22.3 as: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

The Project may affect the bald eagle, however the potential adverse effect would be discountable (i.e., extremely unlikely to occur and essentially not expected to occur) and insignificant (i.e. will not reach a scale where "take" occurs) due to factors explained above. The Project would not "take" or "disturb" bald eagles, as defined in the Eagle Act.

# 7.0 Conservation Measures

Sensitive biological resources are present within the Action Area, including four species listed under the federal ESA and two species protected by the Eagle Act. This section provides recommendations to reduce the effect of the Project on federally listed species that may be affected by the Project. Where potentially adverse effects to listed species could occur during construction and operation of the Project, we provide conservation measures designed to offset the effect. Many of the conservation measures outlined in the following subsections are Applicant Proposed Measures that are part of the Project description and would be voluntarily implemented. Off-site land preservation and other conservation measures such as pre-construction surveys are requirements of the regulatory agencies. Potential land to be preserved has been identified and will be reviewed by USFWS and CDFG. Specific on-site measures have been proposed to enhance habitat for kit fox. Plans are proposed that would result in a net conservation benefit to San Joaquin kit fox.

## 7.1 Summary of Project Design and Conservation Elements

The Topaz Solar Farm Project has been located and designed to avoid and minimize potential adverse effects to the San Joaquin kit fox and two species of fairy shrimp that are present on the Project site (refer to Figure 5, Section 11.0 and Biological Resource Maps in Section 12.0). The Project has been sited primarily on highly disturbed private lands in San Luis Obispo County in an area that provides a unique opportunity to deliver solar energy within PG&E's service territory and which minimizes biological impacts. The Project site contains no federal or state listed plants and only three listed species, and the habitat for two of these species will be completely avoided and protected.

The Applicant is also ready to implement a comprehensive conservation strategy to compensate for potential listed species impacts, including an ambitious conservation land package that involves protection of more than 12,000 acres of land on the Carrizo Plain. Proposed conservation and enhancement of this land would permanently protect and

enhance a large portion of an important movement corridor for kit fox moving northward out of the Carrizo Plain east of the Project site. Additionally, the conservation lands would provide permanent protection and enhancement for a smaller movement corridor on the west side of the Project that provides connectivity to the Paso Robles area kit fox population via the San Juan River valley. The Applicant would also enhance thousands of acres of land currently in crop production and convert it to natural grassland, a significant habitat improvement for kit fox.

### *7.1.1 Project siting*

The Topaz Solar Farm Project is a 550 megawatt solar photovoltaic generating facility that will be situated on approximately 3,500 acres of land in the Carrizo Plain in eastern San Luis Obispo County, California. This renewable energy project will substantially contribute to meeting a variety of federal, state and regional renewable energy policies and goals, thereby reducing our nation's dependence on conventional power sources. After an exhaustive search of potential project locations, the Applicant chose the current location for the following important reasons, among others:

- The Carrizo Plain is in the highest "solar resource" area in PG&E's service territory. It is optimal for solar energy production because of its more southerly latitude when compared to other service territory locations, its high elevation (about 2,000 feet), its relatively dry climate, and its relative lack of fog, haze and dust.
- The site is immediately adjacent to PG&E's Morro Bay to Midway transmission line ("Transmission Line"), which runs through the Project site. As a result, the Project can be interconnected to California's electrical grid without the need to develop a right of way or construct new transmission lines, with associated adverse environmental impacts.
- Since the Transmission Line has available capacity, it can be connected immediately to the power grid as Project array areas are completed without any transmission upgrades. The only transmission line work necessary to accommodate the Project will be eventual reconductoring to accommodate the final 150 megawatts generated by this Project and other projects in the region.
- The lands along the Transmission Line in the Carrizo Plain are available in relatively large parcel sizes and are not in highly productive agricultural use.
- The relatively flat terrain of the Project site is highly suitable for construction and operation of solar arrays.

### *7.1.2 Baseline conditions*

The Project location consists entirely of lands that were previously and repeatedly disturbed by dry land farming and by ranching activities. The vegetation consists of actively farmed lands, fallow farmed lands and grasslands in various stages of recovery. All grassland habitat areas have been previously farmed and grazed, and are, because of this history of disturbance, dominated by non-native annual grass species. Active

croplands farmed for grain form the dominant habitat type within the Project Site (Figure 5, Section 11.0). Various Project layouts have contained different amounts of grassland and cropland habitats. For Study Area A (7,800 acres), approximately 60 percent of the land consists of croplands and the remaining 40 percent consists of annual grasslands. Within this Study Area the Applicant designed preferred Alternative 3B.1 such that approximately 77 percent of the Project would be on cropland and only 23 percent would affect grassland habitat. Research has shown that far fewer kit foxes utilize areas dominated by crop production than areas in natural grassland. Other baseline conditions that are present include:

- There are approximately 2.1 acres of total federal jurisdictional wetlands in Study Area A (a very small amount given the 7,800 site size), along with certain ephemeral drainages totaling 15.46 acres that are considered to be jurisdictional (a delineation was verified by the U.S. Army Corps of Engineers on January 28, 2011).
- No plant species listed under either the federal Endangered Species Act ("ESA") or the California Endangered Species Act ("CESA") are present on the Project site. There are a few relatively small locations of individuals or groups of rare (CNPS listed) plants within the Project.
- After comprehensive wildlife surveys, the only federal or state listed wildlife species detected on the Project Site are the San Joaquin kit fox (ESA and CESA), longhorn fairy shrimp (ESA) and vernal pool fairy shrimp (ESA). Surveys reflect that no giant kangaroo rats, blunt-nosed leopard lizards, California tiger salamanders, California condors, California red-legged frogs or Kern primrose sphinx moths are present. Since all known or potential locations of the two fairy shrimp species will be entirely avoided (with permanent 250-foot buffers), the only ESA-listed species that will be adversely affected in a substantial manner by the Project is the kit fox.
- Only approximately 1700 acres of Option A and 250 acres of Alternative 3B.1 (Section 34) presently constitute quality habitat for kit fox. Section 28 was farmed as recently as five or six years ago and is generally too overgrown to be high quality kit fox habitat.
- There are currently 12,000 linear feet of chain link fence that dramatically limits passage of kit fox in Section 27. In addition, sown croplands prevent passage by kit fox for several months a year (typically April through harvest in August or September) when grain crops are too tall and dense.
- Current farming practices on the Project site lands are believed to be detrimental to the continued existence of listed fairy shrimp species that occur on the site. Farming over vernal pools, such as occurs in Section 20, degrades and fills these habitats. Constituent vernal pool plant species are removed, hydrology is adversely affected, and suitability for listed species is diminished.
- Current farming practices on the Project site lands also reduce habitat suitability for kit fox by changing the vegetative structure of the landscape, reducing prey availability, increasing predation risk, and by fragmenting adjacent potentially

usable habitat areas. Farming activities have long been known to fragment, degrade, and remove kit fox habitat (Grinnell, J. and J.S. Dixon, 1937; Knapp, D.K. 1978; Orloff, S, F. Hall, and L. Spiegel, 1986; U.S. Fish and Wildlife Service, 1998; Cypher, Phillips, and Kelly 2007; Cypher et. al 2005; Warrick et al., 2007). Poor habitat suitability of croplands negatively affects the suitability of surrounding grasslands, thereby adversely affecting more land area than just what is farmed. The Proposed Action would restore thousands of acres of cropland outside of the array fences and 2,675 acres within the fences (Alternative 3B.1) to natural grassland, a significant increase in quality kit fox habitat. At certain times of year, cropland areas allow for kit fox movement and dispersal, however cropland areas do not support the number of rodents found in natural grassland areas. In plowed conditions, croplands offer little in the way of prey or cover for kit fox. The scarcity of dens in cropland relative to non-agricultural areas makes kit fox more susceptible to predation (Cypher et al. 2007).

- Farming practices in the Carrizo Plain have utilized rodenticides extensively in the past, which is known to kill kit fox (U.S. Fish and Wildlife Service, 1998). Heavy equipment utilized for plowing and harvesting likely results in direct mortality through entombment or plow implement strikes of kit foxes.

### *7.1.3 Project conservation measures*

The Applicant has agreed to incorporate a variety of conservation measures into the Project to protect the three ESA-listed species, some of which it originally proposed and some of which it has agreed to at the request of public agencies or third parties. These measures generally fall into three categories – avoidance, minimization and conservation – which will be discussed separately below.

*Avoidance Measures*

The Applicant designed the original Project with important avoidance measures targeted to the three species listed under the ESA and it has agreed to implement further avoidance measures for these species as the Project approval process has proceeded. The key (but not the only) avoidance measures for these species include:

- All known and probable locations of the two listed fairy shrimp species will be avoided, and a permanent 250-foot radius setback will be implemented to protect this habitat.
- Project construction activities will occur before dusk, and employee presence and truck deliveries will only occur during daylight hours, unless otherwise authorized, to avoid sensitive times when kit fox have a greater likelihood of being present.
- The Project was designed to minimize the impact of the Project on potential kit fox movement corridors on both the east and west sides of the Project.
- At the request of the County and the wildlife agencies, the Applicant has designed Project Alternative 3B.1, to incorporate the following additional avoidance

measures requested by the County, the Service and the California Department of Fish and Game ("DFG"):

- It has compacted the total PV array areas substantially by eliminating access-ways, spaces and interstitial areas with less valuable habitat between arrays, thereby reducing the total size of the fenced areas by 15% from approximately 4,100 acres to 3,500 acres.
- It has dramatically reduced the amount of grassland (considered by the wildlife agencies to be the most valuable habitat for kit fox on Project lands) utilized by the Project by 56 percent from approximately 1,700 acres to approximately only 835 acres.
- By moving and compacting PV arrays, it has freed up an additional 1.3 miles of breadth on flat land in the eastern kit fox movement corridor, which runs in a southeast to northwest direction along the eastern side of the Project. Among other things, it has removed all arrays from Section 35 and removed arrays from the eastern quarter of Sections 27 and 34.
- In the northeast corner of the Project, adjacent to the main movement corridor, it has completely eliminated all arrays in Section 22, thereby preserving a large movement corridor in this area.
- In the western and southern areas of the Project, it has taken several steps to promote the western movement corridor. Among other things, it eliminated all arrays in the southern half of Sections 4 and 5 and designed a notched area in Section 32 that frees up a wider diagonal corridor for wildlife movement. Moreover, in Sections 4 and 5, it has completely avoided hundreds of acres of potential fairy shrimp habitat and most rare plant habitats.

*Minimization Measures*

- The Applicant has designed an effective suite of minimization measures designed to minimize potential adverse effects to kit fox during the construction and operation of the Project. Although it is beyond the scope of this document to summarize all of these measures, some of the key measures are as follows:

- A robust suite of pre-construction survey, monitoring, worker education, construction restriction and similar measures will be implemented to ensure that kit fox individuals and kit fox dens are avoided and protected throughout the construction period.

- The Applicant has designed the interior of the fenced arrays to be used as habitat by kit foxes throughout the operation of the Project. Accordingly, it will be installing kit fox passages at regular intervals in the perimeter fencing, will be installing kit fox escape dens both inside and outside the Project fences, and will be installing artificial dens capable of being used as natal dens in an appropriate spatial design throughout the site.

- The interior of the fenced areas will be managed to promote kit fox behavior. Thus, arrays will be mounted so that the bottoms are approximately 18 inches above the ground to allow kit foxes to see underneath and vegetation will be planted among the arrays, and maintained by appropriate means, both to provide protection and to allow kit fox to see prey species. There will be no perimeter lighting or lighting within the array areas. Exterior lighting that is installed for security at the substation, switching station, and operations and maintenance facility will be minimized and shielded to prevent any affect on kit fox.

- All fences around PV arrays will include a 5 to 6 inch gap at the base of the fence to allow movement of kit fox through the fenced areas. This gap will also prevent kit foxes from being trapped against the fence by a predator. This measure has been adopted in response to wildlife agency requests and provides full permeability and opportunity for movement by kit fox through the project site.

*Conservation Measures*

After consultation with the Service and DFG, the Applicant has put together a conservation package to address the loss of potential kit fox habitat caused by the Project. In addition to the kit fox enhancement measures that are being installed on the Project lands, this package consists of the fee purchase or dedication of a conservation easement on more than 12,000 acres of land around the Project and the adjacent movement corridors. The package has the following key features:

- The total amount of proposed conservation land is over 12,000 acres, which is more than three times the total amount of land that will be utilized for the Project.

- The conservation lands provide a range of habitat quality that is better suited to kit fox than the lands that would be utilized for the Project. A comparison of the potential conservation lands to the Project lands demonstrates the following:

    1. The original Option A Project is composed of approximately 42 percent grassland and 57 percent cropland, while the conservation lands are composed of approximately 60 percent grassland and 40 percent cropland.

    2. Project Alternative 3B.1 layout contains approximately 835 acres of grassland, only 250 acres of which is high quality grassland (not farmed in over 20 years), as compared with over 6,500 acres of grassland in the conservation lands. This is approximately an 8:1 ratio of conservation grassland to Project grassland. The remainder of the Project will be returned to an appropriate habitat condition for primary prey animals for kit fox. Additional conservation land offsite will restore natural grassland and dramatically improve habitat for kit fox in the northwestern Carrizo Plain.

3. An analysis of the overall quality of the conservation lands, based on presence, habitat quality, movement corridor value, slope and other factors demonstrates that the conservation lands contain a significantly higher percentage of very good quality kit fox habitat than the Project lands.

- As requested by the Service and DFG, the conservation lands are comprised of thousands of acres of land concentrated in the movement corridor between the Project and the proposed SunPower California Valley Solar Ranch (CVSR) project. When combined with the revised Project layout, these lands substantially protect thousands of acres of land within the eastern movement corridor that are not otherwise generally accessible to or protected for kit fox. These include parcels south of and adjacent to Highway 58, thus protecting locations for road crossings and conserving areas near the highway that might be more susceptible to development risk.
- The conservation package also contains thousands of acres of relatively flat land just north of the Project that connect with the eastern corridor lands that are high quality habitat for kit fox.
- The mitigation package further has 1,040 acres contiguous with the southwest portion of the Project and 640 acres immediately west of the Project that will protect and expand the movement corridor on the western side of the Project.

The Topaz conservation package ensures the protection of high quality San Joaquin kit fox habitat and movement corridors in the northern Carrizo Plain in perpetuity.

## 7.2 San Joaquin Kit Fox

The Topaz Solar Farm San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse and Meade, Inc. June 2011) includes detailed avoidance, minimization, protection, conservation and compensation measures for kit fox, and is included as Appendix B in this report. A primary goal of Project design and construction methodology is to avoid "take" of kit fox. Protection of off-site lands would compensate for the acreage removed from use, contributing to full mitigation. Enhancement of existing habitat on-site will provide increased protection and potential denning habitat for the foxes. Installation of artificial dens, visitor and worker education programs, kit fox friendly management practices, monitoring on-site, and large areas of open space would fully mitigate for modification of approximately 3,520 acres of kit fox habitat due to the Project. The combined on-site and off-site mitigation measures proposed are intended to fully conserve and compensate for the potential effects of the TSF Project on San Joaquin kit fox.

### *7.2.1 Measures to avoid and/or minimize potential direct injury or death to kit fox from TSF Project construction and operation activities*

- Pre-construction surveys for SJKF would consist of three phases: den location surveys, work area clearance surveys, and daily work area surveys.

This approach would be utilized to prevent injury or death of kit fox during Project construction.

- Worker education programs regarding SJKF identification, life history and habits, population status, and protection measures, and penalties for unauthorized take of SJKF would be provided for all construction and operational employees.
- During construction, pre-construction survey and monitoring measures would be conducted specific to the Project that meet the standard San Joaquin kit fox CEQA mitigation measures approved by the County of San Luis Obispo, the USFWS, and the Department of Fish and Game for projects in San Luis Obispo County.
- During the construction phase, any disturbance activities after dusk shall be prohibited unless coordinated through the County, during which additional kit fox mitigation measures may be required. Workers and worker shuttles would be instructed to arrive at the construction site no earlier than one-half hour before sunrise and depart from the site no later than one-half hour after sunset. Delivery of materials by truck would be restricted to daylight hours between sunrise and sunset.
- Speed signs of 25 mph (or lower) would be posted for all on-site construction traffic to minimize the probability of road mortality of the San Joaquin kit fox.
- All excavations, steep-walled holes and trenches in excess of two feet in depth would be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Trenches would also be inspected for entrapped kit fox each morning prior to onset of field activities and immediately prior to covering with plywood at the end of each working day. Any kit fox found shall be allowed to escape before field activities resume, or be removed from the trench or hole by a qualified biologist and allowed to escape unimpeded.
- During Project construction phases, any pipes, culverts, or similar structures with a diameter of four inches or greater, stored overnight at the Project would be thoroughly inspected for trapped San Joaquin kit foxes before the subject pipe is subsequently buried, capped, or otherwise used or moved in any way.
- During the construction phases, all food-related trash items such as wrappers, cans, bottles, and food scraps would be disposed of only in closed containers. These containers would be regularly removed from the Project site.
- Construction activities would be adjusted to avoid active kit fox dens.
- Management practices would avoid the use of rodenticides.
- Pets would not be allowed on the Project site.

### *7.2.2 Measures to increase the on-site habitat quality of the TSF Project*

- Perimeter fencing around solar arrays would be constructed to provide a 5 to 6 inch gap at the bottom, for the entire length of the fence, for kit fox passage into and through the TSF Project. No interior fences within the perimeter fencing would be present.
- Escape dens would be located both inside and outside the Project fences. Artificial den placement would be more than 25 feet from any Project components to avoid potential conflicts.
- Artificial dens capable of supporting kit fox pairs and pups would be installed at a rate of one two-chambered pupping den and at least four escape dens in every section (or square mile) of the Project.
- Solar arrays would be mounted on steel posts with lower edge of modules approximately 18 inches above the ground to allow kit foxes to see under the arrays.
- The ground under and between the solar arrays would be vegetated with a dominant cover of grasses and herbs to promote a more natural habitat that supports kit fox prey. Vegetation height would be controlled by pulse grazing sheep or other means not hazardous to kit fox. Invasive weeds would be monitored and controlled according to the Project Vegetation Management Plan.
- Cross fencing and wildlife wire fencing would be removed from corridors outside of the solar arrays, where feasible.
- All exterior lighting would be placed or shielded to avoid lighting open space and solar array areas. No permanent night lighting would be allowed, except for the Project's Solar Energy Learning Center, substation, monitoring and maintenance facility and PG&E switching station.
- The Project would reduce cropland production that regularly disturbs the land by plowing, seeding, harvesting, and spraying; these activities presently endanger kit fox within the Action Area.

### *7.2.3 Measures to off-set loss of kit fox habitat*

- Off-site lands surrounding the Action Area may be restored to annual grassland or maintained as annual grassland and managed to promote kit fox and other native species, if agreed by the regulatory agencies (including USFWS and CDFG) that these lands would be acceptable as conservation and mitigation lands. This would be achieved through a fee purchase or dedication with a conservation easement, along with Enhancement and Endowment Funds.
- Additional off-site kit fox habitat would be purchased and protected in perpetuity. The proposed amount and location of mitigation land that would be purchased is described in the Topaz Solar Farm San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse and Meade, Inc. February 2011)

attached hereto as Appendix B. This conservation plan has been prepared to prescribe actions that would maintain and improve the condition of the kit fox population in the area. Elements of the plan include habitat enhancement and protection, both on-site and off-site that would fully compensate for Project effects to kit fox under both the federal ESA and the California Endangered Species Act. Further details of these measures are set forth in Appendix B, which is specifically incorporated herein.

### 7.3 Vernal Pool Fairy Shrimp and Longhorn Fairy Shrimp

- Known and probable locations of federally-listed fairy shrimp pools would be avoided and a 250-foot radius setback would be implemented to protect these vernal pool**s**.
- Vernal pools would be protected during construction by installation of orange fencing placed at the setback boundary between the vernal pool and TSF Project areas.
- Natural drainage patterns would be preserved.
- Prior to, during and after the construction phase, use of pesticides or herbicides by the applicant would be in compliance with all local, State, and Federal regulations.

### 7.4 Bald Eagle and Golden Eagle

- An Avian and Bat Protection Plan and Bird Monitoring and Avoidance Plan will be implemented to guide Project design, construction and operation such that avian mortality at the TSF Project is minimized.
- The TSF Project perimeter fence would be designed to closely surround the solar arrays and other project components, which leaves the maximum possible amount of preserved habitat surrounding the TSF Project.
- If lands adjacent to the TSF Project are approved as compensatory mitigation land for SJKF by the regulatory agencies, the land would be managed as habitat for SJKF, including the discontinuation of cropping. Conversion of cropland to grassland protected in perpetuity would increase prey abundance and foraging potential for bald and golden eagles.
- All new construction of Project overhead collection system lines will utilize the Hendrix Spacer Cable System. The Hendrix Spacer Cable System is designed to minimize avian electrocutions and open air collisions by birds and bats. All cables have a covering that limits the electrical charge on the surface such that phase to phase or phase to ground contact by wildlife will not result in lethal electrical charges. The "spacers" that are installed to maintain line separation allow for a compact line system that is easily detected by birds and bats in flight, thus significantly reducing collisions. Also, the compact line configuration allows

for power pole designs that have a reduced cross-arm width of one foot which minimizes the dangerous practice of cross-arm perching and nesting by raptors.

- All new construction of power poles and the substation will incorporate at least one of the following avian protection measures:
    - Avian-safe separations between energized conductors or energized hardware and neutral or grounded hardware and equipment as per the APLIC (2006) guidelines. The APLIC (2006) recommended separation for eagles is 60 inches.
    - Where design constraints prohibit these separation distances between energized conductors or energized hardware and neutral or grounded hardware and equipment (including the pole itself), insulating covers will be installed to prevent electrocutions from wires or other components.

# 8.0 Interrelated Actions

Network upgrades to the existing PG&E Morro Bay to Midway transmission line may be required to accommodate the interconnection of the final 150 MW of the Project to the grid, as well as to accommodate other generation projects in the region. These PG&E upgrades could include the reconductoring of the 230-kV transmission line between the new PG&E switching station on the Project site and the Midway Substation in the San Joaquin Valley. The PG&E Reconductoring Project is an Interrelated Action to the Proposed Action. PG&E has prepared a separate Biological Assessment for the PG&E Reconductoring Project (ICF International 2010). The PG&E Reconductoring Project should be included in the consultation for the Proposed Action. PG&E is currently expected to obtain all other permits for their project.

# 9.0 Cumulative Effects

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the Action Area considered in this Biological Assessment. Future federal actions that are unrelated to the Project are not considered in determining the cumulative effects because they are subject to separate consultation requirements pursuant to section 7 of the ESA (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998).

The cumulative effect of the Project and adjacent non-federal activities that are reasonably certain to occur could degrade movement pathways through the northwest portion of the Carrizo Plain, affecting dispersing San Joaquin kit fox. Privately owned properties surrounding the Action Area are expected to continue to be managed as dry farmed cropland or as heavily grazed grassland. Non-federal activities that are "reasonably certain to occur" in the Carrizo Plain area include road and utility right-of-way management, livestock grazing, home building, continued agriculture, recreational activities such as off-road vehicle riding, and hunting. Impacts to listed species habitat from such activities include direct mortality, temporary and permanent habitat loss, habitat degradation, fragmentation, and trampling of host or food plants. Impacts to

individual animals include collisions with vehicles or equipment, entombment in burrows, displacement due to human activity, trampling and shooting, increased predation associated with human development, ground squirrel reduction efforts (poisoning), and reduction of food sources.

Non-federal activities that could potentially affect listed vernal pool species in the vicinity of Action Area include, but are not limited to, development, construction, and maintenance activities associated with urban, highway/roadway and utility projects; application of herbicides/insecticides (i.e., chemical contaminants); conversion of vernal pools and/or vernal pool grasslands to agricultural uses; and application of seasonal water to create irrigated pastures. Conversion of rangeland to active agricultural uses in San Luis Obispo County does not require a special use permit, grading permit, or any other type of discretionary decision by the County prior to implementation of the action. Therefore, this type of conversion may go unnoticed by the local and federal agencies and an unknown amount of vernal pool and vernal pool grassland habitat may be affected by agricultural activities.

Grasslands with low, sparse cover and plowed agricultural fields provide foraging habitat for mountain plover that occasionally and irregularly occur in the Action Area during winter. Mountain plovers could be adversely affected by future State, local, and private actions, as described above. However, the effects of these conversions are expected to minimally affect the species given the infrequent occurrence of the species, reduced suitability of most grasslands, and the widespread availability of agricultural lands in and near the Action Area.

Cumulative effects of the Project and adjacent non-federal activities could result from ongoing activities described above including farm and ranch operations, highway or utility projects, and a few building projects for barns and homes. Conservation of lands near the Project could reduce cumulative effects by protecting and preserving land currently not subject to federal action.

# 10.0 Conclusion

Construction of the proposed Topaz Solar Farm Project may affect federally-listed, candidate, or proposed species. Approximately 3,500 acres of land would be fenced around solar arrays. Installation of the solar panels and connecting lines would temporarily disturb the Project site, as would grading in some areas to smooth slopes. Harrowing and rolling with a smooth roller would prepare the Project site for panel installation and reduce trip hazards for panel installers. Grading for access roadways, lay-down area/staging areas, a substation, and other structures would be minimal. The solar farm would be present for at least 30 years. Development of habitat usable by small mammals and kit fox would occur soon after installation.

Four species listed under the federal Endangered Species Act were detected within the Action Area: San Joaquin kit fox, longhorn fairy shrimp, vernal pool fairy shrimp and giant kangaroo rat. Only two of these species (kit fox and longhorn fairy shrimp) occur in the Project area. Two species protected by the Eagle Act were detected within the Action Area: bald eagle and golden eagle.

The Action Area contain numerous parcels that have been in agricultural production for over 70 years. All habitats within the Action Area are heavily influenced by past farming and ranching operations. Land management practices have removed all shrub vegetation from the Action Area, and converted natural grassland systems to rangeland and farmland dominated by introduced species. Rangeland, described here as California annual grassland, varies in species composition. Areas that have been untilled the longest, some over 20 years as part of the Conservation Reserve Program, typically contain higher diversity and abundance of native plants than areas that have only been untilled for 5 years.

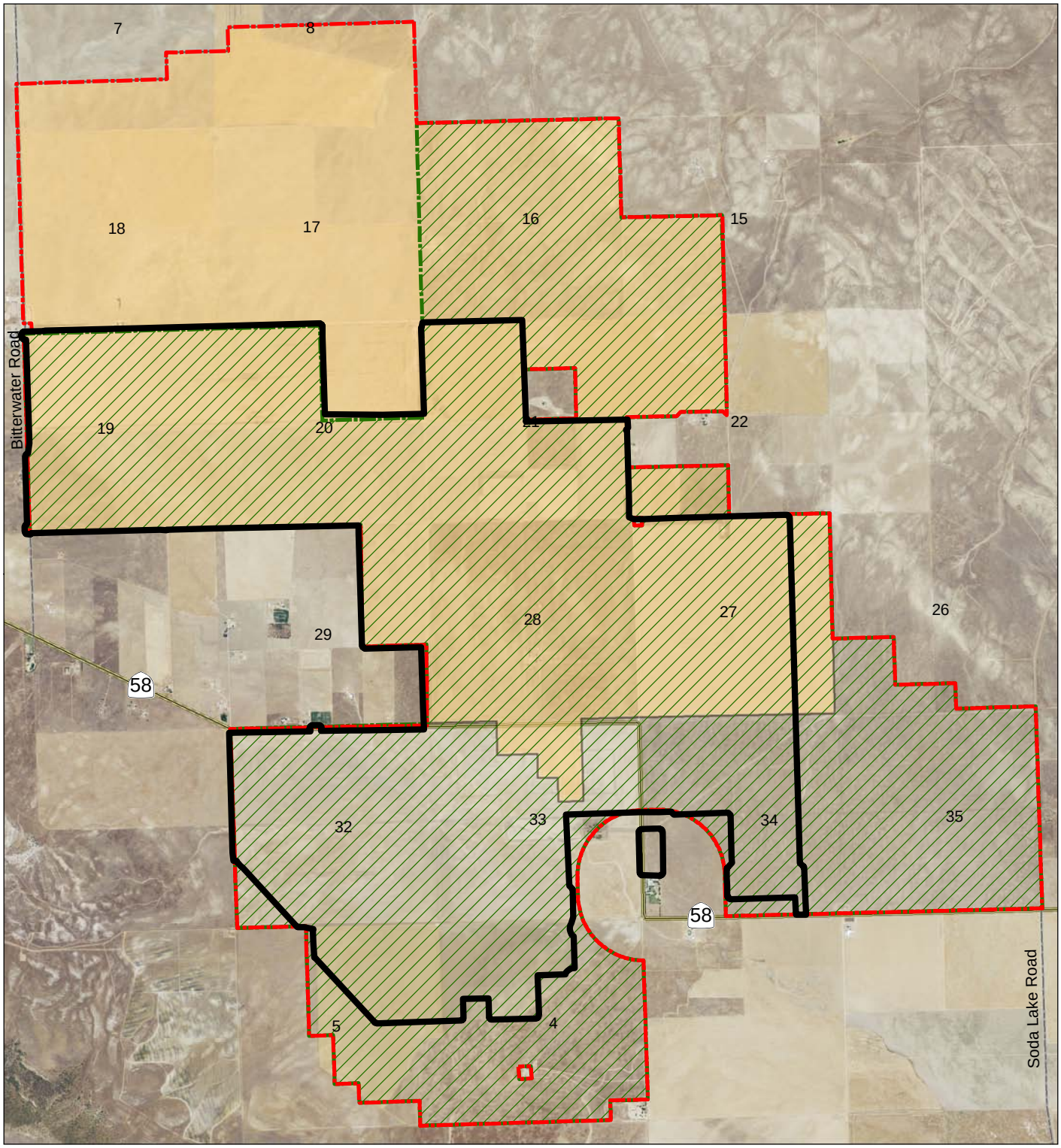
A lack of shrub development limits the amount of shade and cover available to many animal species. Species that are locally common in saltbush scrub habitats in the Carrizo Plain National Monument have not been detected within the Action Area. Species present within the Action Area are those that prefer wide-open habitats and are adaptable to variable habitat conditions, including frequent disturbance. Small mammal and reptile fauna such as mice, kangaroo rats, gophers, lizards and snakes, are present in low abundance. We attribute this condition primarily to detrimental effects of farming activities. Medium sized mammals such as badger, coyote and kit fox occur within the Action Area and are also affected by farming activities.

The Project would change the habitat type within the solar arrays, but would still provide usable habitat for small mammals, kit fox, reptiles, birds, and invertebrates. For fairy shrimp, avoidance and protection of pools would result in habitat improvement over current conditions, and therefore improved prospects for increasing populations. For areas of the Project currently in cropland, the Project could result in habitat improvements for kit fox. Overall, the Project with proposed conservation measures would not result in any jeopardy to federally listed species, and may result in an increase in the regional populations of vernal pool fairy shrimp, longhorn fairy shrimp, giant kangaroo rat and San Joaquin kit fox.

# 11.0 Figures

- **Figure 1. Project Site Study Areas**
- **Figure 2. USGS Topographic Map**
- **Figure 3. Aerial Photograph**
- **Figure 4. CNDDB & FWS Critical Habitat Map**
- **Figure 5. Alternative 3B.1 Siting Map**
- **Figure 6. Alternative 3B.1 Project Action Area**

# Figure 1. Project Site Study Areas



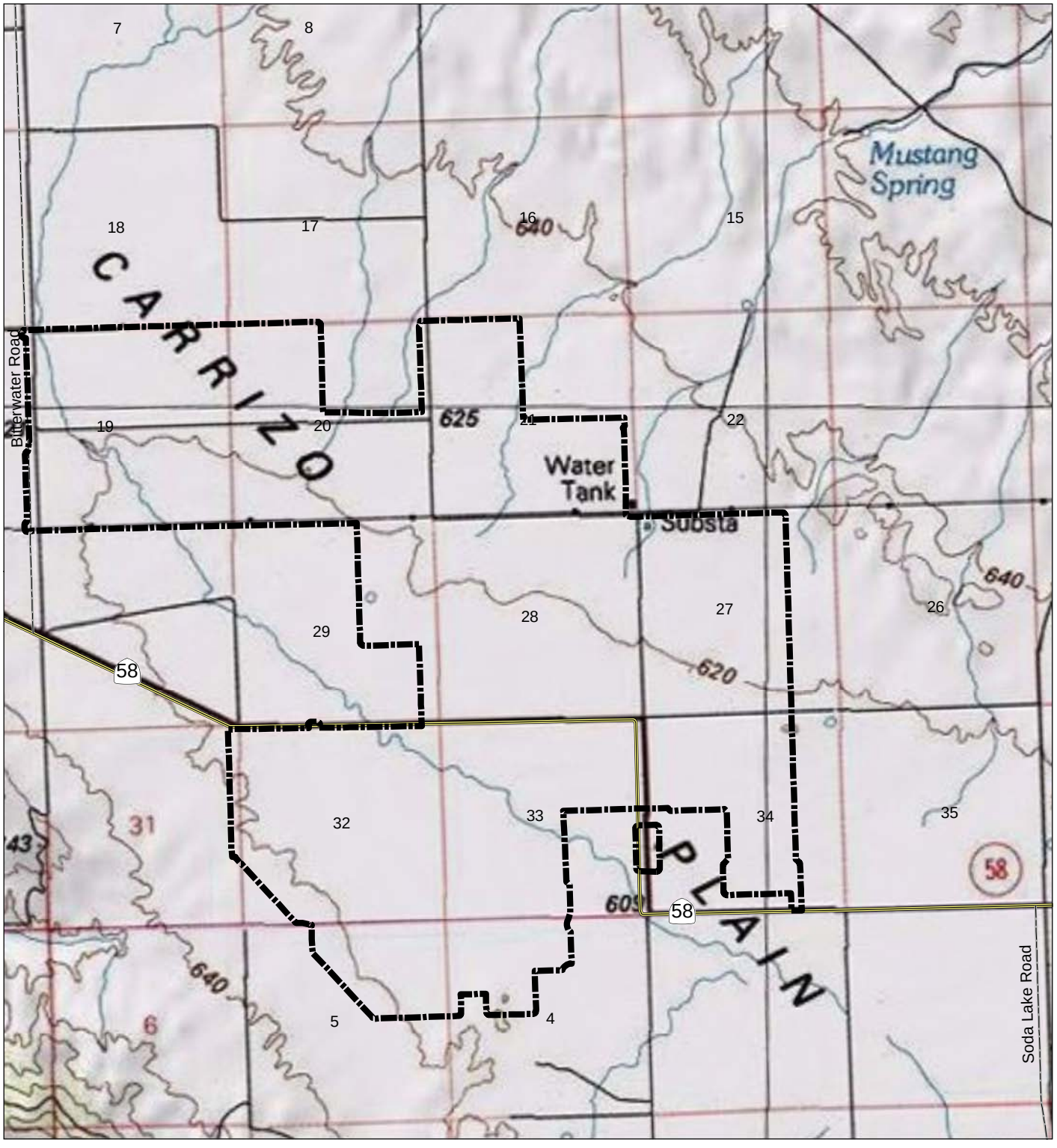


Topaz Solar Farms, LLC
1111 Broadway, 4th Floor
Oakland, CA 94607


2009 San Luis Obispo County
NAIP Aerial Photography
Map Updated: July 07, 2011


Althouse and Meade, Inc.
1602 Spring Street
Paso Robles, CA 93446

# Figure 2. USGS Topographic Map



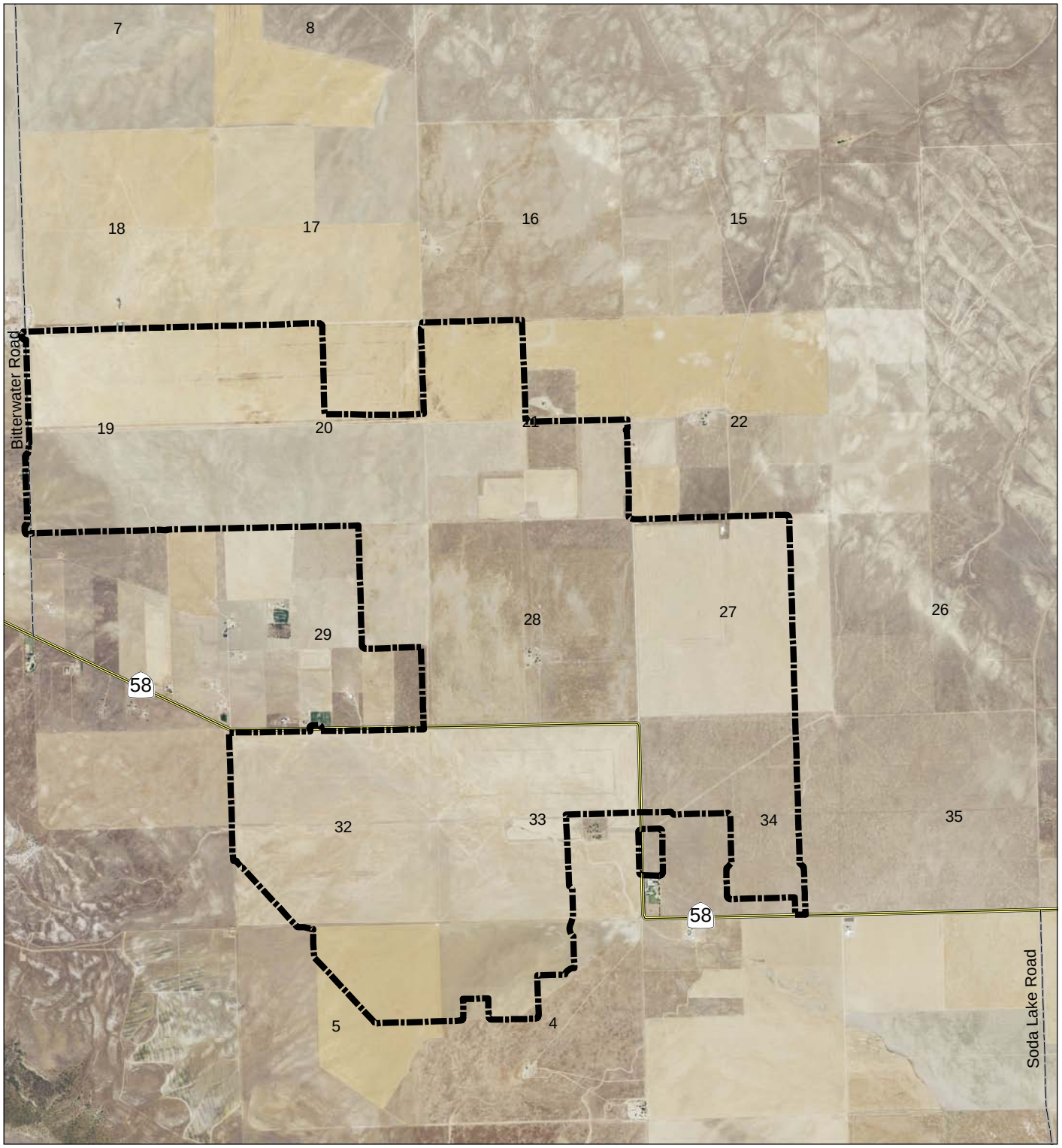


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1111 Broadway, 4th Floor
Oakland, CA 94607


USGS Topographic Map
Project site located in La Panza NE &
California Valley 7.5' Quadrangles
Map Updated: July 07, 2011


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# Figure 3. Aerial Photograph



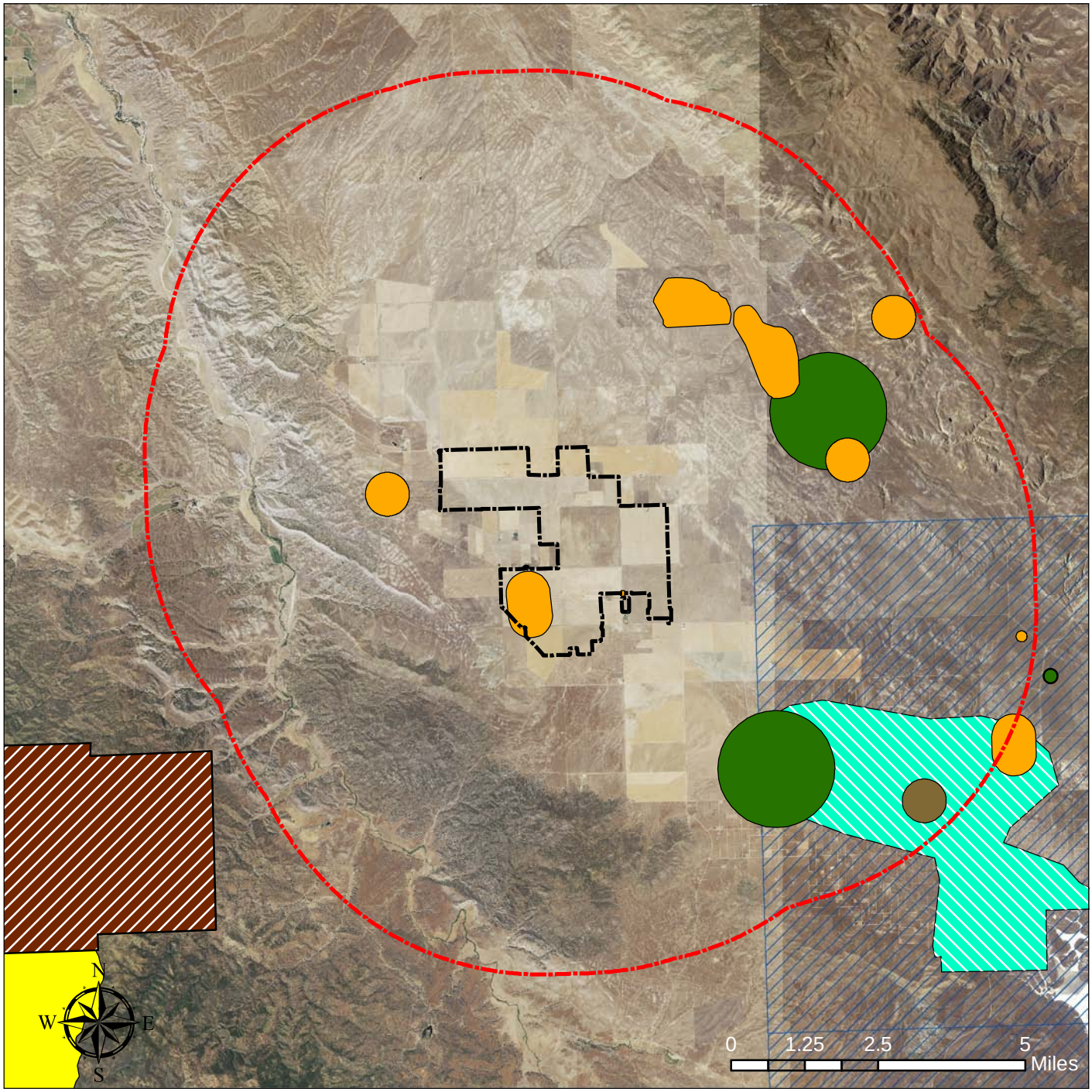


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# Figure 4.
# Federal CNDDB Species & FWS Critical Habitat




Alternative 3B.1 Action Area

5 Mile Radius

**CNDDB-Federally Listed Species**

Longhorn Fairy Shrimp (Endangered)

San Joaquin Kit Fox (Endangered)

Giant Kangaroo Rat (Endangered)

Vernal Pool Fairy Shrimp (Threatened)

**FWS Critical Habitat**

California Condor

California Red-legged Frog

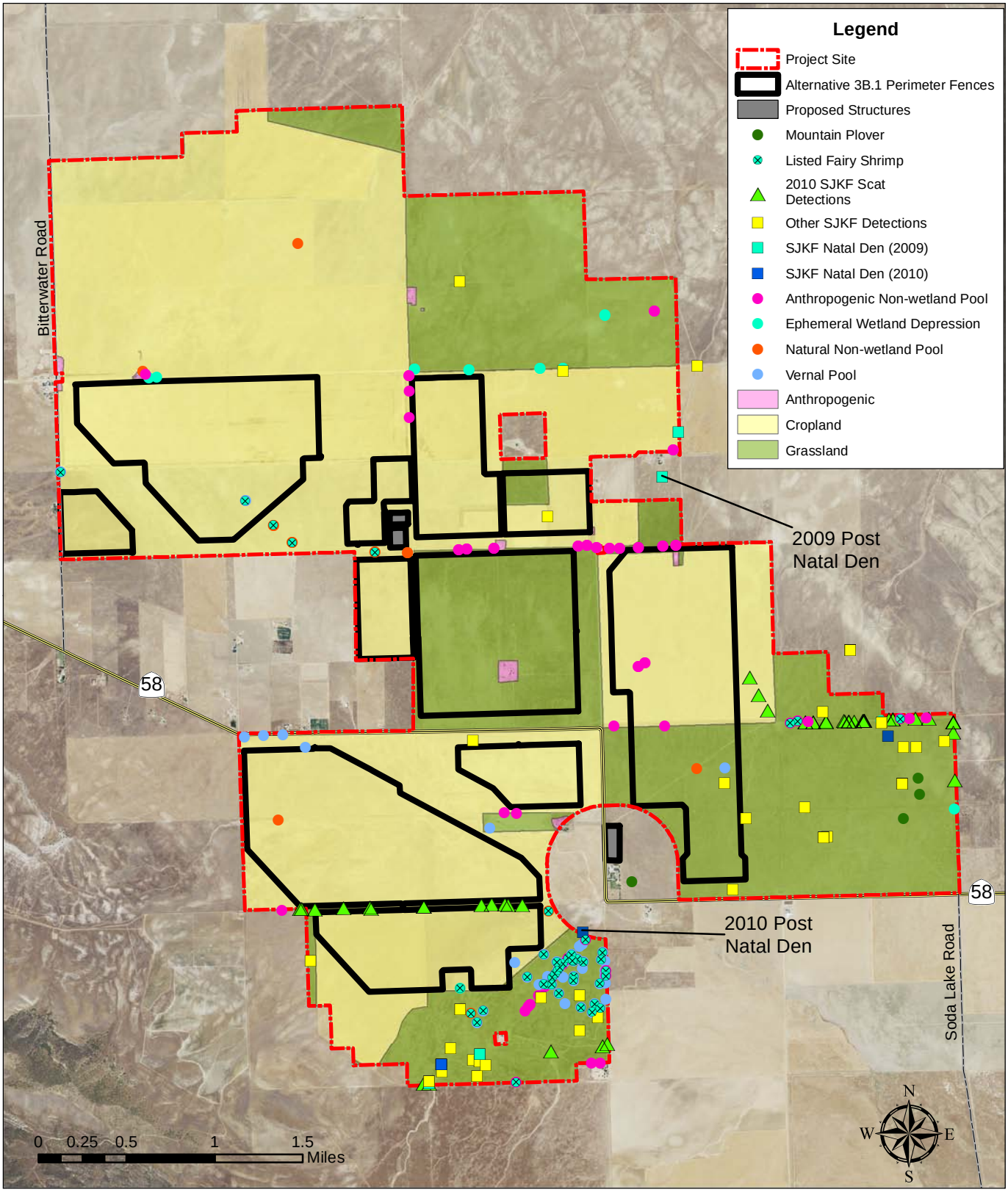
Longhorn Fairy Shrimp
Vernal Pool Fairy Shrimp


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Oakland, CA 94607


2009 San Luis Obispo County NAIP Aerial Photography Project in La Panza NE & California Valley 7.5' Quads
Map Updated: July 21, 2011


Althouse and Meade, Inc.
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Paso Robles, CA 93446

# Figure 5. Alternative 3B Siting Map



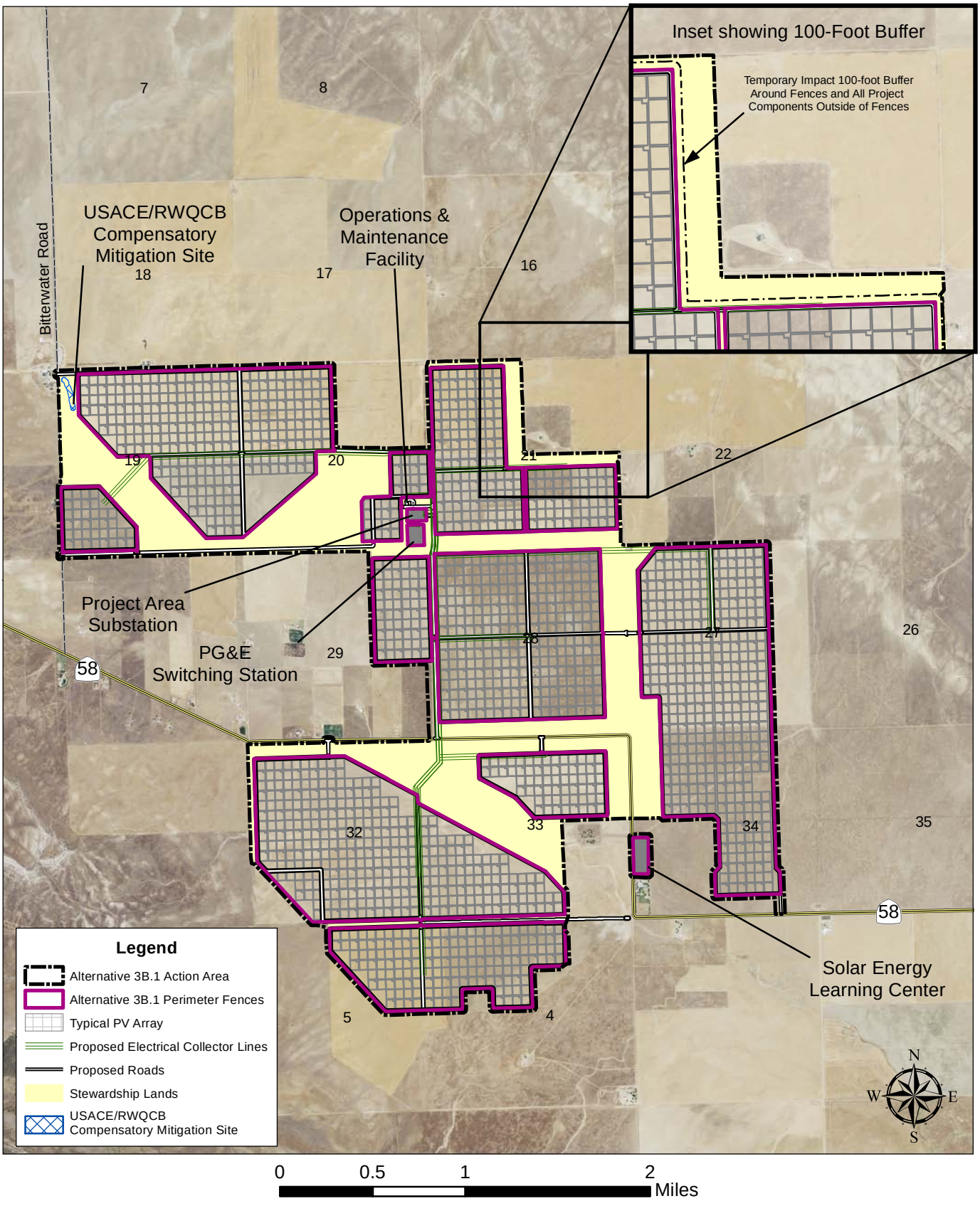


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2009 San Luis Obispo County
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Map Updated: July 07, 2011


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# Figure 6. Alternative 3B.1 Project Action Area





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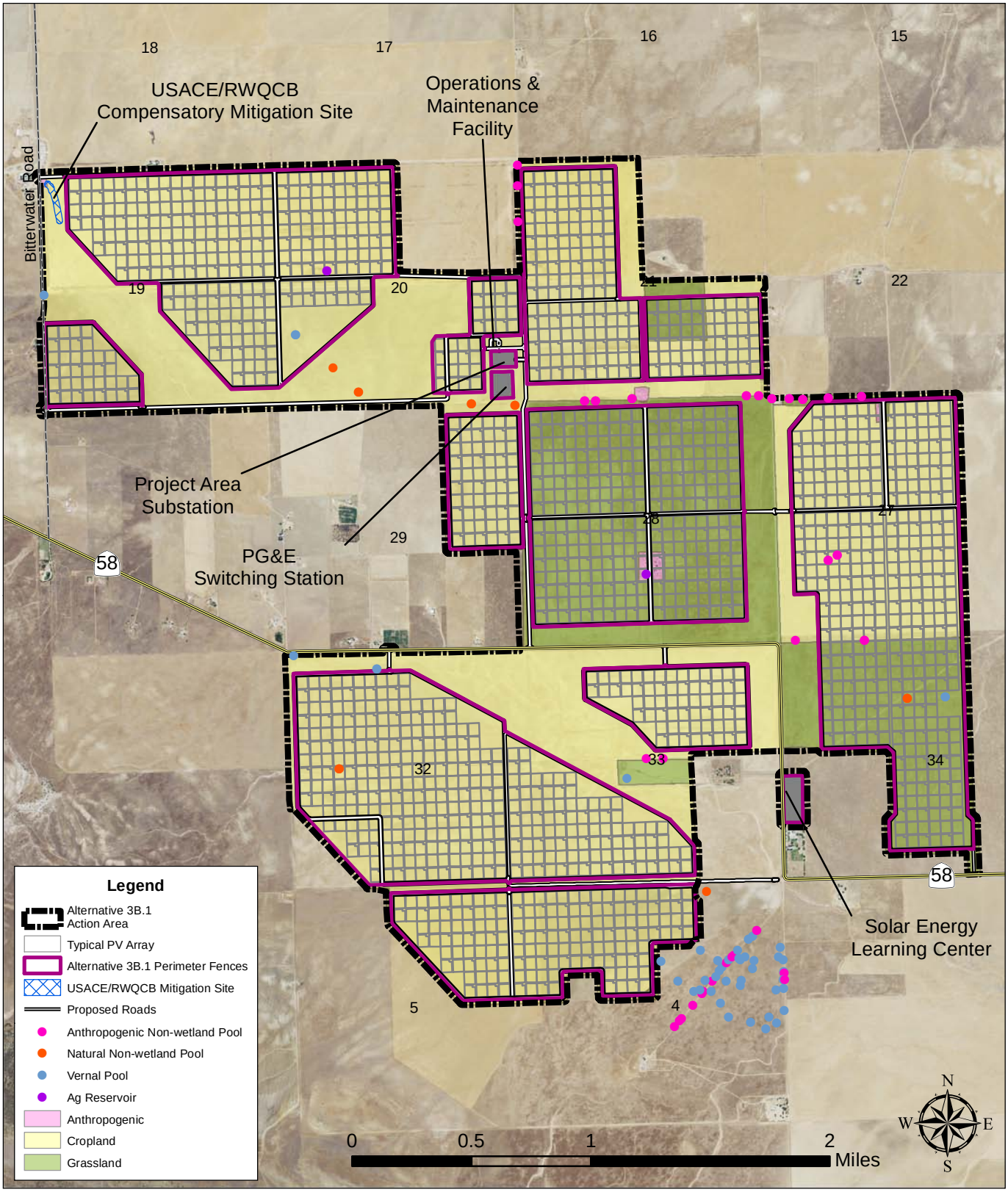

2009 San Luis Obispo County
NAIP Aerial Photography
Map Updated: July 21, 2011


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# 12.0 Biological Resource Maps

- **BR Map 1. Habitat**
- **BR Map 2. San Joaquin Kit Fox Genetic Results**
- **BR Map 3. Kit Fox Active Den Areas**
- **BR Map 4. BNLL Survey Areas 2007-2010**
- **BR Map 5. Listed Vernal Pool Branchiopod Localities**
- **BR Map 6. Golden Eagle Aerial Nest Survey Results**
- **BR Map 7. Conservation Land Habitats**

# BR Map 1. Habitat



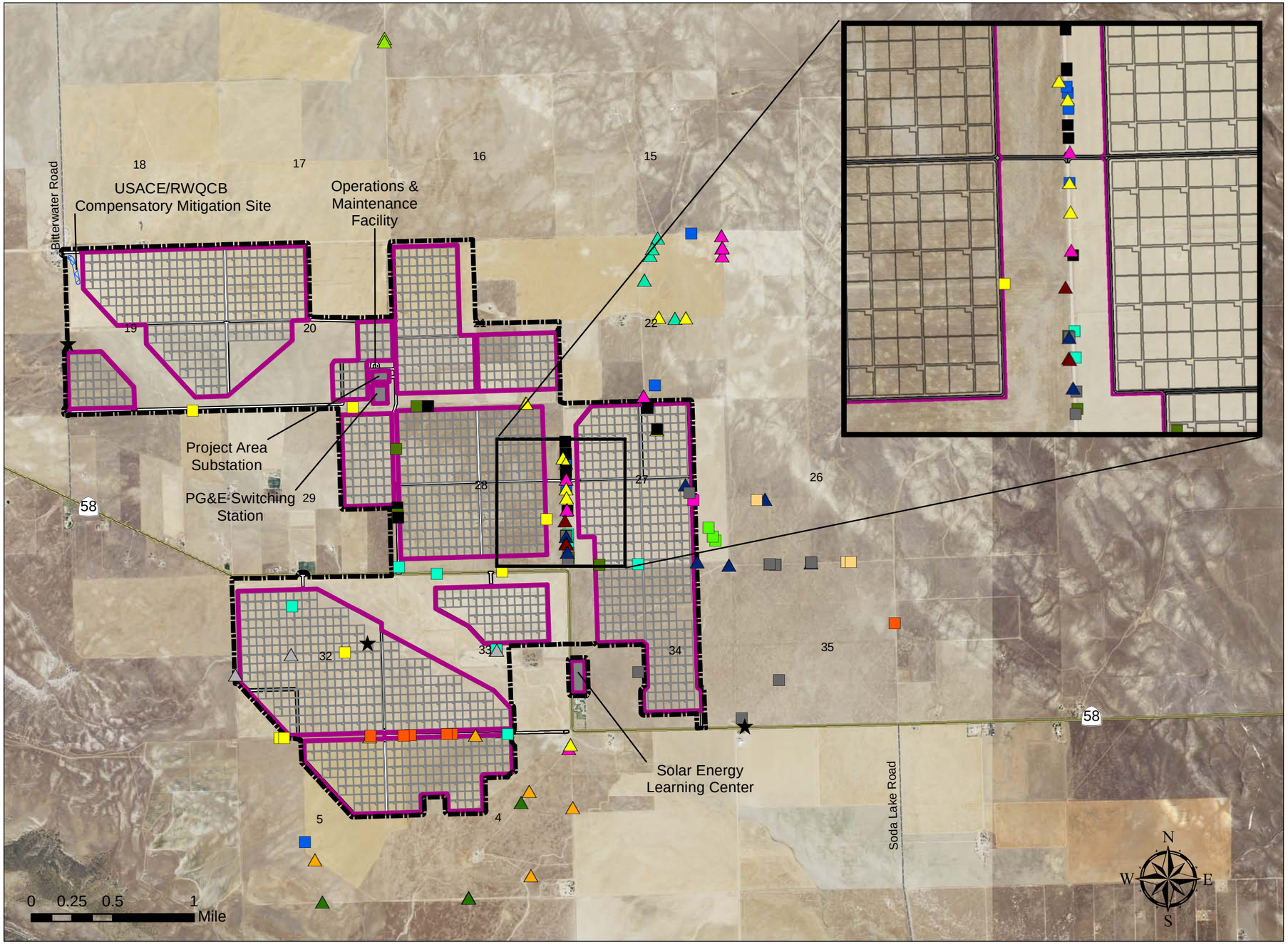


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# BR Map 2a. San Joaquin Kit Fox 2009 Genetic Results




## Legend

- Alternative 3B.1 Action Area
- Typical PV Array
- USACE/RWQCB Mitigation Site
- Alternative 3B.1 Perimeter Fences
- Proposed Roads
- ★ Red Fox

| Map Symbol | Sex | SJKF Individual | Number of Detections |
|---|---|---|---|
| | Male | 2 | 8 |
| | Male | 3 | 14 |
| | Male | 7 | 6 |
| | Male | 8 | 4 |
| | Male | 9 | 6 |
| | Male | 13 | 4 |
| | Male | 14 | 8 |
| | Male | 15 | 1 |
| | Male | 17 | 7 |
| | Male | 19 | 13 |
| | Female | 1 | 4 |
| | Female | 4 | 3 |
| | Female | 5 | 6 |
| | Female | 6 | 2 |
| | Female | 10 | 4 |
| | Female | 11 | 5 |
| | Female | 12 | 7 |
| | Female | 16 | 8 |
| | Female | 18 | 10 |

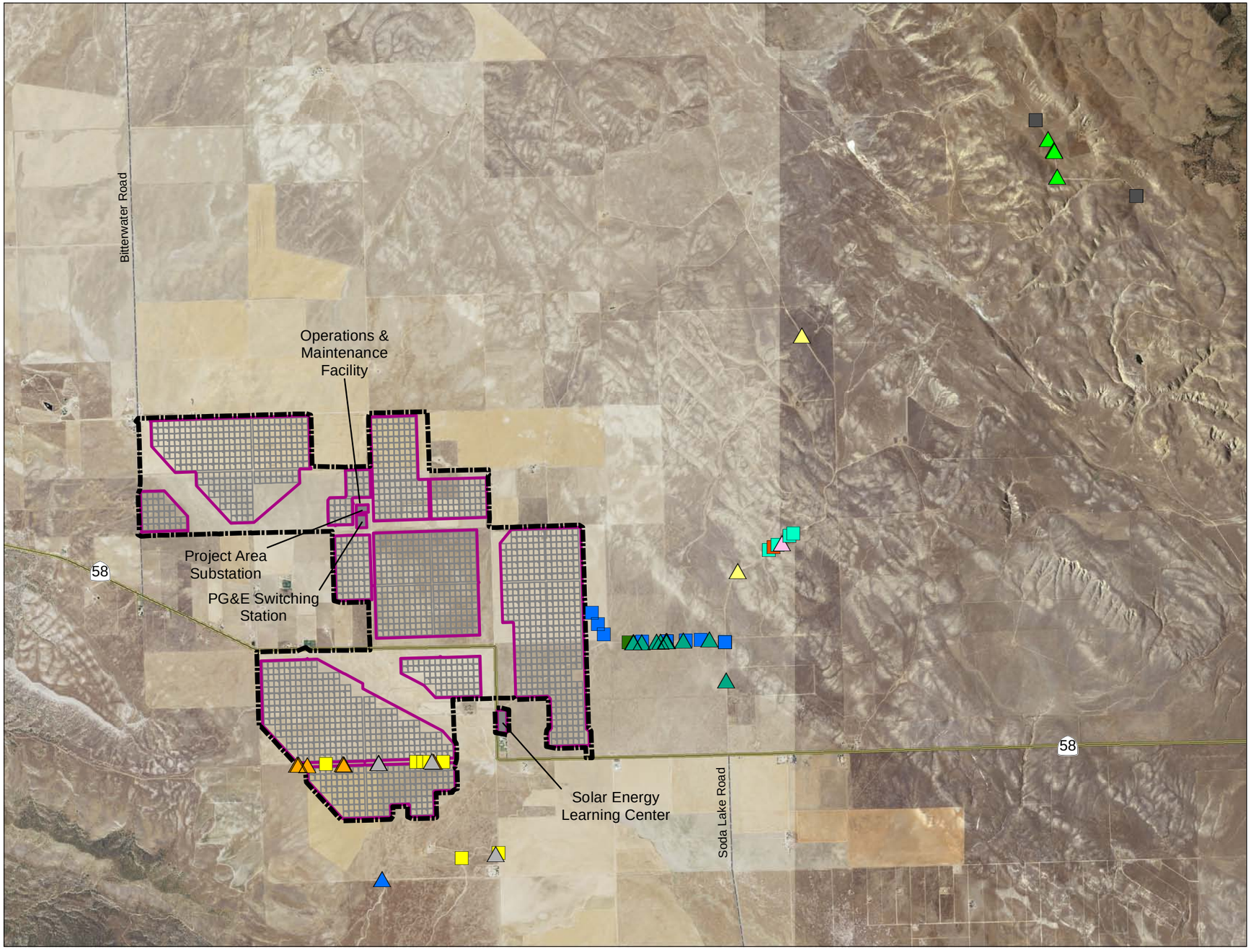
*Scat collection locations from Smith 2010 (2009 data)*
*Genetic results from Maldonado 2010*


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2009 San Luis Obispo County
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# BR Map 2b. San Joaquin Kit Fox 2010 Genetic Results




## Legend

- Alternative 3B.1 Action Area
- Typical PV Array
- Alt 3B.1 Perimeter Fences

| Map Symbol | Sex | SJKF Individual | Number of Detections | |
|---|---|---|---|---|
| △ | Female | 1* | 4 | Topaz Solar Farm |
| △ | Female | 20 | 1 | |
| △ | Female | 21 | 11 | |
| △ | Female | 24 | 7 | |
| ■ | Male | 2* | 6 | |
| ■ | Male | 28 | 10 | |
| ■ | Male | 29 | 2 | |
| △ | Female | 22 | 1 | Mitigation Propterties |
| △ | Female | 23 | 2 | |
| △ | Female | 25 | 4 | |
| ■ | Male | 26 | 4 | |
| ■ | Male | 27 | 4 | |
| ■ | Male | 7* | 1 | |

*Scat collection locations from Smith 2011(2010 data)*
*Genetic results from Maldonado 2011*

**Detected in 2009*

N
W E
S

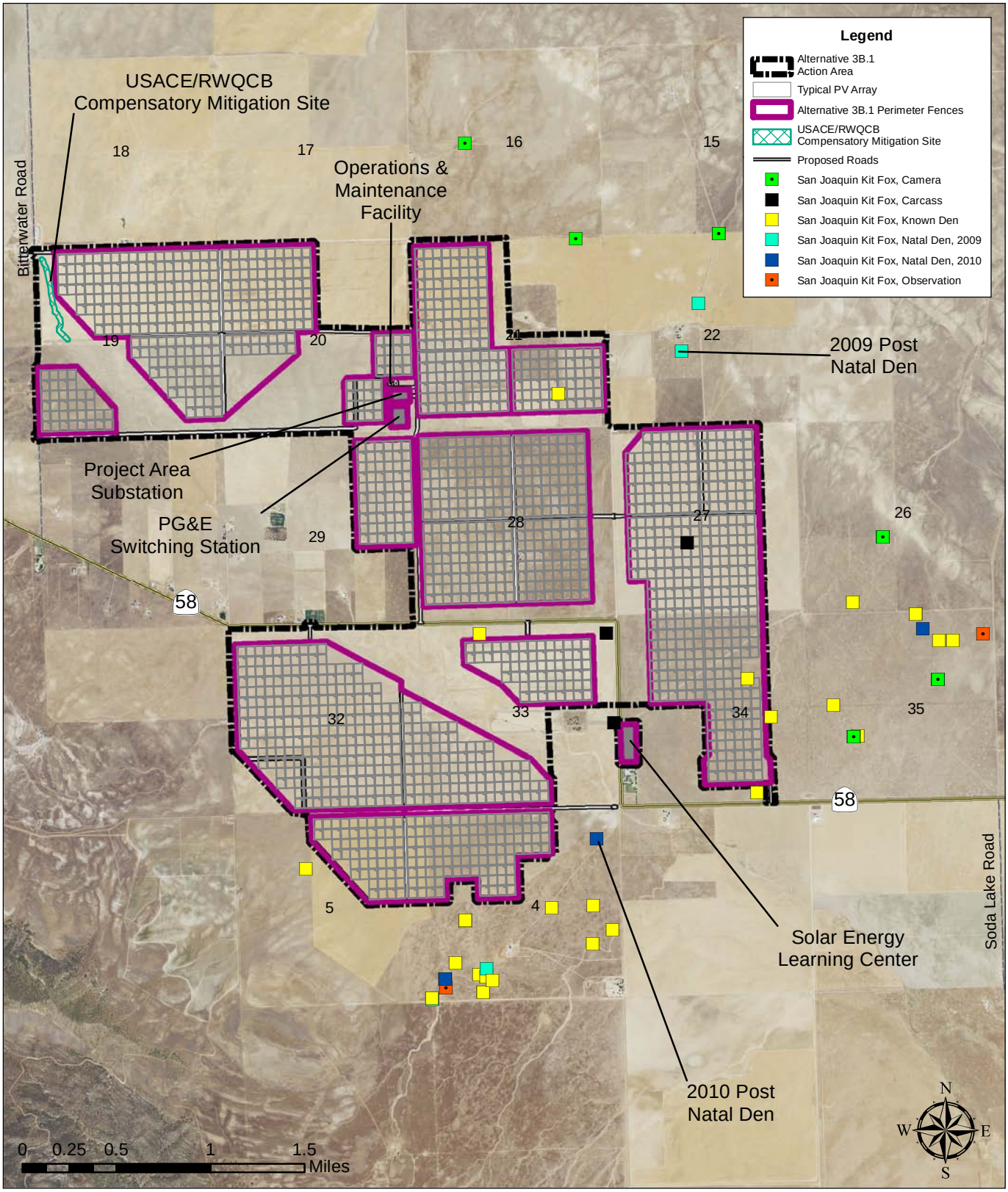
0 0.5 1 2 Mile

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NAIP Aerial Photography
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# BR Map 3.
# Kit Fox Active Den Areas



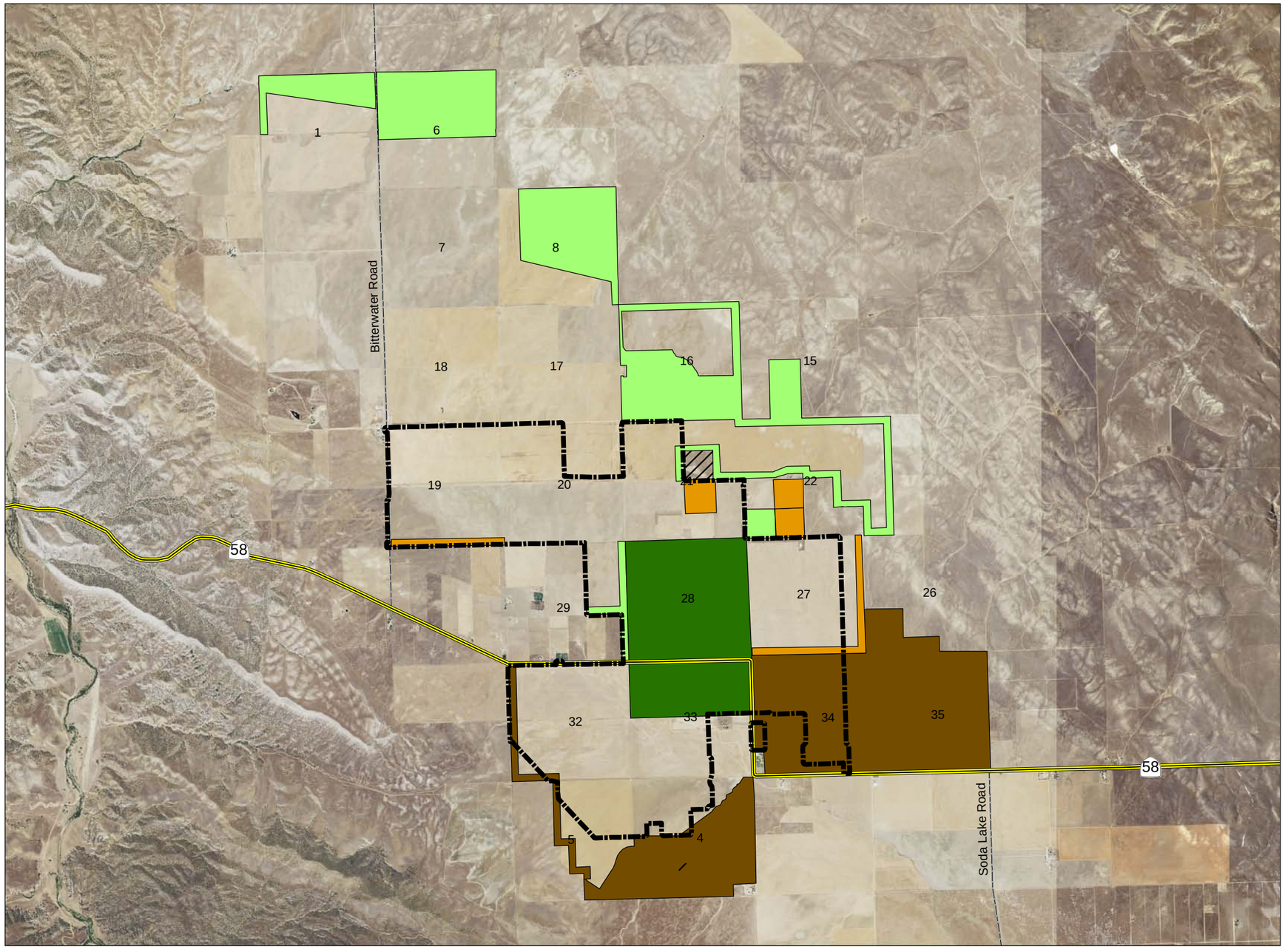


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# BR Map 4. BNLL Survey Areas, 2007-2010




Alternative 3B.1 Action Area

**Approx. Acres**

Excluded Area

'07-'08 Ausra Survey Area...1020

2008 Survey Area.....1584

2009 Survey Area.....224

2010 Survey Area.....2010

*BNLL: Blunt-nosed Leopard Lizard*
*NEAS: Nelson's Antelope Squirrel*

N
W E
S

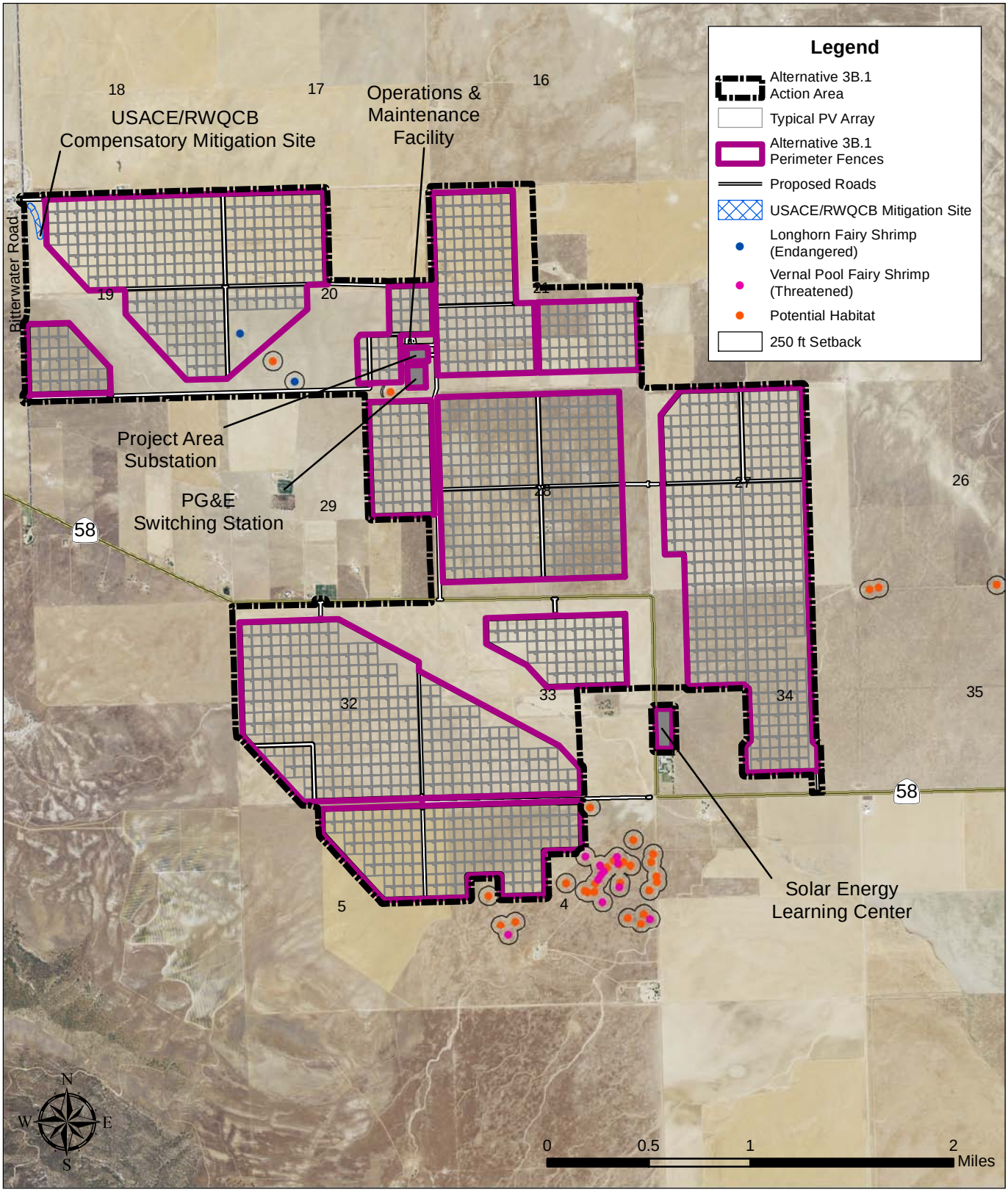
0 0.5 1 2 Miles


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NAIP Aerial Photography
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# BR Map 5.
# Listed Vernal Pool Branchiopod Localities



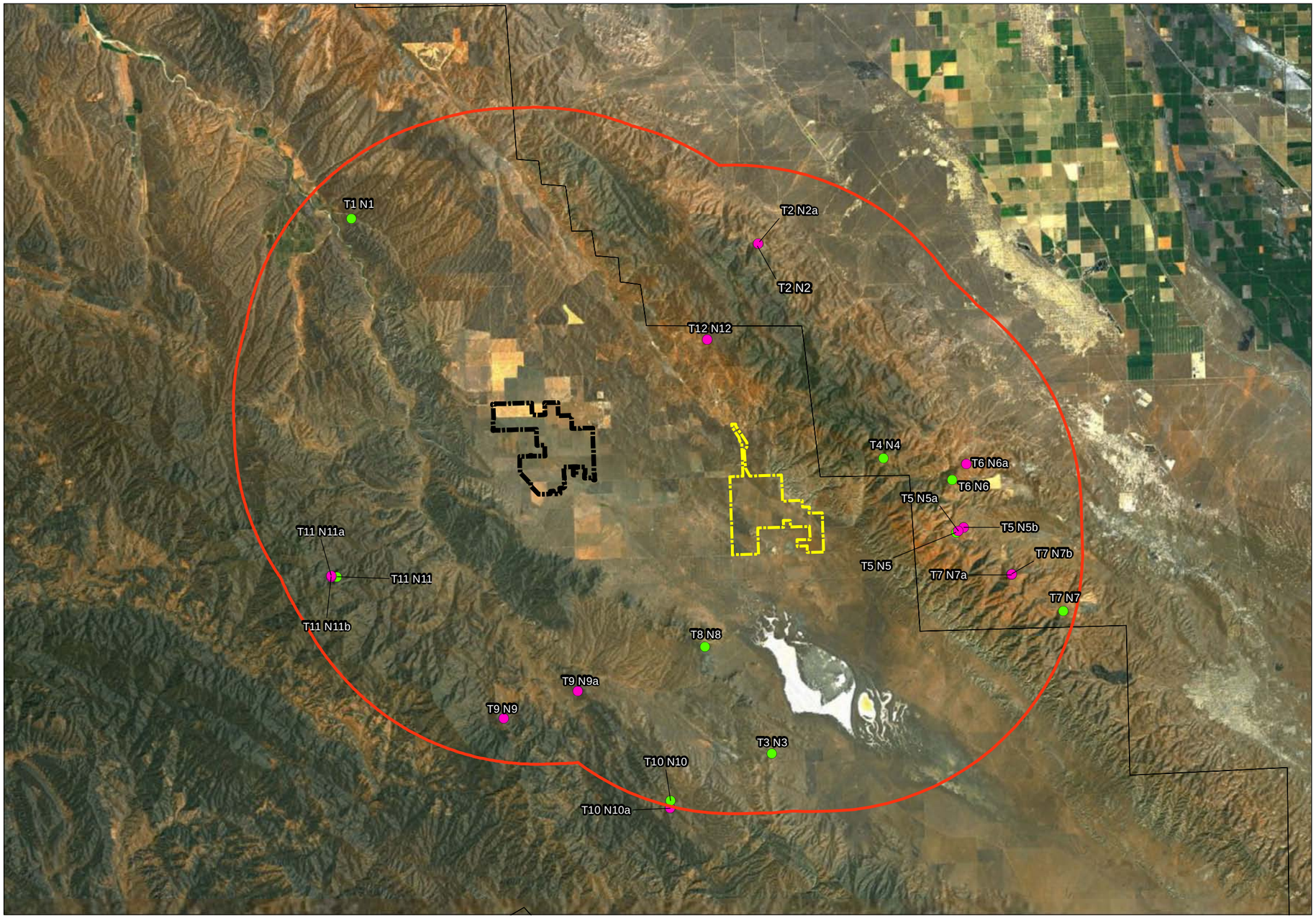


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NAIP Aerial Photography
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# BR Map 6. Golden Eagle Aerial Nest Survey Results




Alternative 3B.1 Action Area

Sun Power Study Area

Survey Area

Active Nest

Inactive Nest

T1= Eagle Territory Number
N1= Eagle Nest Number

N
W E
S

0 2.5 5 10 Miles

*Aerial nest surveys conducted by:*
*Brian Latta*
*Senior Raptor Biologist*
*230 Ross St.*
*Santa Cruz, CA 95060*

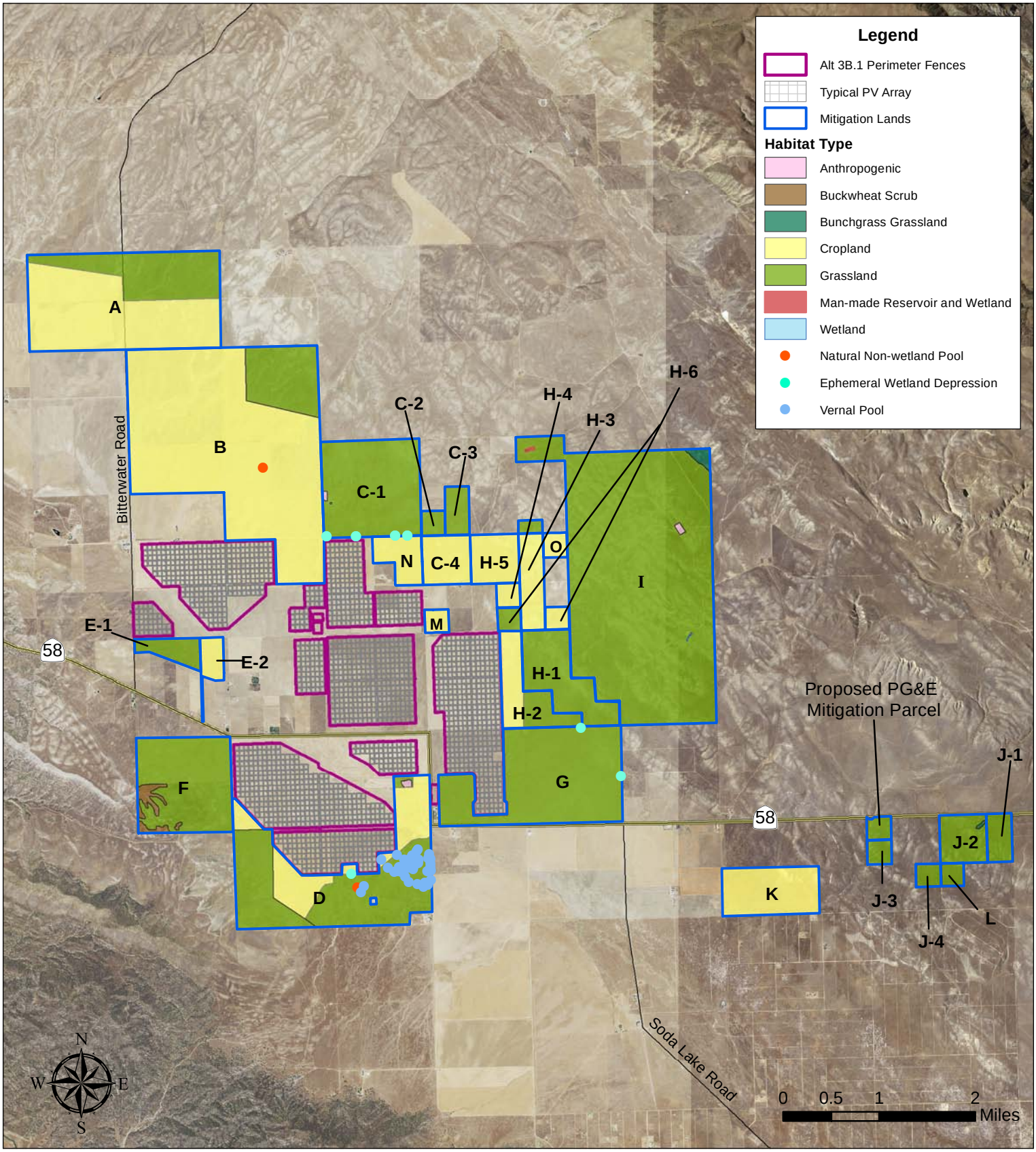
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2005 NAIP Aerial Photography
Map Updated: July 07, 2011

Althouse and Meade, Inc.
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# BR Map 7. Conservation Land Habitats





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2009 San Luis Obispo County
NAIP Aerial Photography
Map Updated: July 8, 2011


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# Appendix A: Other Federally-listed Species Reported from the Region

## Introduction to Appendix A

Appendix A includes information regarding other federally-listed species reported from the region for which the Project would have no effect (refer to Table 3and following discussions). Extensive field surveys and investigation of habitat suitability and occurrence records have determined that none of these eight federally-listed species occur within or close enough to the Action Area to be affected by the Project. For each species we provide a detailed description of field survey methods and we summarize the resulting determination that they are not present.

TABLE 3. OTHER FEDERALLY-LISTED SPECIES Two federally-listed plants and six federally-listed animals reported from the region are listed that were not found on or near the Project and would not be affected by the Project.

| | Common and Scientific Names | Fed/State Status Global/State Rank CNPS List/ DFG Rank | Blooming /Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within Action Area? | Effect of Project |
|---|---|---|---|---|---|---|---|
| **Plants–2 species** | | | | | | | |
| | **California Jewelflower** *Caulanthus californicus* | Endangered/ Endangered G1/S1.1 List 1B.1 | February–May | Chenopod scrub, grassland, pinyon-juniper woodland on non-alkaline sandy and rocky soils; 65-900 m. | No. Suitable habitat conditions and soil types are not present within either of the Action Area. | No | No Effect |
| | **San Joaquin Woollythreads** *Monolopia congdonii* | Endangered/none G3/S3.2 List 1B.2 | February–May | Chenopod scrub, grassland, in alkaline or loamy plains or sandy soils. 60-800 m. | Yes. Suitable habitat and loamy plains or sandy soils are present within portions of Sections 4 and 5 of the Option A Action Area. Suitable soils are not present within the Option B Action Area. | No | No Effect |
| **Animals–6 species** | | | | | | | |

| | Common and Scientific Names | Fed/State Status Global/State Rank CNPS List/ DFG Rank | Blooming /Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within Action Area? | Effect of Project |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | **California Tiger Salamander** *Ambystoma californiense* | Threatened/none G2G3/S2S3 SSC | Rainy season | Need underground refuges, ground squirrel burrows & vernal pools or other seasonal water for breeding. | No. Suitable aquatic habitat with untilled adjacent upland habitat is not present within either of the Action Area. No historic suitable aquatic habitat on the Carrizo Plain. No historic or current specimen records from the Carrizo Plain. | No | No Effect |
| | **Giant Kangaroo Rat** *Dipodomys ingens* | Endangered/ Endangered G2/S2 Special Animal | Spring - Summer | Sandy loamy soil on level and gently sloping ground with annual grasses, forbs, and scattered shrubs. sw SnJV | Yes. Potentially suitable habitat may be present within the Action Area. However, intensive burrow transect surveys and a kangaroo rat burrow and scat measurement study determined all kangaroo rat precincts within the Action Area were created and inhabited by the common and widespread Heermann's kangaroo rat (*Dipodomys heermanni*). Giant kangaroo rat does not occur within the Action Area. | No | No Effect |

| | Common and Scientific Names | Fed/State Status Global/State Rank CNPS List/ DFG Rank | Blooming /Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within Action Area? | Effect of Project |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | **Kern Primrose Sphinx Moth*** *Euproserpinus euterpe* | Threatened/None G1/S1 Special Animal | Spring | Host plant is evening primrose (*Camissonia contorta epilobioides*) and potentially other *Camissonia* species. | No. Suitable habitat is not present within the Action Area. Potentially suitable habitat is located in Section 4, outside of the Option A Action Area. | No | No Effect |
| | **Blunt-nosed Leopard Lizard** *Gambelia sila* | Endangered/ Endangered G1/S1 Fully Protected | Spring | Semiarid grasslands, alkali flats, and washes; SnJV and adjacent lands. 30-730 m. | Yes. However, most portions of the Action Area are too disturbed. Grasslands are generally too densely vegetated, with no shrub cover. Suitable burrows are present. | No | No Effect |
| | **California Condor** *Gymnogyps californianus* | Endangered/ Endangered G1/S1 Special Animal | March 15 through August 15 | Wide-ranging over Coast Ranges from Ventura to Big Sur, California. | Yes. Condors likely pass over the area on occasion, and could feed locally on carrion when available. However, Applicant Proposed Measures regarding micro trash clean-up and power line design would be implemented to avoid potential impacts. | No | No Effect |
| | **California Red-legged Frog** *Rana draytonii* | Threatened/none G4T2T3/S2S3 SSC | January - March | Lowlands and foothills in or near sources of deep water with dense, shrubby or emergent riparian vegetation. | No. Suitable habitat is not present within either of the Action Area. | No | No Effect |

**San Joaquin Woollythreads and California Jewelflower**

The San Joaquin woollythreads (*Monolopia congdonii*) is a federally listed endangered plant species (also CNPS List 1B.2) that occurs in interior areas of the southern San Joaquin Valley, as well as in the Carrizo Plain region of San Luis Obispo County. The San Joaquin woollythreads is distinguished by disciform heads, minute rays, disk fruits that are two-angled, and disk pappus of 2 to 7 scales. It occurs in grassland and chenopod scrub habitats, typically in sandy or loamy alkaline soils, where it blooms from February to May. The nearest recorded occurrence is a 1954 collection from approximately 14 miles east-northeast of the Action Area, now presumed extirpated (CNDDB 17). This species is also reported from the Carrizo Plain National Monument, with the nearest occurrence approximately 19 miles southeast of the Action Area (CNDDB 31, 45, 46, 79). A reference population in the Monument was visited by Althouse and Meade, Inc. botanists on March 26, 2010 where this species was observed in flower (Althouse and Meade, Inc. 2010c). Moderately suitable habitat is present in the Action Area for this species.

The California jewelflower (*Caulanthus californicus*) is a federally listed endangered plant species (also CNPS List 1B.1) that occurs in the southern San Joaquin Valley, as well as in the Carrizo Plain region of San Luis Obispo County. The California jewelflower occurs in chenopod scrub, valley and foothill grassland, and pinion-juniper woodland habitats, where it blooms from February to May. It is an annual plant in the mustard family that differs from other members of the genus by having stems not inflated and obviously hairy, sepals typically 4 to 8 millimeters, petals 6 to 11 millimeters, and fruits 1 to 6 centimeters. The nearest recorded occurrence is 1991 observation of a single plant on private land approximately 6.3 miles west of the Action Area (CNDDB 73). Suitable habitat is not present within the Action Area for this species.

Botanical surveys conducted in 2010 utilized a transect survey method in which botanists covered parallel belts of land in north-south orientation across annual grasslands and croplands. Each transect belt was 660 feet wide and up to 5,280 feet (one mile) long. Botanists walked meandering lines within each transect, ultimately compiling a complete flora for every Section. Land Sections within the project study area were sampled individually to generate a separate dataset for each Section. Each botanist compiled a list of all plants encountered during their first transect in a new Section; only plant species new for the Section were listed on subsequent transect data sheets. Some plants that could not be positively identified in the field were collected, pressed, and identified in the lab. In addition to compiling plant lists, the botanists recorded notes on dominant species, percent cover, percent bare ground, and vegetation height in all transects. When the botanists identified rare plant populations, they recorded coordinates taken by hand-held GPS, number of plants present, and the approximate size of the occurrence. This data was used to direct focused surveys to completely map rare plant populations. The 2010 transect surveys completed total ground cover once in March, once in April, and once in May. We conducted focused surveys for botanical resources throughout the spring season. Focused surveys were conducted by senior botanists, at times working with Dr. David Keil, Curator of the R.F. Hoover Herbarium at Cal Poly, in order to make determinations on species identity questions raised during transect surveys, collect

voucher specimens, map rare plant populations, and to fully investigate complex habitat types such as vernal pools.

Botanical surveys were timed to coincide with the typical blooming period for rare plant species with potential to occur within the Action Area, including San Joaquin woollythreads and California jewelflower. Botanical surveys conducted through July 2010 determined the San Joaquin woollythreads and California jewelflower do not occur within the Action Area. San Joaquin woollythreads and California jewelflower do not occur in the Action Area, therefore the Project would have No Effect on these species.

**Kern Primrose Sphinx Moth**

The Kern primrose sphinx moth (*Euproserpinus euterpe*) is a federally listed threatened species known from Ventura, Santa Barbara, Kern, and San Luis Obispo Counties. This sphinx moth species is a medium-sized, day-flying moth that has been found in cropland, hedge rows, grassland, herbaceous areas, shrubland, chaparral, and open weedy areas in desert scrub. The sphinx moth requires the presence of the larval host plant, evening primrose (*Camissonia* ssp.). Grassland and sandy washes provide potentially suitable habitat for the sphinx moth. Potential low quality habitat is present in sandy washes that contain patches of *Camissonia* ssp. in Section 4 outside of the Option A Action Area (Arnold 2010).

A habitat assessment and limited presence-absence survey for the Kern primrose sphinx moth was conducted on April 2, 2010 by Richard A. Arnold, Ph.D. of Entomological Consulting Services, Ltd. (Arnold 2010, included in the Biological Report Technical Addendum, Volume 3). Althouse and Meade, Inc. mapped 45 locations of *Camissonia strigulosa*, a potential larval food plant for the sphinx moth, within the study area (as defined in Althouse and Meade, Inc. 2010c) during botanical transect surveys in April 2010. Dr. Arnold reviewed the *Camissonia strigulosa* locations and Natural Resource Conservation Service (NRCS) soil maps prior to conducting the April 2 site visit to determine which locations were situated on soils potentially suitable to the sphinx moth larval life stage. Dr. Daniel E. Meade from Althouse and Meade, Inc. accompanied Dr. Arnold on the April 2 site visit. Each location was surveyed for larvae and signs of larval feeding damage.

All but one of the previously identified 45 locations of *Camissonia strigulosa* were determined by Dr. Richard Arnold to be situated on clay or loam soils which are not suitable for the pupal stage of the Kern primrose sphinx moth. One location in a sandy wash at the south end of Section 4 (outside the Action Area) was determined to be potentially suitable. No sphinx moth adults or larvae were detected, and no evidence of larval feeding on the *Camissonia strigulosa* plants was observed.

No direct adverse effects to Kern primrose sphinx moth would occur from the Project. Incidental take is not expected as Kern primrose sphinx moths were not detected within the Action Area during field surveys conducted in 2010 and existing Project site conditions provide very poor potential habitat. The Project would have No Effect on the Kern primrose sphinx moth.

### California Tiger Salamander

The California tiger salamander (*Ambystoma californiense*) is a federally listed threatened species in San Luis Obispo County, and it is listed as threatened under the California Endangered Species Act. The California tiger salamander (CTS) is endemic to California. California tiger salamanders are restricted to vernal pools and seasonal ponds, in grassland and oak savannah habitats, predominantly from sea level to 2,000 feet, in central California. As an adult, it is a large, stocky, terrestrial salamander with a broad, rounded snout. Larvae are fully aquatic and require standing bodies of fresh water (natural or artificial) that are typically inundated for a minimum of 12 weeks during an average rainfall year. Ponds or agricultural reservoirs with a hydro-period of more than two years can accumulate a diverse array of aquatic predators, including invertebrates, aquatic salamanders, and fishes (Semlitsch 2002). Ponds containing high densities of aquatic predators, especially non-native fishes or bullfrogs (*Rana catesbeiana*), appear to be unsuitable as breeding habitat. Adults migrate to and from breeding ponds during the rainy season beginning in early November, with greatest breeding activity occurring December through March (Stebbins 2003). Newly-metamorphosed CTS leave the pond and spend most of their adult life underground in burrows of California ground squirrels, gophers, and other animals.

In San Luis Obispo County, the current range of the CTS is restricted to seasonal ponds along the northern San Andreas Fault Zone, between Kerr Lake one mile south of the Monterey County line and Grant Lake at Palo Prieto Pass (CNDDB September 2010). The southern known extent of CTS in San Luis Obispo County at Grant Lake is approximately 13 miles northwest of the Action Area. Tiger salamanders in San Luis Obispo County represent the southern extent of the Central Coast Range genetically distinct population, which extends northwest to Monterey Bay (CDFG 2010). The CTS is not known to occur in the Carrizo Plain. Reservoirs located within the Action Area could potentially provide suitable aquatic habitat, however, the intense agricultural production that immediately surrounds these reservoirs does not allow for appropriate upland habitat required by adult CTS. The Project would have no effect on the CTS due to the lack of suitable habitat within the Action Area.

### Giant Kangaroo Rat

The giant kangaroo rat (*Dipodomys ingens*) is listed as an endangered species under the Federal and California Endangered Species Acts. The giant kangaroo rat inhabits the arid southwestern edge of central California's San Joaquin Valley and adjacent valleys and plateaus of the Inner Coastal Ranges, including the Carrizo Plain. Giant kangaroo rats are described by the Endangered Species Recovery Program (ESRP) as inveterate diggers that frequently remodel their burrows, closing old entrances and creating new ones. These burrows also provide shelter for the federally listed endangered blunt-nosed leopard lizard (BNLL), state-listed threatened Nelson's antelope squirrel, and other animals. The nearest reported occurrence in the CNDDB is located approximately three miles east of the Action Area. The occurrence was recorded in 1979 and is located at the north end of the Carrizo Plain, approximately 3.5 air miles north-northeast of Simmler (CNDDB 110).

Small mammal taxa within the Action Area were inventoried during four trapping studies (URS 2008, Vanherweg 2008, Collins 2009, and Collins 2010, in the Biological Report Technical Addendum, Volume 3), three visual detection transect surveys (Althouse and Meade, Inc. 2009a, 2010c), a barn owl pellet analysis (Collins 2009), a kangaroo rat burrow and scat measurement study, and during focused wildlife surveys. The trapping studies each focused on different locations of the Action Area, resulting in a comprehensive sample of small mammals (primarily nocturnal) occurring across the Action Area.

Thirty barn owl pellets were collected and the bone contents were identified to species by Paul Collins, Curator of Vertebrate Zoology at the Santa Barbara Museum of natural History (Collins 2009).

Giant kangaroo rat focused visual detection surveys were conducted in suitable habitats within the Action Area in 2008 and 2009 and in 2010 concurrently with the 17 BNLL full-coverage passes for the adult survey period. These surveys were preceded by visits to known reference sites in the Carrizo Plain National Monument (Panorama Road). Additionally, all 2010 BNLL surveyors attended a giant kangaroo rat field training on May 14, 2010 given by Paul Collins.

Biologists conducting focused surveys for giant kangaroo rat walked transects through suitable habitat looking for kangaroo rat precincts. All precincts identified were mapped and carefully examined for the diagnostic sign of the giant kangaroo rat (vegetation clearing, haystacks, pit caches, etc.). On June 18, 2010, Paul Collins and Tom Olson (Thomas E. Olson Biological Consulting) conducted a kangaroo rat burrow and scat measurement study within the Action Area. Althouse and Meade, Inc. biologist Jason Dart assisted with the survey. Each potential kangaroo rat precinct was surveyed for horizontal and vertical burrows, and other diagnostic sign. Where rodent burrows and sign were positively identified as that of a kangaroo rat, vertical and horizontal measurements were taken of all burrows, and scat was collected where available for later evaluation in the lab. Burrow and scat morphometrics were compared to those presented in the published literature (Williams 1992).

The giant kangaroo rat does not occur within the Action Area. Visual detection surveys conducted during the 2010 BNLL adult survey period identified potential kangaroo rat precincts, which were later evaluated by Paul Collins and Tom Olson.

The kangaroo rat burrow and scat measurement study conducted in June 2010 determined all kangaroo rat precincts were created and inhabited by the common and widespread Heermann's kangaroo rat (*Dipodomys heermanni*). The federally listed endangered giant kangaroo rat does not occur within the Action Area.

No direct adverse effects to giant kangaroo rat would occur from the Project. Incidental take is not expected as no giant kangaroo rats were detected within the Action Area during field surveys conducted in 2008 through 2010. No Effect to giant kangaroo rat is expected to occur from the Project.

**Blunt-nosed Leopard Lizard**

The blunt-nosed leopard lizard (*Gambelia sila*) is a federal and state-listed endangered species. It is a Fully Protected species by CDFG, meaning no take may be authorized.

Blunt-nosed leopard lizards (BNLL) live in the San Joaquin Valley and Carrizo Plain in expansive, arid areas with scattered vegetation. They inhabit non-native grassland and alkali sink scrub communities of the valley floor marked by poorly drained, alkaline, and saline soils. Insects comprise the major portion of their diet, although other lizards also are eaten. They are opportunistic when foraging for animals, feeding on whatever prey is of appropriate size for capture and consumption. BNLL use small mammal burrows such as those of ground squirrels and kangaroo rats for permanent shelter and dormancy. Seasonal activity above ground depends on weather conditions, especially temperature. The optimum activity period occurs when air temperatures are between 77 and 95 °F and soil temperatures are between 86 and 122 °F. The breeding season begins in April and lasts into or through June. Eggs are laid in June and July, with young emerging in August or September. The nearest recorded occurrence, from July of 1958, is located approximately 7.8 miles south of the Action Area, 8.75 miles northwest of Painted Rock (CNDDB 134).

Protocol surveys for the BNLL were conducted throughout the Action Area (URS 2007, URS 2008, Althouse and Meade, Inc. 2009a, Althouse and Meade, Inc. 2010a, Althouse and Meade, Inc. 2010b). Methods of the BNLL protocol surveys were consistent with published protocol (CDFG 1994). Five protocol surveys were conducted within portions of the Action Area from 2007 to 2010 with negative survey results. The BNLL does not occur within the Action Area.

Protocol surveys did not detect any BNLL within the Action Area. No direct impacts to blunt-nosed leopard lizards would occur from the Project. Indirect impacts may include beneficial effects such as the increase in potential habitat due to the conversion of agricultural lands to grassland. No Effect to BNLL is expected to occur from the Project.

**California Condor**

The California condor (*Gymnogyps californianus*) is listed as endangered under the federal Endangered Species Act and the California Endangered Species Act. In addition, it is a Fully Protected species by CDFG, meaning no take may be authorized. Condors utilize vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges of moderate altitude. Deep canyons containing clefts in rocky walls provide nesting sites; large trees are used on occasion. In California, the condor presently ranges over approximately 9,500 square miles of land extending in a wishbone shaped area from Los Angeles northwest through the Coast Ranges to Monterey and San Benito Counties, and northeast through the Tehachapi Mountains east of Bakersfield into southern Fresno County. The California condor may forage up to 100 miles from its nightly roosting site.

From the late 1970's until 1987, wild condors foraged in foothills bordering the San Joaquin Valley, including San Luis Obispo County. The Elkhorn Hills-Cuyama Valley-Carrizo Plain complex and the southern San Joaquin Valley were the primary feeding areas for wild condors after 1982. Between 1982 and 1987 most condor sightings in the Carrizo Plain were at the south end of the National Monument, where sightings were most common in late winter and spring (USFWS 1996b; BLM 2010a). The Carrizo Plain is not presently occupied by condors, and according to the BLM (2010a) condors have not used the National Monument in recent years.

The United States Fish and Wildlife Service has designated nine critical habitat areas for the California Condor, including one area in San Luis Obispo County. Over 600,000 acres of land is designated as critical habitat. The area in San Luis Obispo County is split into the East and West Units of the High Mountain-Beartrap Condor Area. The Action Area are situated approximately 5.5 miles east of the closer 8,320 acre East Unit. The Carrizo Plain is not part of a critical habitat area for the California Condor, although its proximity and potential food sources make it suitable foraging habitat. Each of the Action Area, which are not within a designated critical habitat area, account for less than one tenth of one percent of the total range of the California condor.

Focused bird surveys were conducted within the Action Area during winter and spring months. Bird surveys were designed to detect and identify all species present. Over 221 survey hours were conducted specifically for winter bird surveys, and hundreds of survey hours were conducted for spring wildlife surveys that included intensive birding efforts.

California condors were not detected on or near the Topaz Solar Farm Action Area during our field surveys conducted from March 2008 through July 2010. The Topaz Solar Farm Action Area do not contain adequate roosting or nesting sites for California condors. However, large open areas for foraging are present, and cattle and wild ungulate carcasses in the region may provide feeding opportunities that could attract condors to the Carrizo Plain periodically. The California condor could potentially feed within the Action Area if a large mammal carcass was present.

Construction and subsequent operation of the Project would not adversely affect the California condor. Project construction, operation and maintenance procedures include regular trash clean-up and removal of small metal objects such as nuts and bolts. Clean-up protocols would eliminate small trash items in the extremely unlikely event that a condor would land within the Action Area.

The Project would have some medium-voltage collection system lines that would be designed to not present a danger for electrocution or collision by condors or raptors. This would be accomplished by utilizing design features recommended by the Avian Power Line Interaction Committee (APLIC 2006) which provides species-specific minimum horizontal and vertical spacing guidelines that would eliminate the potential for electrocution by bridging the gap between conductors.

The Carrizo Plain is not presently occupied by condors. The Project is not within a designated critical habitat area for condors. The change of use on approximately 4,100 acres of farming and grazing land would be a discountable effect to California condor, particularly with approximately 250,000 acres of suitable habitat within the Carrizo Plain National Monument and another 12,570 acres of protected critical habitat located in the region. No Effect to California condor is expected to occur from the Project.

**California Red-legged Frog**

The California red-legged frog (*Rana draytonii*) is a federally listed threatened species with sporadic occurrences documented throughout much of San Luis Obispo County. It does not occur on the Carrizo Plain, but is known from the Caliente Mountains to the west, and from the vicinity of the Cholame Valley to the north. San Luis Obispo County contains four critical habitat areas officially designated by the USFWS, the closest of which is SLO-4, located approximately 8.6 miles west of the Action Area.

The California red-legged frog generally requires seasonal pools or streams that hold water until late summer for successful breeding. Bullfrogs and introduced fish are detrimental to its breeding success, and have severely reduced many populations in larger watercourses and perennial ponds. The Action Area do not contain suitable aquatic or upland habitat for the California red-legged frog. Aquatic sampling surveys conducted within the Action Area determined the California red-legged frog does not occur within the Action Area. No Effect to the California red-legged frog is expected to occur from the Project.

# Appendix B: San Joaquin Kit Fox Conservation and Monitoring Plan

# Appendix C: Habitat Mitigation and Monitoring Plan

# Appendix D: Habitat Restoration and Revegetation Plan

# Appendix E: Vegetation Management Plan

# Appendix F: Mitigation Land Phasing

The TSF Project will be constructed sequentially in up to six overlapping phases over an approximate three or more year period starting in fall 2011. Each phase will receive separate construction permits from the County. Topaz Solar Farms LLC will record conservation easements on that prorata portion of conservation lands that is consistent with the ratio described below and at least commensurate with the impacts for each phase, plus at least 15 percent additional acreage (except for the last phase). Topaz Solar Farms LLC may elect to complete compensatory mitigation requirements in phases. At a minimum, Topaz Solar Farms LLC shall complete all compensatory mitigation requirements separately and in their entirety for each construction Phase of the Project prior to commencing ground-or-vegetation-disturbing activities for the next Project Phase and no later than the end of the 90 day period specified below. The installation of water wells required by the County to satisfy conditions precedent to the start of actual construction are not considered ground-or-vegetation disturbing activities.

The overall ratio of mitigation land area to permanently impacted area is 3.45 to 1. The Applicant will provide 3.45 times as much conservation land acreage as impacted acreage for each Project phase. In addition, with respect to construction Phases 1 through 5 (i.e., all phases except the last phase), the Applicant will increase the amount of conservation land by 15% after the ratio is applied in order to provide a buffer with respect to the timing of acquisition of conservation land, but this timing buffer shall not increase the overall amount of conservation land that will be provided for the TSF Project. For example, if Phase 1 includes a permanent impact to 100 acres of Project land, the Applicant will record conservation easements on at least 397 acres of conservation lands. This conservation total for Phase 1, in this example, would then be calculated as follows:

100 impacted acres * 3.45 ratio = 345 conservation acres * 1.15 (15% buffer) =
**397 conservation acres for Phase 1 (in this example)**

Prior to the start of construction, the Applicant will define and submit to the Service an initial construction phase comprised of the specific project elements to be constructed in Phase 1 (e.g., substation, array, O&M facility, access roads, etc). The following actions will be completed no more than 90 days after the initial ground disturbance associated with the first phase of construction and no more than 90 days after the initial ground disturbance for each subsequently defined phase:

1. An approved conservation easement to meet the conservation measures will be recorded on approved conservation lands;
2. The Topaz Habitat Mitigation and Monitoring Plan (HMMP), which will serve as a management plan for these conservation lands, will be approved by the Service;

3. An analysis of the management costs and endowments required to fund the HMMP will be approved by the Service; and
4. The endowment will be fully funded for the appropriate amount of conservation land being recorded.

Initial ground disturbance associated with subsequent phases will not begin until conditions 1 through 4 have been completed for the prior phase.

In addition to being commensurate with impacts for each construction phase, the phasing schedule for recording conservation easements on the mitigation lands will record parcels preferentially according to the ranking list below (Table 4). The ranking list allows the Applicant to manage land acquisition constraints while ensuring that conservation easements are recorded on parcels with high mitigation value with the early phases of the Project. The mitigation land acquisition grouping number in the first column denotes priority levels, within which the Applicant can choose the parcel(s) that would satisfy mitigation acreage requirements, as calculated above.

It is contemplated that, using the Table 7 list of mitigation land properties, CDFG will provide Applicant with CDFG's final approved list of mitigation properties at the time of issuance of the Permit, subject to CDFG's review of the documentation required under Section 8.3(a) of this Permit Application. Within 30 days of receipt of this documentation from the Applicant, CDFG will either approve all title and hazardous materials matters disclosed in such documentation or provide Applicant with a detailed written explanation of any issues or constraints that arise out of such documentation and that are to be addressed prior to recordation of a conservation easement. To facilitate acquisition of the mitigation land parcels consistent with the project schedule, Applicant will promptly address any identified issues or constraints and CDFG will promptly respond. If CDFG does not notify Applicant of any issues or concerns with such documentation with the stated time period, CDFG will be confirming that such documentation and status of the mitigation properties are acceptable without further action.

For the mitigation parcels proposed to be provided as compensatory mitigation for each phase of the project, the Applicant will provide CDFG with the Section 8.3(a) documentation no later than 75 days prior to starting construction on such phase.

TABLE 4. MITIGATION LAND ACQUISITION LIST FOR EASEMENT PHASING.

| Mitigation Land Acquisition Grouping | APN | T-R-S | Map Label (Figure 3) | Total Index Score 100 pts maximum | Notes | Approx. Mitigation Land acres |
|---|---|---|---|---|---|---|
| 1 | 072-151-004 | T30S R18E S6 | K | 50 | Cropland, flat | 319 |
| 1 | 072-061-053 | T29S R18E S22/23 | H6 | 65 | Cropland | 37 |
| 1 | 072-151-014 | T30S R19E S4 | J1 | 89 | Grassland, mostly flat | 84 |
| 1 | 072-151-031<br>072-151-047 | T30S R19E S5 | J3 | 89 | Grassland, mostly flat | 41 |
| 1 | 072-061-054 | T29S R18E S21/22 | C4 | 54 | Cropland with kit fox | 165 |
| 2 | 072-051-003 | T29S R18E S16 | C1 | 74 | Grassland with kit fox, tall grass | 656 |
| 2 | 072-051-023<br>072-051-024 | T29S R18E S21, 22 | Portion of N | 54 | Cropland, flat | 80 |
| 2 | 072-051-005 | T29S R18E S20 NE1/4 | Portion of B | 59 | Cropland | 160 |
| 3 | 072-061-057<br>072-061-007<br>072-061-006<br>072-101-001<br>072-101-002 | T29S R18E S13/14/23/24/25/26 | I | 89 | Grassland with kit fox, low hills | 2,714 |
| 3 | 072-051-012 | T29S R18E S23 | H3 | 53 | Cropland, hilly | 162 |
| 3 | 072-311-004<br>072-301-001 | T29S R18E S30 | E1 | 73 | Grassland | 95 |
| 3 | 072-061-017<br>072-051-025<br>072-061-031 | T29S R18E S22 | H5, M, portion of N | 59, 48, 54 | Cropland, low hills | 240 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 072-061-048 | T29S R18E S22 | H6 | 65 | Grassland | 38 |
| 4 | 072-101-031<br>072-101-030<br>072-101-029<br>072-101-003 | T29S R18E S26/34/35 | G, H1, portion of H2 | 84, 83, 78 | Grassland with kit fox, flat | 1,382 |
| 4 | 072-011-001<br>071-131-001<br>072-051-027 | T29S R18E S6<br>T29S R 17E S1 | A, portion of B | 59, 59 | Cropland with small grassland area, flat | 1,610 |
| 4 | 072-151-024 | T30S R19E S4 | J4 | 89 | Grassland, mostly flat | 39 |
| 4 | 072-061-027 | T29S R18E S15 | C2 | 86 | Grassland, low hills, kit fox present | 40 |
| 4 | 072-061-049 | T29S R18E S22 | H4 | 63 | Cropland, flat | 40 |
| 4 | 072-061-037<br>072-061-036 | T29S R18E S15 | C3 | 83 | Grassland, flat | 82 |
| 4 | 072-301-002 | T29S R18E S30 | E2 | 46 | Cropland | 70 |
| 4 | 072-151-042 | T30S R18E S4 | J2 | 89 | Grassland, mostly flat | 158 |
| 4 | 072-151-020 | T30S R18E S4 | L | 89 | Grassland, flat | 40 |
| 4 | 072-061-042<br>072-061-050 | T29S R18E S14, 23 | O | 67 | Grassland and cropland, flat | 60 |
| 5 | 072-051-028<br>072-011-005<br>072-011-006 | T29S R18E S5/6/17/18 | Portion of B | 59 | Cropland with smaller grassland area, flat | 1,921 |
| 5 | 072-101-023 | T29S R18E S27 | Portion of H2 | 78 | Cropland with kit fox, flat | 160 |
| 6 | 072-091-008<br>072-091-006<br>072-091-004 | T29S R18E S31 | F | 82 | Grassland with kit fox, some hills | 623 |
| 6 | 072-131-001<br>072-131-002 | T30S R18E S4/5 | Portion of D | 83 | Grassland, small cropland areas, flat | 975 |

# Appendix G: Biological Assessment for the Carrizo-Midway 230 kV Reconductoring Project

# BIOLOGICAL ASSESSMENT FOR THE CARRIZO-MIDWAY 230 KV RECONDUCTORING PROJECT

**PREPARED FOR:**

Pacific Gas and Electric Company
245 Market Street
San Francisco, CA 94105
Contact: Brandon Liddell
(415) 973-4893

**PREPARED BY:**

ICF International
630 K Street, Suite 400
Sacramento, CA 95814
Contact: Danielle Wilson
(916) 737-3000

**December 2010**

ICF INTERNATIONAL

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**Appendix A. Species List for the Carrizo-Midway 230kV Power Line Reconductoring Project in Kern and San Luis Obispo Counties, California**

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# Acronyms and Abbreviations

| | |
|---|---|
| BA | biological assessment |
| BMPs | best management practices |
| CAISO | California Independent System Operator |
| CDFG | California Department of Fish and Game |
| CFR | Code of Federal Regulations |
| CNDDB | California Natural Diversity Database |
| CNPS's | California Native Plant Society's |
| DOE | Department of Energy |
| ESA | Endangered Species Act |
| GPS | Global positioning system |
| IBEW | International Brotherhood of Electrical Workers |
| kV | kilovolt |
| LSTs | lattice steel towers |
| MP | milepost |
| msl | mean sea level |
| NEPA | National Environmental Policy Act |
| O&M HCP | Operations & Maintenance Habitat Conservation Plan |
| PG&E | Pacific Gas and Electric Company |
| ROW | right-of-way |
| SR | State Route |
| SWPPP | Storm Water Pollution Prevention Plan |
| TSP | tubular steel pole |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S Geological Survey |
| VELB | valley elderberry longhorn beetle |
| WHR | wildlife-habitat relationships classification system |

Chapter 1
# Introduction

## 1.1 Purpose of Biological Assessment

The California Independent System Operator (CAISO) has determined that transmission upgrades will be required to deliver the energy generated by proposed the Topaz Solar Farm Project on the Carrizo Plain. Specifically, reconductoring an approximately 34-mile segment of a Pacific Gas and Electric Company (PG&E) 230-kilovolt (kV) transmission line (Proposed Action) would be required. *Reconductoring* is the process of installing new conductor wires on existing towers to increase the capacity of an existing transmission line, although in some cases reconductoring requires the modification or replacement of some towers.

The purpose of this biological assessment (BA) is to provide the information necessary for formal consultation between the Department of Energy (DOE) and U.S. Fish and Wildlife Service (USFWS) regarding the effects of the Proposed Action as required pursuant to Section 7(a)(2) of the Endangered Species Act (ESA). This BA provides all the necessary information for the proposed action. Chapter 2 of the BA describes the specific area that may be affected by the proposed action; the listed, proposed, and candidate species that may be affected by the proposed action; and the environmental baseline against which project-related effects are determined. Chapter 3 describes the action to be considered; Chapter 4 describes the proposed conservation measures; and Chapter 5 describes how the action may affect federally listed, proposed, and candidate species and critical habitat.

As stated in the *Endangered Species Consultation Handbook* (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998) (referred to in this document as the *Consultation Handbook*), one of the purposes of a Section 7 BA is to help determine whether the proposed action is "likely to adversely affect" listed species and critical habitat, and thus whether formal consultation is necessary. These determinations are provided in Chapter 6 of the BA, along with summaries of project-related effects on the listed species.

## 1.2 Legal and Regulatory Background

PG&E's reconductoring project is a connected and interrelated action to the First Solar Topaz Solar Farm Project (Topaz Project). This Topaz Project is applying for a federal loan guarantee from DOE for their project, and as a result must comply with the National Environmental Policy Act (NEPA). Also, in accordance with Section 7 of the federal ESA, the DOE is required to consult with the USFWS to ensure that the Topaz Project would not jeopardize the continued existence of any federally listed species or result in the adverse modification or destruction of designated critical habitat. For purposes of this Biological Assessment, Proposed Action shall refer only to the PG&E reconductoring project. The Topaz Project proposed action is covered by the biological assessment for the Topaz Solar Farm.

The Section 7 implementing regulations (50 Code of Federal Regulations [CFR] 402.14[a]) require each federal agency to review its actions in order to determine whether an action "may affect" listed, proposed, and candidate species or critical habitat. If a project "may affect" but is "not likely to adversely affect" a federally-listed species or critical habitat, formal consultation with USFWS is not necessary (50 CFR 402.14[a]). Formal consultation between the DOE and USFWS is necessary only for a DOE action that is "likely to adversely affect" a federally listed species or critical habitat (50 CFR 402.14[a]).

The Section 7 implementing regulations (50 CFR 402.14[c]) require a federal agency to provide the following information to USFWS with any written request to initiate formal consultation:

- A description of the action to be considered;
- A description of the specific area that may be affected by the action;
- A description of any listed species or critical habitat that may be affected by the action;
- A description of the manner in which the action may affect any listed species or critical habitat and an analysis of any cumulative effects;
- Relevant reports, including any environmental impact statement, environmental assessment, or biological assessment prepared; and
- Any other relevant available information on the action, the affected species, or critical habitat.

## 1.3 Action Area

The *action area* as defined in 50 CFR 402.02 includes all areas in which federally listed species would be directly and indirectly affected by the Proposed Action, which is defined as the PG&E reconductoring project. The *action area* includes all work areas for construction activities associated with the reconductoring work.

## 1.4 Federally Threatened or Endangered Species

This document addresses potential impacts only for species that are federally listed as threatened or endangered, are proposed under the ESA for such designation, or are designated as a candidate for listing. Species with such designations are under the regulatory authority of USFWS pursuant to Section 7. California state-listed species and other special-status species (California species of special concern and California Native Plant Society listed species) that are not federally listed, proposed, or candidate species are not addressed in this document but are addressed in Appendix 4 of the *Topaz Solar Farm, LLC Draft Environmental Impact Report* (Aspen Environmental Consultants October 2010).

Consistent with Section 7 implementing regulations (50 CFR 402.12[b][2]), a list of endangered, threatened, proposed, and candidate species (USFWS list) was generated on September 28, 2010, for the La Panza NE, Las Yeguas Ranch, Carneros Rocks, Belridge, Lokern, Buttonwillow, and McKittrick Summit 7.5-minute U.S Geological Survey (USGS) quadrangles from the USFWS Sacramento Office website (Appendix A).

The following species that were included in the list are not considered in this BA for the following reasons:

- California jewelflower (*Caulanthus californicus*) (Endangered) – Species was not observed within the project area during botanical surveys conducted in 2010.
- San Joaquin wooly-threads (*Monolopia congdonii*) (Endangered) – Species was not observed within the project area during botanical surveys conducted in 2010.
- Conservancy fairy shrimp (*Branchinecta conservatio*) (Endangered)– Suitable habitat does not occur within the project area or within 250 feet of the project area.
- Longhorn fairy shrimp (*Branchinecta longiantenna*) (Endangered) - Suitable habitat does not occur within the project area or within 250 feet of the project area.
- Vernal pool fairy shrimp (*Branchinecta lynchi*) (Threatened) - Suitable habitat does not occur within the project area or within 250 feet of the project area.
- Kern primrose sphinx moth (*Euproserpinus euterpe*) (Threatened) – Host food plant (*Camissonia campestris*) was not observed within the project area.
- Delta smelt (*Hypomesus transpacificus*) (Threatened) – Project will not affect waters that flow into the Sacramento-San Joaquin Delta where the fish occurs.
- California tiger salamander (*Ambystoma californiense*) (Threatened) – Project does not occur within the range of the species.
- California red legged frog (*Rana draytonii*) (Threatened) – Project does not occur within the range of the species.
- Giant garter snake (*Thamnophis gigas*) (Threatened) – Species has been extirpated from Kern County. Project will not affect any suitable aquatic habitat for the species or affect upland habitats within 200 feet of suitable aquatic habitat.
- Buena Vista Lake shrew (*Sorex ornatus relictus*) (Endangered) – Project does not occur within the range of the species.

Based on these lists, a review of relevant literature, and database searches, ICF International biologists identified the following federally threatened, endangered, proposed, and candidate species that occur or potentially could occur within the action area:

- Kern mallow (*Eremalche kernensis*) (Endangered)
- Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (Threatened)
- Blunt-nosed leopard lizard (*Gambelia sila*) (Endangered)
- California condor (*Gymnogyps californianus*) (Endangered)
- Golden eagle (*Aquila chrysaetos*) (Protected under the Golden and Bald Eagle Protection Act and Migratory Bird Treaty Act),
- Mountain plover (*Charadrius montanus*) (Proposed for federal listing as threatened),
- Giant kangaroo rat (*Dipodomys ingens*) (Endangered)
- Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*) (Endangered)
- San Joaquin kit fox (*Vulpes macrotis mutica*) (Endangered)

Accordingly, the above-listed species are addressed in this BA.

This BA includes a determination as to whether the proposed action "may affect" each of the species on the USFWS list; the determination is based on the species range and habitat preferences, and the types of impacts that would result from the proposed action. *May affect* is defined as the "appropriate conclusion when a proposed action may pose any effects on listed species or designated critical habitat." The appropriate conclusion when a proposed action would not affect a listed species or designated critical habitat, as stated in the Consultation Handbook, is "no effect". When the federal agency proposing the action determines that a "may affect" situation exists, it must initiate formal consultation or seek written concurrence from USFWS that the action "is not likely to adversely affect" the listed species.

# 1.5 Critical Habitat

*Critical habitat* is defined in Section 3(5)(A) of the ESA as "(i) the specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species, and (II) which may require special management consideration or protection, and (ii) specific areas outside the geographical area occupied by the species upon a determination by the Secretary of Commerce or the Secretary of the Interior that such areas are essential for the conservation of the species." The effects analyses for designated critical habitat in this assessment consider the role of critical habitat in both the continued survival and the eventual recovery of the species in question, consistent with the Ninth Circuit judicial opinion, *Gifford Pinchot Task Force* v. *United States Fish and Wildlife Service*.

Of those species that are covered in this BA, critical habitat has not been designated or proposed for Kern mallow, blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, or San Joaquin kit fox.

Critical habitat for the valley elderberry longhorn beetle (VELB) and California condor have been formally designated. These are discussed below.

## 1.5.1 Critical Habitat for the Valley Elderberry Longhorn Beetle

USFWS designated critical habitat for the valley elderberry longhorn beetle on August 8, 1980 (*Federal Register* 45-52803). This critical habitat is located along the lower American River in Sacramento. No designated critical habitat for valley elderberry longhorn beetle is located in or near the action area.

## 1.5.2 Critical Habitat for the California Condor

The USFWS first proposed critical habitat for the California condor on December 16, 1975 (*Federal Register* 40-58308). Final critical habitat was designated on September 22, 1977 (*Federal Register* 42-47840). No designated critical habitat for the California condor is located in or near the project area. The nearest designated critical habitat is the East Unit of the Hi Mountain-Beartrap Condor Area, approximately 7.1 miles west of the western end of the action area, where captive-raised condors were formerly released.

# 1.6 Consultation to Date

On September 28, 2010, Mr. Will Kohn obtained an official species list from the USFWS Sacramento Office website of all species federally listed as endangered or threatened, and species proposed or candidates for listing that could occur in the action area within Kern County; and from the Ventura Office website of all species federally listed as endangered or threatened, species proposed for such listing, or candidates for listing that could occur in the action area within San Luis Obispo County (Appendix A).

# Chapter 2
# Environmental Baseline

To assess the effects of an action on listed species, the Section 7 implementing regulations require an analysis of how the proposed action would affect the environmental baseline (50 CFR 402.02). The *environmental baseline* is a current measurement of the status of the listed species or their critical habitat and the status of the present environment in which the species or critical habitat exists (Sullins 2001). The environmental baseline includes the past and present impacts of all federal, state, or private actions and any other human activities, and the anticipated future effects of proposed projects that have already undergone Section 7 consultation, in the action area (50 CFR 402.02).

This chapter characterizes the environmental baseline in the action area. Section 2.1 describes the methods used to assess the present environment and the known or potential occurrences of federally listed species in the action area. Section 2.2 describes the vegetation communities and habitat types found in the action area. Section 2.3 describes the status, habitat requirements, and known or potential presence of each listed species in the action area.

Potential habitat is identified here based on vegetation communities and habitat types occurring in the action area; suitable habitat is then described based on the results of habitat assessment and focused survey efforts.

## 2.1 Assessment Methodology

### 2.1.1 Review of Existing Information

Prior to conducting field surveys, existing and readily available information was collected and reviewed to establish lists of special-status plant and wildlife species and other sensitive biological resources likely to be present in the vicinity of the action area. The key sources of data and information accessed during the prefield review are listed below:

- A search of the California Natural Diversity Database (CNDDB) for special-status plant and wildlife occurrences within 10 miles of the action area (California Natural Diversity Database 2010);
- The California Native Plant Society (CNPS) online Inventory of Rare and Endangered Plants of California (CNPS 2010);
- Special species list from the USFWS Sacramento Office website (2010) for the La Panza NE, Las Yeguas Ranch, Carneros Rocks, Belridge, Lokern, Buttonwillow, and McKittrick Summit 7.5-minute USGS quadrangles; and
- Special species list for San Luis Obispo County from the USFWS Sacramento Office website (2010).
- PG&E has an existing Operations & Maintenance Habitat Conservation Plan (O&M HCP) for the San Joaquin Valley that provides take coverage for federally and state listed species that occur

within PG&E's service area in the San Joaquin Valley. Many of these species occur within the portion of the project that occurs within Kern County. The HCP includes avoidance and minimization measures to ensure that PG&Es O&M activities are conducted consistently with state and federal endangered species regulations.

## 2.1.2 Vegetation and Habitat Mapping

A thorough assessment was conducted within the action area to determine the presence or absence of potential wetlands and/or waters of the United States. Several ephemeral and intermittent streams are present in the action area; however, no wetlands, as defined by the Corps, appear to be present in the action area. A formal wetland delineation that was conducted according to Corps delineation protocols under Section 404 of the Clean Water Act will be submitted to the Corps for verification.

## 2.1.3 Habitat Assessments and Focused Surveys

General habitat assessment surveys were conducted on February 22 and 23, 2010; March 10, 11, and 18, 2010; June 3, 2010; and August 24, 2010, to characterize wildlife habitat types and evaluate the potential for occurrence of federally listed wildlife species in the action area. The general habitat assessment surveys were conducted by wildlife biologists walking and driving the proposed project work areas (i.e., tension/pull sites, staging areas, and access roads), recording general habitat conditions, and noting habitat features associated with special-status species that could occur in the action area. Focused surveys for federally listed wildlife species were not conducted within the action area for the Proposed Action.

### 2.1.3.1 Listed Plant Species

The botanical survey area consisted of individual work areas where PG&E is proposing to conduct ground-disturbing activities for the proposed action . Botanical surveys of the work areas were conducted based on current California Department of Fish and Game (CDFG) guidance—*Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Natural Communities* (CDFG 2009). Surveys were conducted in all work areas as well as access roads that may be graded or improved as part of the proposed action. The surveys were floristic (i.e., all species encountered were identified to the lowest taxonomic level possible) and were conducted using systematic field techniques (i.e., transects spaced at an appropriate distance to visually survey the entire area).

The work areas are spaced unevenly along an approximately 35-mile alignment that crosses west from the San Joaquin Valley to the Carrizo Plain. In general, most of the work areas are within grassland or saltbush scrub habitats and along an elevation gradient. The work areas are small and therefore were relatively quick to survey; however, the elevation difference between the lowest point (near Buttonwillow) and the highest point (near the Kern/San Luis Obispo county line in the Temblor Range) necessitated multiple visits over an approximately 4-month period to account for the number of potentially occurring species and differences in flowering times. Generally, the lower elevation areas were surveyed in February, March, and April, and the higher elevation areas were surveyed in April and May. Additionally, known reference sites for many of the special-status plant species identified as having a high potential to occur in the area were visited by ICF International botanists to verify the flowering condition of each species at the time of the surveys.

Botanical surveys were conducted by ICF International botanists on 12 individual days between February and June in 2010 (see Table 2-1).

**Table 2-1. Survey Dates, Botanists, and Areas Surveyed**

| Survey Dates | Botanists | General Areas Surveyed* |
|---|---|---|
| February 22, 23 | Brad Schafer, Cristian Singer | All |
| March 10, 11 | Cristian Singer, Seth Kirby | Low elevation |
| March 29, 30, 31 | Rob Preston, Cristian Singer | All |
| April 22, 23 | Rob Preston, Seth Kirby | All |
| May 18, 19 | Rob Preston, Jessica Hughes | High elevation |
| June 3, | Brad Schafer | High elevation (new areas added in late May only) |

*Several additional work areas were added in late May 2010 and were not surveyed until early June.

Adverse conditions, such as inadequate rainfall, often can affect survey results in the San Joaquin Valley region. Annual species in the region are often small and difficult to observe during drought years, and may sometimes not appear at all during a given year if conditions are not adequate. Rainfall in the region during the 2009–2010 season was approximately 110% of normal[1] at Bakersfield (National Weather Service 2010) and above normal within the Carrizo Plain, at the western end of the Proposed Action. Additionally, temperatures were relatively moderate very late into the spring season. These factors contributed to a large amount of vegetative growth, especially near Buttonwillow; and rare annual species such as Kern mallow (*Eremalche kernensis*) were often abundant within known populations.

# 2.2 Vegetation Communities and Habitat Types

The following habitats were identified and mapped within the action area: annual grassland, saltbush scrub, oak woodland, California juniper woodland, ephemeral drainage, irrigation canal, irrigated row and field crop, and disturbed. ICF International biologists mapped and described habitat types within a 1,000-foot corridor along the project route based on the California wildlife-habitat relationships classification system (WHR) (Mayer and Laudenslayer 1988).

## 2.2.1 Upland Vegetation and Habitat Types

### 2.2.1.1 Annual Grassland

Annual grassland occurs throughout the action area. This vegetation community type often occurs as an integral herbaceous understory component within other vegetation communities, such as saltbush scrub. Herbaceous canopy within stands is generally continuous and dense, to an average height of 0.5 meter. Composition and density of this community type vary widely, depending on fall temperatures and precipitation and a variety of disturbance-related events, including grazing

[1] Normal yearly rainfall at Bakersfield, California is 6.49 inches; rainfall during the 2009–2010 season was 7.18 inches.

intensity and fire frequency. Soil conditions and variations in microtopography also affect the composition of this community type.

Annual grassland within the action area is dominated by ripgut brome (*Bromus diandrus*), barley (*Hordeum murinum*), filaree species (*Erodium cicutarium*, *E. moschatum*, *E. botrys*), fiddleneck species (*Amsinckia menziesii* var. *menziesii*, *A. menziesii* var. *intermedia*), pepper-grass (*Lepidium nitidum*), Sierra tidytips (*Layia pentachaeta* ssp. *albida*), pygmy weed (*Crassula connata*), and goldfield species (*Lasthenia californica*, *L. debilis*). Additional common native plant species include blue dicks (*Dichelostemma capitata*), lupine species (*Lupinus* spp.), California mustard (*Guillenia lasiophylla*), common monolopia (*Monolopia lanceolata*), popcorn flower (*Plagiobothrys* sp.), and bracted alkali goldenbush (*Isocoma acradenia* var. *bracteosa*). Round-leaved filaree (*California macrophylla*), a CNPS List 1B.1 species (rare, threatened, or endangered in California and elsewhere), is known to occur in at least one portion of the action area.

Annual grasslands are used by a large variety of wildlife species. Amphibians in this community include western toad (*Bufo boreas*), Pacific tree frog (*Hyla regilla*), Reptiles that breed in annual grassland habitats include western fence lizard (*Sceloporus occidentalis*), coast horned lizard (*Phrynosoma coronatum frontale*), western skink (*Eumeces skiltonianus*), San Joaquin whipsnake (*Masticophis flagellum ruddocki*), gopher snake (*Pituophis catenifer*), and western rattlesnake (*Crotalus oreganus*). Mammals typically found in this habitat include California vole (*Microtus californicus*), western harvest mouse (*Reithrodontomys megalotis*), California ground squirrel (*Spermophilus beeheyi*), black-tailed jackrabbit (*Lepus californicus*), and coyote (Canis *latrans*). Western meadowlark (*Sturnella neglecta*), and horned lark (*Eremophila alpestris*) are common birds that breed in annual grasslands. Annual grasslands provide foraging habitat for red-tailed hawk (*Buteo jamaicenis*) and turkey vulture (*Cathartes aura*), whereas other species occupy annual grassland only when special habitat features such as cliffs, caves, ponds, or woody plants are available for breeding, resting, or escape cover. In addition, many species that nest or roost in adjacent woodlands may forage in grasslands, including western bluebird, western kingbird, and some species of bats. Federally listed wildlife species that could occur within the annual grassland habitat within the action area include blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox. Golden eagles and federally listed California condor also could forage in the annual grasslands in the Temblor Range.

### 2.2.1.2 Oak Woodland

Oak woodland occurs in a limited portion of the action area within the Temblor Range. Oak woodland in the action area is dominated by Tucker's oak (*Quercus john-tuckeri*). Tucker's oak is an evergreen shrub that reaches an average height of 6 meters. Stands typically occur on steep slopes and ridges. Canopy within stands is open and sparse to continuous and dense. Composition and density within stands are influenced by fire frequency and intensity.

Additional species observed occurring within this community type in the action area include oak gooseberry (*Ribes quercetorum*), linear-leaved goldenbush (*Ericameria linearifolia*), bush lupine (*Lupinus albifrons*), one-sided bluegrass (*Poa secunda*), common lomatium (*Lomatium utriculatum*), and California poppy (*Eschscholzia californica).* Additional common herbaceous species include lupine species, blue dicks, slender tropidocarpum (*Tropidocarpum gracile*), and fiddleneck species.

Many of the same wildlife species that occur in annual grassland habitat are found in coastal oak woodlands. Coastal oak woodlands also provide nesting and foraging habitat for many bird species.

Elderberry shrubs that provide suitable habitat for the federally listed VELB occur along an access road on the east slope of the Temblor Range in oak woodland.

### 2.2.1.3 Saltbush Scrub

Saltbush scrub stands occur throughout the action area but are primarily concentrated and best represented within the lower, eastern portion of the action area, east of the Temblor Range. Saltbush scrub within the action area is dominated by allscale (*Atriplex polycarpa*), an intricately branched woody perennial shrub that reaches an average height of 1 to 2 meters. Shrub canopy within stands varies from open and sparse to continuous and dense. Allscale exhibits a high tolerance for drought and some tolerance for saline conditions. Natural stand replacement is primarily via flooding events in lowland areas. Natural stand replacement in upland areas is typically via fire events.

The herbaceous understory in these stands commonly supports plant species such as ripgut brome, barley, filaree species, Arabian schismus (*Schismus arabicus*), fiddleneck species pepper-grass, and several commonly occurring native annual plant species, including Sierra tidytips, pygmy weed, goldfield species, tansy leafed phacelia (*Phacelia tanacetifolia*), and slender tropidocarpum. Kern mallow, a species federally listed as endangered and a CNPS List 1B.1 species (rare, threatened, or endangered in California and elsewhere), is known to occur in saltbush scrub habitat within portions of the action area east of the Temblor Range.

Wildlife species that use saltbush scrub habitat include coast horned lizard, San Joaquin whipsnake, California towhee (*Pipilo crissalis*), California quail (*Callipepla californica*), California thrasher (T*oxostoma redivivum*), brush rabbit (*Sylvilagus bachmani*), and coyote. Federally listed wildlife species that could occur within the saltbush scrub habitat in the action area include blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox.

### 2.2.1.4 California Juniper Woodland

California juniper (*Juniperus californica*) woodland occurs in a limited portion of the action area within the Temblor Range. California juniper is an evergreen shrub that reaches an average height of 4 meters. Canopy within stands is open to intermittent, often consisting of a few scattered individuals. Natural stand replacement is via seed; California juniper does not sprout after moderate to intense fire events.

Additional species observed occurring within this community type in the action area include bracted alkali goldenbush, linear-leaved goldenbush, one-sided bluegrass, fiddleneck species, common lomatium, blue dicks, slender tropidocarpum, pepper-grass, and bush lupine.

### 2.2.1.5 Irrigated Row and Field Crops

Irrigated row and field crop habitat consists of currently cultivated lands (i.e., row crops) and fallow fields (Mayer and Laudenslayer 1988). This habitat occurs at the eastern end of the action area. Dominant vegetation in irrigated row and field crop habitat in the action area consists of agricultural cultivars such as alfalfa, cabbage, onions, and lettuce.

Agricultural lands were established on habitat that historically supported an abundance of wildlife. The diversity of wildlife greatly diminishes when row crops are planted. The understory consists of low-growing grasses and is commonly sprayed with herbicides to prevent the growth of herbaceous vegetation. Many species of rodents and birds have adapted to agricultural lands but are controlled

by fencing, trapping, and poisoning to prevent excessive crop losses. Wildlife species associated with agricultural lands include mourning dove (*Zenaida macroura*), American crow (*Corvus branchytrhynchos*), Brewer's blackbird (*Euphagus cyanocephalus*), and many species of rodents, among others. Irrigated row and field crops do not provide suitable habitat for any federally listed plant or wildlife species, although the federally listed San Joaquin kit fox could move through agriculture lands.

#### 2.2.1.6 Disturbed Areas

Disturbed areas, although not designated as WHR habitats, are distinct habitats within the action area. Disturbed habitats are mostly bare areas that support ruderal species whose life history enables them to quickly colonize areas that have undergone some level of disturbance, either as the result of human activity or natural events (e.g., fire).

Disturbed areas typically provide low habitat value for many wildlife species, although there are exceptions, as in the case of burrowing owls (*Athene cunicularia***)**. California ground squirrels often colonize disturbed areas; their burrows often provide habitat for other wildlife species. Other wildlife species that commonly use disturbed areas include mourning dove, house sparrow (*Passer domesticus*), American crow, and Brewer's blackbird. Disturbed areas do not provide suitable habitat for any federally listed plant or wildlife species, although the federally listed San Joaquin kit fox could move through disturbed areas.

### 2.2.2 Other Waters

#### 2.2.2.1 Ephemeral Drainages

One named ephemeral drainage (Salt Creek) and three unnamed ephemeral drainages were identified in the action area, for a total of 0.419 acre of other waters. The drainages occur in the foothills of the Temblor Range, with two drainages draining to the Carrizo Plain and eventually into Soda Lake. Two other drainages drain east toward the Central Valley, occurring as sheet flow upon reaching the valley floor. The ephemeral drainages occurred on the Las Yeguas Ranch, McKittrick Summit, and Lokern USGS 7.5-minute topographical maps as a blueline stream. All four ephemeral drainages carry water seasonally from winter to late spring during and after rain events; and clearly defined beds and banks are indicated by sediment deposition, sediment sorting, shelving, scour, and an abrupt change in vegetative community. In addition, the drainages all occur in annual grassland habitats and have little or no vegetation in the channels. The ephemeral drainages in the action area do not provide habitat for any federally listed plants or wildlife species.

#### 2.2.2.2 Irrigation Canals

One named irrigation canal (Eastside Canal) and six unnamed irrigation canals were identified in the action area. The Eastside Canal occurs as a named canal on the Buttonwillow USGS 7.5-minute topographical map. All of the mapped canals occur adjacent to farm land along Lokern Road or State Route (SR) 58 near Buttonwillow and are used for irrigation. These canals are well defined by a clear cut bed and bank, with little or no vegetation in the channels. The irrigation drainages in the action area do not provide habitat for any federally listed plant or wildlife species.

# 2.3 Listed Species

## 2.3.1 Kern Mallow

### 2.3.1.1 Status

Kern mallow is federally listed as endangered under the ESA and is a CNPS List 1B.1 species (rare, threatened, or endangered in California and elsewhere). Critical habitat for this species has not been designated.

### 2.3.1.2 Distribution

Kern mallow in an annual herbaceous plant known to occur within portions of Kern, Kings, San Luis Obispo, and Tulare Counties (U.S. Fish and Wildlife Service 1998).

### 2.3.1.3 Habitat

Typical habitat type is the herbaceous understory within saltbush scrub stands, valley sink scrub, and valley and foothill grassland on sandy clay-loam soils at elevations of 315 to 900 feet (U.S. Fish and Wildlife Service 1998).

### 2.3.1.4 Threats

The greatest threat to Kern mallow is the continued conversion and modification of suitable habitat due to agricultural conversion and urban development (U.S. Fish and Wildlife Service 1998).

### 2.3.1.5 Presence in the Action Area

Kern mallow is known to occur in saltbush scrub habitat within portions of the action area east of the Temblor Range. Specific locations where Kern mallow is known to occur in the action area include the area at and around Tower 109 and between Tower 127 and Tower 128. Although some of these locations are previously known in the action area, the results of assessment-level botanical surveys in 2010 already have resulted in discovery of increased densities within some known locations, as well as additional locations not previously known in the action area.

## 2.3.2 Valley Elderberry Longhorn Beetle

### 2.3.2.1 Status

The valley elderberry longhorn beetle is listed as threatened under the ESA. Critical habitat for this species has been designated in Sacramento, approximately 250 miles to the north of the action area.

### 2.3.2.2 Distribution

The distribution of valley elderberry longhorn beetle extends throughout the Central Valley and associated foothills, from the 3,000-foot contour in the Sierra Nevada foothills, across the valley floor, to the Central Valley watershed in the foothills of the Coast Ranges (U.S. Fish and Wildlife Service 2006).

#### 2.3.2.3 Habitat

The valley elderberry longhorn beetle's life cycle is entirely dependent on its host plants—blue elderberry (*Sambucus mexicana*) and red elderberry (*Sambucus racemosa*). Red and blue elderberry both occur commonly in riparian forest patches along the Sacramento, American, and San Joaquin Rivers and their tributaries, and may also be found as isolated bushes or clumps of bushes in elderberry savannas adjacent to riparian vegetation. Elderberry shrubs usually co-occur with other woody riparian plants, including Fremont cottonwood (*Populus fremontii*), California sycamore (*Platanus racemosa*), various willows (*Salix* spp.), wild grape (*Vitis californica*), blackberry (*Rubus* spp.), and poison-oak (Collinge et al. 2001).

#### 2.3.2.4 Threats

Threats to valley elderberry longhorn beetle include ongoing maintenance of levees and canals where elderberry shrubs occur, urban expansion, use of insecticides, and infestations of aggressive Argentine ants (*Linepthema humile*) (U.S. Fish and Wildlife Service 2006).

#### 2.3.2.5 Presence in the Action Area

There are currently no valley elderberry longhorn beetle CNDDB records within 10 miles of the action area (California Natural Diversity Database 2010). Ten elderberry shrubs that provide potential habitat occur along the access road to Tension/Pull Site at Tower 65. There is no designated critical habitat located in the action area. The USFWS has designated critical habitat for valley elderberry longhorn beetle along the American River in Sacramento, approximately 250 miles to the north of the action area.

### 2.3.3 Blunt-Nosed Leopard Lizard

#### 2.3.3.1 Status

The blunt-nosed leopard lizard is federally listed as endangered under the ESA and is state listed as endangered. Critical habitat for this species has not been designated. The blunt-nosed leopard lizard was included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998). USFWS prepared a 5-year review for the status of blunt-nosed leopard lizards in 2010. USFWS concluded that the status of blunt-nosed leopard lizards continues to meet the definition of endangered because the species is in danger of extinction throughout its known range (U.S. Fish and Wildlife Service 2010a).

#### 2.3.3.2 Distribution

Blunt-nosed leopard lizards are endemic to the San Joaquin Valley and the Carrizo Plain in California. Historically, this species was found from Stanislaus County in the north to the Tehachapi Mountains in Kern County in the south. The foothills of the Sierra Nevada and Coast Ranges roughly define the eastern and western boundaries of its distribution, except for populations on the Carrizo Plain and in the Cuyama Valley west of the San Joaquin Valley. Blunt-nosed leopard lizard occurs at elevations below 2,600 feet (U.S. Fish and Wildlife Service 2010a).

#### 2.3.3.3 Habitat

Blunt-nosed leopard lizards are found in sparsely vegetated plains, alkali flats, grasslands, low foothills, canyon floors, and large washes. They inhabit areas with sandy soils and scattered vegetation and are usually absent from thickly vegetated habitats. On the floor of the San Joaquin Valley, they are usually found in nonnative grassland, valley sink scrub habitats, valley needlegrass grassland, alkali playa, and valley saltbush scrub. Blunt-nosed leopard lizards use small rodent burrows for shelter, predator avoidance, and behavioral thermoregulation. These burrows may be abandoned ground squirrel tunnels, or occupied or abandoned kangaroo rat tunnels (U.S. Fish and Wildlife Service 2010a).

#### 2.3.3.4 Threats

The greatest threats to blunt-nosed leopard lizards include the continued conversion and modification of suitable habitat due to agricultural conversion and urban development. Mineral and gas/oil exploration and extraction and water banking activities also have affected significant portions of the range of blunt-nosed leopard lizards. More recently, the proposed siting of solar facilities in blunt-nosed leopard lizard habitat is a potential emerging threat with the potential to substantially affect the blunt-nosed leopard lizard (U.S. Fish and Wildlife Service 2010a).

#### 2.3.3.5 Presence in the Action Area

Protocol surveys for blunt-nosed leopard lizards were not conducted for this project; however, ICF International wildlife biologists previously have observed blunt-nosed leopard lizards in the Lokern Preserve between Tower 109 and Tower 143. Several CNDDB (2010) records for blunt-nosed leopard lizards occur within 10 miles of the proposed action area. Many of the proposed tension/pull sites, landing zones, and areas for crossing guards between Tower 90 and Tower 138 are located within suitable habitat for blunt-nosed leopard lizards.

### 2.3.4 Golden Eagle

#### 2.3.4.1 Status

Golden eagles and their nests are protected under the Bald Eagle and Golden Eagle Protection Act and under the Migratory Bird Treaty Act.

#### 2.3.4.2 Distribution

Golden eagles are found throughout most of California except for the center portion of the Central Valley. Most commonly found in the grassland of the foothills surrounding the Central Valley

#### 2.3.4.3 Habitat

Golden eagles typically inhabit open grassland areas in foothills surrounding the Central Valley. Golden eagle nests are commonly built on cliff ledges and in large trees in open areas. They typically forage in open grasslands, where they prey on California ground squirrels and black-tailed jackrabbits (Kochert et al. 2002).

#### 2.3.4.4 Threats

Death from human causes account for >70% of golden eagle mortality. Of these, collision with vehicles, and aerial structures account for a majority of deaths followed by electrocution, shooting, and poisoning (Kochert er al. 2002).

#### 2.3.4.5 Presence in the Action Area

No golden eagles were reported by the CNDDB (2010) within 10 miles of the project area. One golden eagle was observed soaring above Tension/Pull Site 013 during the 2010 field surveys. Large trees and towers occurring in or near the project area provide suitable nesting habitat for this species, and grasslands and agricultural areas provide suitable foraging habitat.

### 2.3.5 California Condor

#### 2.3.5.1 Status

The California condor is federally listed as endangered under the ESA and is state listed as endangered. Critical habitat for this species has been designated. The nearest designated critical habitat is the East Unit of the Hi Mountain-Beartrap Condor Area, approximately 7.1 miles west of the western end of the action area, where captive-raised condors were formerly released. USFWS published a third revision of the *Recovery Plan for the California Condor* in 1996 (U.S. Fish and Wildlife Service 1996). The USFWS is currently in the process of preparing a 5-year review for the status of California condors.

#### 2.3.5.2 Distribution

In the early nineteenth century, the California condor occurred in northern Baja California, northern California, Oregon, Washington, and southern British Columbia—with a few reports from Arizona, Nevada, Utah, Wyoming, Colorado, Idaho, Montana, and southern Alberta. By the mid-twentieth century, its range was confined mostly to southern California. In California, California condors historically occurred along a wishbone-shaped area encompassing 10 counties in the southern and central parts of the state—San Benito, Monterey, San Luis Obispo, Santa Barbara, Kern, Ventura, Tulare, Fresno, Kings, and Los Angeles Counties (U.S. Fish and Wildlife Service 1996).

The wild population was extirpated by mid-1987 (with the trapping of the last individuals for captive breeding). Since 1992, releases of captives have occurred in parts of California and Arizona (Snyder and Schmitt 2002). A third reintroduction area was added in 2002 in Baja California, Mexico (Arizona Department of Game and Fish 2008). Reintroduction sites in California include Big Sur in the Ventana Wilderness Sanctuary; the Sespe Condor Sanctuary; and the Los Padres National Forest in Santa Barbara, Ventura, and Kern Counties (Arizona Department of Game and Fish 2009). As of August 31, 2010 there were 188 California condors in the wild, with 96 in California, 19 in Baja California, and 73 in Arizona. (Condor Program Monthly Status Report 2010).

#### 2.3.5.3 Habitat

California condors are cavity nesters that require caves, cliff ledges, or large trees in which to build nests. Condors also require cliffs for roosting and other California condors forage for carrion in grassland and oak savannah, as well as along the coastline of California. Cliffs, large trees, and snags

are also used for roosting. Roosting areas are often close to nest sites or foraging grounds; scattered roost sites are located through the condor's range (U.S. Fish and Wildlife Service 1996).

Condors feed primarily on the carcasses of medium- to large-sized mammals. Historically, condors fed on the carcasses of mule deer (*Odocoileus hemionus*), tule elk (*Cervus elaphus nannodes*), pronghorn (*Antilocarpa americana*), and marine carrion, including whales (*Cetacea* spp.) and California sea lions (*Zalophus californianus*) along the Pacific Coast. Domestic cattle, sheep, and horses—along with mule deer and California ground squirrel—are the predominant food sources for California condors today (U.S. Fish and Wildlife Service 1996).

### 2.3.5.4 Threats

Because California condors are characterized by high survival rates and low reproductive rates, they are dependent on low rates of adult mortality for population stability (Meretsky et al. 2000, Snyder and Schmitt 2002, Walters et al. 2008). Condors have a clutch size of one egg, a normal nest success rate of from 40 to 50 percent, and an age of first breeding from 6 to 8 years. Mortality in recent release efforts has been too high to develop a self-sustaining population (Meretsky et al. 2000, Snyder and Schmitt 2002). Reducing mortality factors is necessary to create a self-sustaining wild population (Snyder and Schmitt 2002).

Largely because of their size, California condors have few predators, except humans. Recent evidence from release efforts indicate that condors may occasionally be killed by golden eagles (*Aquila chrysaetos*) (Meretsky et al. 2000). Eggs and nestlings are susceptible to predation by common ravens (*Corvus corax*), golden eagles, and black bears (*Ursus americanus*) (Snyder and Schmitt 2002).

Human causes of mortality prior to the 1980s have been numerous, including strychnine poisoning due to predator-control programs; collisions with overhead wires; drowning in water tanks; and shooting for curiosity, quills, and museum collections (Snyder and Schmitt 2002). Recent evidence (since the 1980s) indicates that lead poisoning caused by ingestion of ammunition fragments in carcasses is a key factor in mortality (Snyder and Schmitt 2002). Other recent sources of mortality in released condors include collisions, drowning, golden eagle predation, anti-freeze poisoning, and feeding of micro-trash to nestlings (Snyder and Schmitt 2002, Walters et al. 2008). Collisions may be especially frequent because of the condors' attraction to human structures and developed areas (Snyder and Schmitt 2002). Although historical condor habitat, especially foraging areas, has been modified, condors do not seem to be habitat specialists and have switched to feeding on domestic livestock with the conversion of native grasslands to pasture (Snyder and Schmitt 2002). Current condor populations may be too low to be affected by low habitat availability (Snyder and Schmitt 2002).

### 2.3.5.5 Presence in the Action Area

The Carrizo Plain was part of the California condor's foraging range prior to the initiation of the captive breeding program. Condors subsequently have been returned to the Los Padres National Forest to the south and west of the Carrizo Plain. The Ventana Wildlife Society has been tracking the flight patterns of released condors fitted with radio transmitters. As of April 2009, there had been no recent California condor records on the Carrizo Plain. There have been no reports of injury or death of California condors resulting from collisions with the Carrizo-Midway 230 kV transmission line or any other nearby transmission lines.

The nearest designated critical habitat for California condor is the East Unit of the Hi Mountain-Beartrap Condor Area, approximately 7.1 miles west of the western end of the action area.

## 2.3.6 Mountain Plover

### 2.3.6.1 Status

Mountain plovers have been proposed for listing as threatened under the federal ESA and their nests are protected under the Migratory Bird Treaty Act.

### 2.3.6.2 Distribution

Mountain plovers breed in the short-grassland prairies of the high plains east of the Rocky Mountains. Mountain plovers are a winter resident in California in the San Joaquin Valley, the Carizzo Plain, and Imperial Valley. They primarily occur in California from September through February (Shuford and Gardali 2008).

### 2.3.6.3 Habitat

Mountain plovers are associated with short-grass prairie habitats. They prefer areas that are relatively flat and devoid of vegetation (Shuford and Gardali 2008).

### 2.3.6.4 Threats

Loss of winter and breeding habitat is the primary threat to this species. Conversion of grassland habitats to agricultural production that is incompatible with this species, urban development, detrimental range management practices, and oil and gas production are all contributing factors negatively affecting Mountain plovers.

### 2.3.6.5 Presence in the Action Area

No mountain plovers were reported by the CNDDB (2010) within 10 miles of the project area. Mountain plovers were observed between January and March 2010 by Althouse and Meade biologists during surveys conducted between November 2009 and March 2010 (Althouse and Meade 2010).

## 2.3.7 Giant Kangaroo Rat

### 2.3.7.1 Status

The giant kangaroo rat is federally listed as endangered under the ESA and is state listed as endangered. Critical habitat for this species has not been designated. The giant kangaroo rat was included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998). USFWS prepared a 5-year review for the status of giant kangaroo rats in 2010. USFWS concluded that the status of giant kangaroo rats continues to meet the definition of endangered because the species in danger of extinction throughout its known range (U.S. Fish and Wildlife Service 2010b).

### 2.3.7.2 Distribution

Historically, the range of giant kangaroo rats extended from the base of the Tehachapi Mountains north to approximately 10 miles south of Los Baños, Merced County; in the Carrizo Plain and San Juan Creek watershed in the west; and the floor of the San Joaquin Valley to the east (U.S. Fish and Wildlife Service 2010b)

Currently, giant kangaroo rats occupy only 5 percent of their former range. The current distribution of giant kangaroo rats is fragmented into six major geographic regions: (1) the Ciervo-Panoche region in western Fresno and eastern San Benito Counties; (2) Kettleman Hills in southwestern Kings County; (3) San Juan Creek Valley in eastern San Luis Obispo County; (4) the Lokern area, Elk Hills previously known as the National Petroleum Reserve Number One (NPR-1), which includes Buena Vista and McKittrick Valleys; National Petroleum Reserve Number Two (NPR-2); and Taft and Maricopa in western Kern County; (5) the Carrizo Plain in eastern San Luis Obispo County; and (6) Cuyama Valley along the eastern Santa Barbara County-San Luis Obispo county line (U.S. Fish and Wildlife Service 2010b).

### 2.3.7.3 Habitat

Giant kangaroo rats inhabit annual grassland and shrub community habitats with various soil types and slopes up to 22 percent. It is believed that historical populations occupied annual grassland habitat with few or no shrubs, sandy-loam soils, and gentler slopes of approximately 10 percent or less. This change in habitat usage suggests that current populations occupy suboptimal lands in response to large-scale agricultural development of optimal grassland habitat that supported historical populations. Inhabited areas receive an average of 6–7 inches of rain and are free from flooding (U.S. Fish and Wildlife Service 2010b).

Changes in rainfall have been linked to expansions and declines in giant kangaroo rat populations. Changes in rainfall also can affect the availability of forage plant species, the development of toxic pathogentic molds, and fire fuel loads—affecting habitats inhabited by giant kangaroo rats (U.S. Fish and Wildlife Service 2010b).

### 2.3.7.4 Threats

Historically, the greatest threat to giant kangaroo rats was the conversion of natural habitat to agricultural lands. The amount of suitable lands that are currently being converted to agricultural use has slowed because the remaining suitable habitats are too rugged for agricultural uses. Currently, there are numerous potential threats to suitable habitat. These include development of certain large-scale renewable solar energy projects and construction of large transmission lines; potential increases in oil and gas developments in the southern portion of the species range and Kettleman Hills; increased off-road vehicle use throughout the species range, but particularly in the southern portion of the range; and urban and residential development in western Kern County. Road widening projects continue to threaten giant kangaroo rats, although these road projects currently affect less habitat area than the threats listed previously (U.S. Fish and Wildlife Service 2010b).

### 2.3.7.5 Presence in the Action Area

Protocol surveys for giant kangaroo rats were not conducted for this project. Several CNDDB (2010) records for giant kangaroo rat occur within 10 miles of the proposed action area. Many of the

proposed tension/pull sites, landing zones, and areas for crossing guards between Tower 73 and Tower 138 are located within suitable habitat for giant kangaroo rats. ICF International wildlife biologists observed potential giant kangaroo burrows north of Tower 75 and in the Lokern Preserve between Tower 128 and Tower 130 during habitat assessment in February and March 2010.

## 2.3.8 Tipton Kangaroo Rat

### 2.3.8.1 Status

The Tipton kangaroo rat is federally listed as endangered under the ESA and is state listed as endangered. Critical habitat for this species has not been designated. The Tipton kangaroo rat was included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998). USFWS prepared a 5-year review for the status of Tipton kangaroo rats in 2010. USFWS concluded that the status of Tipton kangaroo rats continues to meet the definition of endangered because the species in danger of extinction throughout its known range (U.S. Fish and Wildlife Service 2010c).

### 2.3.8.2 Distribution

Historically, the geographic range of Tipton kangaroo rats was distributed on arid-land communities occupying the valley floor of the Tulare Basin. By 1985, the inhabited area had been reduced, primarily by cultivation and urbanization, to only about 4 percent of the historical acreage. Current occurrences are limited to scattered, isolated areas in Kings, Tulare, and Kern Counties (U.S. Fish and Wildlife Service 2010c).

### 2.3.8.3 Habitat

Tipton kangaroo rats inhabit valley saltbush scrub and valley sink scrub habitats located on the San Joaquin Valley floor. They occur on level to nearly-level terrains with alluvial fan and floodplain soils ranging from fine sands to clay-sized particles with high salinity. Although Tipton kangaroo rats occur in terrace grasslands devoid of woody shrubs, sparse to moderate shrub cover is associated with populations of high density. Densities typically are low, but populations are known to fluctuate greatly in response to climatic conditions (precipitation) and to vary across habitat type (seasonal/short-lived invasion of vegetation, particularly by non-native grasses, can exacerbate Tipton kangaroo rat declines) (U.S. Fish and Wildlife Service 2010c).

### 2.3.8.4 Threats

The large-sale conversion of suitable habitat for agriculture or urban development was principally responsible for the decline and endangerment of the Tipton kangaroo rat. Current threats of habitat destruction or modifications are increasing. Urban sprawl and associated human activities are currently the greatest threat to Tipton kangaroo rats (U.S. Fish and Wildlife Service 2010c).

#### 2.3.8.5 Presence in the Action Area

Protocol surveys for Tipton kangaroo rats were not conducted for this project. There are four Tipton kangaroo rat CNDDB (2010) occurrences within 10 miles of the action area. One record is located approximately 0.70 mile south of Tower 139. The proposed tension/pull sites between Tower 138 and Tower 139 and the road crossing at Tower 162 are located within suitable habitat for Tipton kangaroo rats.

## 2.3.9 San Joaquin Kit Fox

### 2.3.9.1 Status

The San Joaquin kit fox is federally listed as endangered under the ESA and is state listed as threatened. Critical habitat for this species has not been designated. San Joaquin kit fox was included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998). USFWS prepared a 5-year review for the status of the San Joaquin kit fox in 2010. USFWS concluded that the status of the San Joaquin kit fox continues to meet the definition of endangered because the species is in danger of extinction throughout its known range (U.S. Fish and Wildlife Service 2010d).

### 2.3.9.2 Distribution

The historical range of San Joaquin kit fox included most of the San Joaquin Valley as well as low-elevation basins and ranges along the eastern side of the central Coast Ranges. By 1930, this range had been reduced by more than half, with the largest populations occurring in the southern and western portions of the San Joaquin Valley. Today, the San Joaquin kit fox occurs in the remaining native valley and foothill grasslands and chenopod scrub communities of the valley floor and surrounding foothills, from southern Kern County north to Los Baños, Merced County. Smaller, less dense populations may be found further north and in the narrow corridor between Interstate 5 and the Interior Coast Ranges from Los Baños to Contra Costa County. The range of the San Joaquin kit fox also includes portions of Monterey, Santa Clara, and San Benito Counties and the upper Cuyama River watershed in northern Ventura and Santa Barbara and southeastern San Luis Obispo Counties (U.S. Fish and Wildlife Service 1998). Monitoring of kit fox populations has indicated that the occupied range of kit foxes is contracting and is increasingly fragmented. It is also likely that kit foxes have disappeared from areas of extant habitat within the central and northern portions of their historical range (U.S. Fish and Wildlife Service 2010d).

### 2.3.9.3 Habitat

The San Joaquin kit fox inhabits a variety of habitats, including grasslands; scrublands; vernal pool areas; alkali meadows and playas; and agricultural irrigated pastures, orchards, and vineyards. They prefer habitats with loose-textured soils and are primarily found in arid grasslands and open scrublands that are suitable for digging, but they occur on virtually every soil type (U.S. Fish and Wildlife Service 2010d).

Dens generally are located in open areas with grass or grass and scattered brush, and seldom occur in areas with thick brush. Preferred sites are relatively flat, well-drained terrain. They are seldom found in areas with shallow soils resulting from high water tables or impenetrable bedrock or

hardpan layers. However, kit fox may occupy soils with high clay content where they can modify burrows dug by other animals, such as ground squirrels (U.S. Fish and Wildlife Service 1998).

### 2.3.9.4 Threats

The greatest threats to San Joaquin kit fox and its habitat is the conversion of natural habitat to agricultural lands, infrastructure construction, and urban development. The amount of suitable lands that are currently being converted to agricultural use has slowed because the remaining suitable habitats are too rugged for agricultural uses. The proposed siting of large-scale renewable solar energy projects in core, satellite, and linkage San Joaquin kit fox habitat is a potential emerging threat to San Joaquin kit foxes (U.S. Fish and Wildlife Service 2010).

### 2.3.9.5 Presence in the Action Area

Protocol surveys for San Joaquin kit foxes were not conducted for this project. There are numerous San Joaquin kit fox CNDDB (2010) occurrences within 10 miles of the action area. One San Joaquin kit fox was observed just south of SR 58 in the Carrizo Plain by an ICF International wildlife biologist during the March 2010 field surveys. Suitable San Joaquin kit habitat occurs between the Solar Switching Station on the western end of the project east to Tower 38 and between Tower 72 and Tower 140.

# Chapter 3
# Project Description

This section identifies the specific transmission line segment that would be reconductored by PG&E, and provides an overview of the reconductoring process. It describes the basic work involved in reconductoring a transmission line, as well as specific designs (when known) for the reconductoring project (project or proposed project) which is referred to as the "proposed action".

## 3.1 Reconductoring

Reconductoring would occur on both circuits of the PG&E Morro Bay–Midway double-circuit 230 kV transmission line between a new 230 kV PG&E switching station (Solar Switching Station) at the point of interconnection of the Topaz Solar Farm Project and the existing Midway Substation in Kern County. The existing transmission line extends from PG&E's Morro Bay Substation in the City of Morro Bay, San Luis Obispo County, California to PG&E's Midway Substation in the City of Buttonwillow, Kern County, California. However, only the portion of the line between the solar energy projects on the Carrizo Plain and the Midway Substation would be reconductored, as shown in Figure 1a-1f. In all, approximately 35 miles of the transmission line would be reconductored, ranging in elevation from 80 feet above mean sea level (msl) (at the Midway Substation) to 3,600 feet above msl (in the Temblor Range). Figure 1a-1f shows an overview of the entire project.

The 35-mile portion of the existing transmission line proposed for reconductoring is supported by 171 lattice steel towers (LSTs), some of which would require modification or replacement to accommodate the new conductors, which are heavier and operate at a higher temperature than the existing conductors. The existing 1113 AA conductor is 1.0440 lbs/foot, and the replacement 954 ACSS conductor would be 1.2270 lbs/foot. Most of these towers are double-circuit towers, with the exception of eight single-circuit transposition towers, two single-circuit substation dead-end structures at Midway Substation, and one double-circuit tubular steel pole (TSP) at Midway Substation. The average height of existing towers is approximately 118 feet, and the average height of towers with proposed extensions would be approximately 127 feet. PG&E's right-of-way (ROW) for the existing transmission line between the Solar Switching Station and the Midway Substation varies between 75 and 128 feet wide. For approximately 6 miles extending easterly from the Topaz Solar Farm on the Carrizo Plain, the transmission line is adjacent to a ROW with a 115 kV transmission line. The wider sections of ROW within the 230 kV transmission corridor are located near transposition towers (where the positions of the conductors are changed at four separate sites along the path). The transmission line segment to be reconductored would begin at the Solar Switching Station required for interconnection of the Topaz Solar Farm to the PG&E 230 kV transmission system.

From milepost (MP) 0, the reconductored transmission line follows a path due east for 7.2 miles, passing within 325 feet of a residence at MP 0.5, crossing Soda Lake Road at MP 1.5, and east to MP 7. At MP 7.3, the transmission line turns east-southeast for 3.0 miles and crosses the Temblor Range into Kern County at MP 10.3. The line then proceeds east for 4.7 miles and northeast for 3.5 miles, crossing a number of tributaries of Salt Creek between MP 11 and MP 16. The transmission line then

turns due east for 1.2 miles, northeast for 0.4 mile, and east again for another 14.1 miles, crossing Lost Hills Road at MP 21.7, Highway 33 (West Side Highway) at MP 22.8, a petroleum pipeline at MP 27.2, the California Aqueduct at MP 29.0, SR 58 at MP 29.5, and the West Side Canal (Kern River Flood Canal) at MP 29.8. The transmission line turns northeast for 0.4 mile and then north for 0.4 mile, once again crossing SR 58 at MP 30.0 before entering Midway Substation at MP 35.0 and elevation 80 feet above msl. A detailed illustration of the route is included on Figures 1a-1f.

## 3.1.1 Switching Stations

### 3.1.1.1 Solar Switching Station (Topaz Project)

The Topaz Solar Farm would interconnect with PG&E transmission lines using a three-bay, six-position breaker and a half configuration switching station. PG&E's Switching Station, called the Solar Switching Station, would contain nine 230 kV gas-insulated circuit breakers. Two positions of this switching station would be used to connect the Topaz Solar Farm output to the switching station, and the remaining four positions would be used to loop the PG&E line through the switching station. The PG&E Solar Switching Station work area would be approximately 600 feet by 650 feet (9 acres) with a buffer zone and would be enclosed by a fence separate from the adjacent Topaz Solar Farm substation. The switching station would require additional area for the incoming and existing transmission line, and the dimensions with the transmission line would be 880 feet by 715 feet. PG&E would install night lighting at the switching station for security purposes. To interconnect the Topaz Solar Farm, both circuits of the Morro Bay–Midway 230 kV double-circuit line would be looped from the transmission corridor into the new Solar Switching Station adjacent to the transmission corridor and then back to the transmission corridor. The loop lines would be approximately 200 feet to 400 feet in length. A total of four new circuits would be constructed between the existing transmission corridor and the new switching station (two in and two out of the switching station) with two circuits per tower line. Two new double-circuit LSTs and four TSPs would be installed to accommodate the looping of PG&E's 230 kV line into the Solar Switching Station. It is expected that the two LSTs would be located within or adjacent to the existing PG&E transmission line ROW. The four TSPs would be located on either side of the new PG&E Solar Switching Station to position the transmission conductors for proper ingress and egress to the station.

### 3.1.1.2 Switching Station Equipment

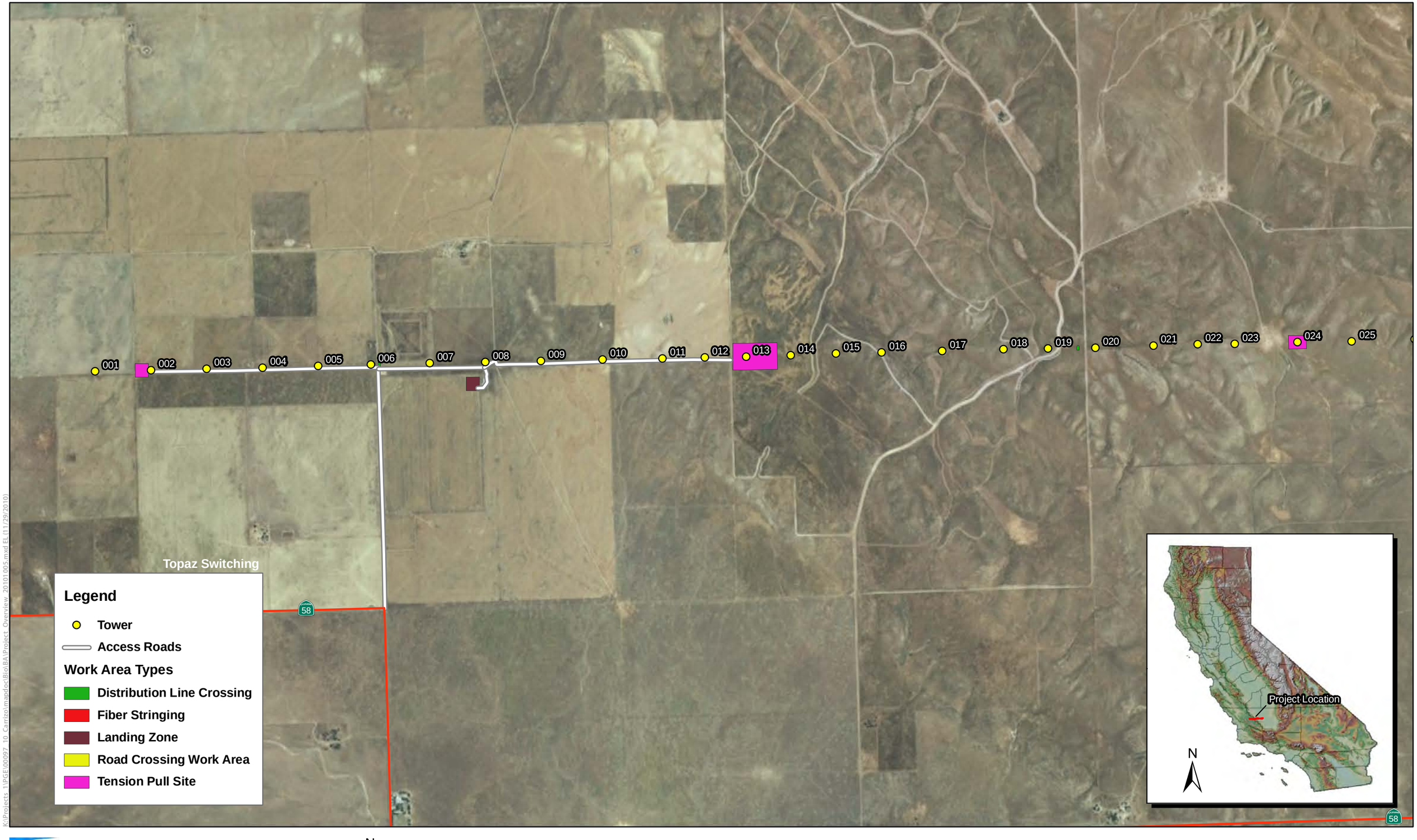
Two short transmission line segments would be required to connect the proposed switching station to the existing Morro Bay–Midway double-circuit 230 kV transmission line. These line segments would require facility modifications on the 230 kV and potentially on the 115 kV lines, as described below.

Modifications to the existing PG&E 115 kV transmission line facilities would include the following:

- Remove two existing 115 kV towers, and
- Install two low-profile, horizontally configured towers.

Modifications to the existing Morro Bay–Midway 230 kV double-circuit transmission line facilities would include the following:

- Install two new 230 kV dead-end towers, and

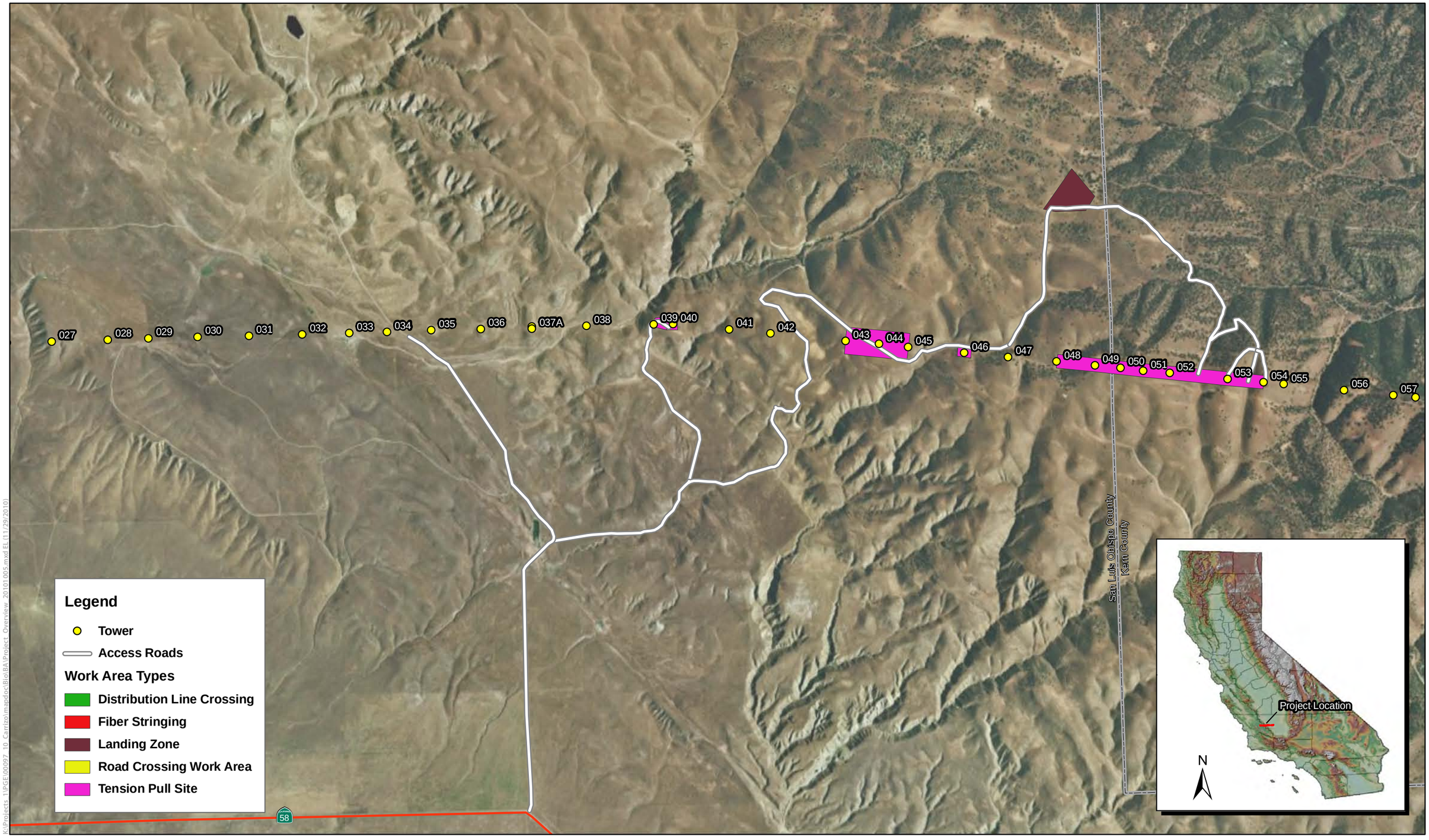



ICF INTERNATIONAL

N

0 0.5 1 Miles

**Figure 1a**
**Carrizo to Midway Reconductoring Project**




ICF INTERNATIONAL

N

0 0.5 1 Miles

**Figure 1b**
**Carrizo to Midway Reconductoring Project**

059 060 061 062 063 064 065 066 067 068B 068A 069 070 071 072 073 074 075 076 077 078 079 080 081 082 083 084 085 086

Kern County
San Luis Obispo County
58

**Legend**

- Tower
- Access Roads

**Work Area Types**

- Distribution Line Crossing
- Fiber Stringing
- Landing Zone
- Road Crossing Work Area
- Tension Pull Site

Project Location

N

N

0 0.5 1 Miles

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**Figure 1c**
**Carrizo to Midway Reconductoring Project**

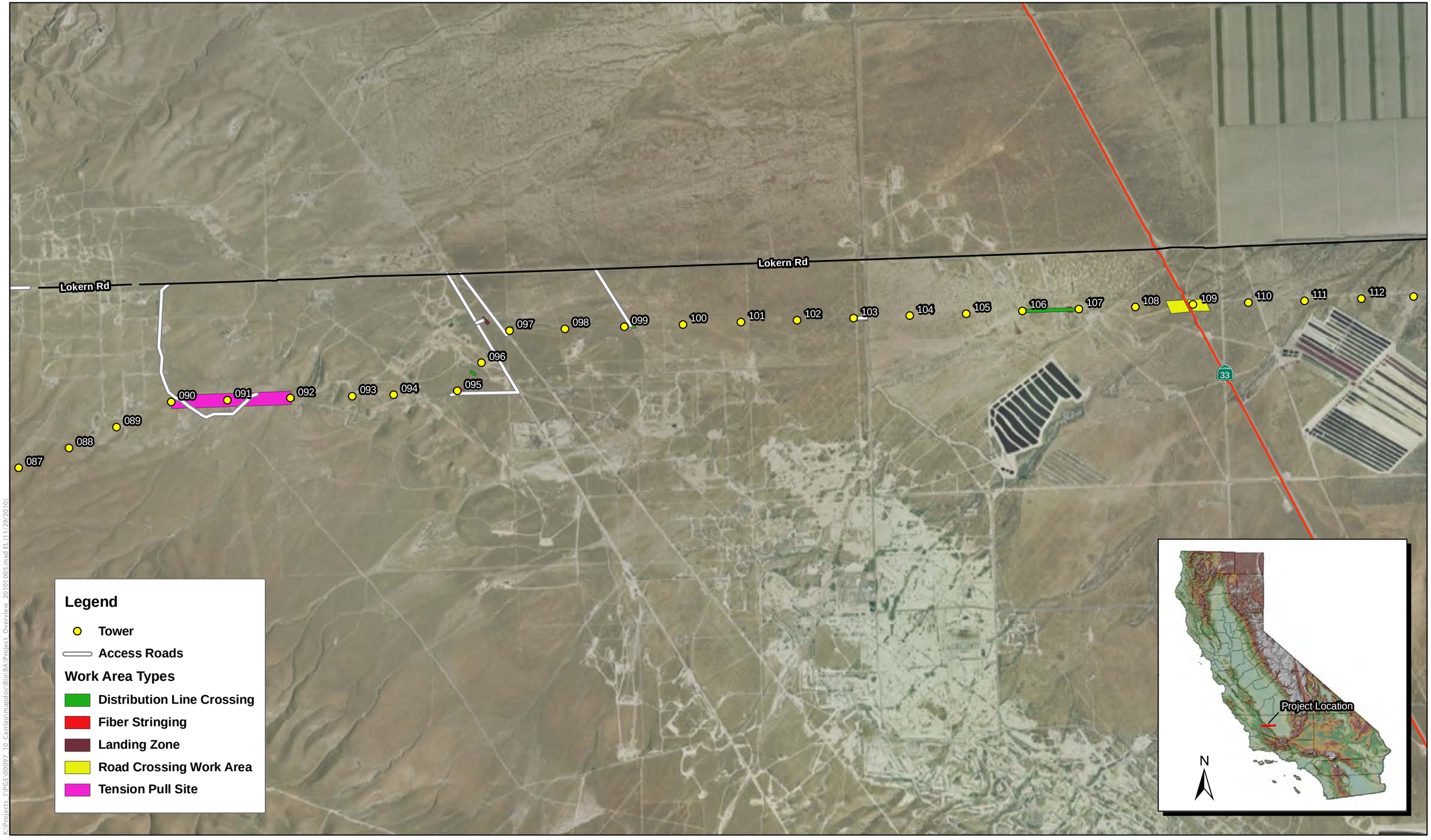



**Figure 1d**
**Carrizo to Midway Reconductoring Project**

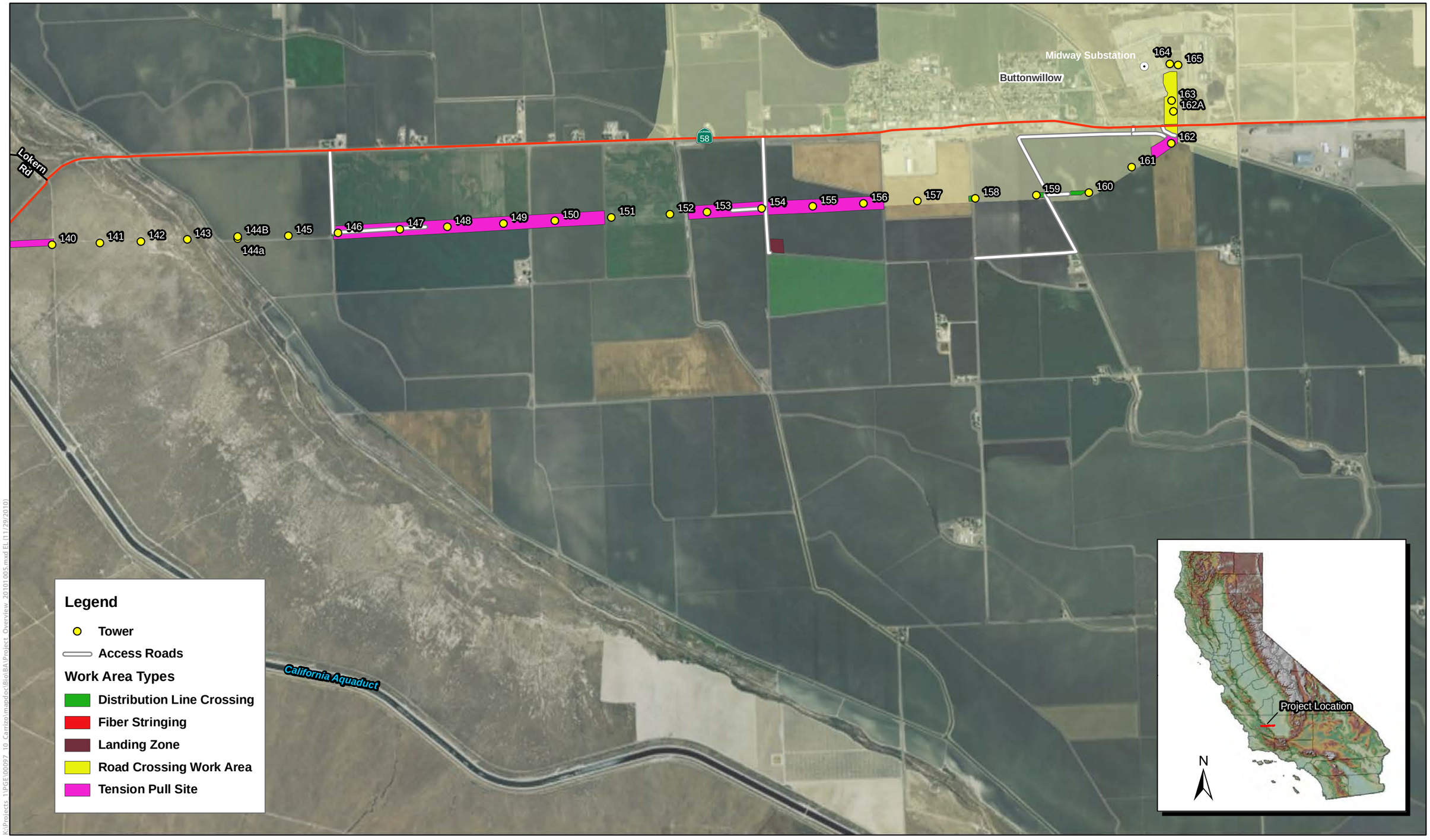



ICF INTERNATIONAL

N

0 0.5 1 Miles

**Figure 1e**
**Carrizo to Midway Reconductoring Project**




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ICF INTERNATIONAL

**Figure 1f**
**Carrizo to Midway Reconductoring Project**

- Remove one existing tangent lattice tower.

Construction of new 230 kV transmission line facilities would include the following:

- Install two new tangent double-circuit, steel monopole towers midway between the existing Morro Bay–Midway 230 kV transmission line and the proposed switching station (one tangent tower would be required in each line segment), and

Heights of all proposed tower modifications and new towers would be determined based on the heights of existing conductors and the need to provide clearance above ground and to any obstructions, based on the CPUC's General Order 95 and the National Electrical Safety Code. Pending detailed engineering design, the proposed towers may be up to 150 feet in height. This height would be required if it is determined that the 230 kV interconnect lines should pass over the 115 kV line located between the switching station and the 230 kV line without modifying the existing 115 kV structures.

### 3.1.2 Microwave Tower and Reflector

PG&E would install an approximately 175-foot-tall microwave tower at the Solar Switching site. The microwave tower would be a self supporting lattice steel structure. The microwave antennas are typically grey, but may be painted a particular undetermined color at the discretion of San Luis Obispo County and the California Public Utilities Commission.

At least one microwave reflector would be required off-site. Depending on the final locations of the switching stations, it is possible that one microwave reflector would suffice for both switching stations. However, the number and location(s) of the microwave reflector(s) would be determined based on the final location of the switching stations. The location of the microwave reflector for the Solar Switching Station is unknown at this time. The reflector would be mounted on a structure approximately 30 feet tall and would be approximately the size of a billboard. A typical microwave reflector is approximately 10 feet by 24 to 32 feet.

## 3.2 Land Uses along Transmission Line Right-of-Way

The area around the transmission line corridor and switching stations is primarily undeveloped along the westernmost 30 miles of the route of the Solar-Midway segment. Only two residential structures are located near the reconductoring project, the closest of which is approximately 325 feet from the ROW. Petroleum settling ponds associated with active petroleum extraction activities are located directly adjacent to and south of the ROW at MP 22 to MP 24. Active agricultural operations occur within and adjacent to the ROW. These are grazing and dry land grain cultivation operations west of MP 30.8 and irrigated crop production east of MP 30.8. Portions of the ROW have been disturbed by vegetation management practices beneath the existing transmission line, by the construction of access roads, and by ongoing maintenance activities. Between where the line crosses SR 58 near MP 30 until it enters the Midway Substation at about MP 35, the transmission line parallels SR 58 (Jeppi Road) approximately 0.3 mile to the south of the road. Between MP 31 and MP 33.4, the highway has scattered individual homes along its northern side. From MP 33.4 until it enters the Midway Substation near MP 35, the alignment is approximately 0.3 mile south of the town of Buttonwillow, which is primarily on the north side of the highway. Existing land uses along the 35-mile transmission line are shown in Table 3-1.

**Table 3-1. PG&E Reconductoring Project Existing Land Uses in Action Area**

| Location | Jurisdiction(s) | Land Use Classifications | Specific Land Uses |
|---|---|---|---|
| MP 0.2.7 | County of San Luis Obispo | Agriculture, Public Facilities and Utilities | Tracy Lane, Grazing, Dryland Grain Production, Soda Lake Road, Unnamed Drainages |
| MP 2.7.10.3 | County of San Luis Obispo | Agriculture | Grazing, Unnamed Drainages |
| MP 10.3.21.7 | County of Kern | Agriculture | Grazing, Salt Creek, Lost Hills Road, Petroleum Pipeline, Temblor Creek, Unnamed Drainages |
| MP 21.7.22.8 | County of Kern, Caltrans (State Highway 33) | Agriculture, Public Facilities and Utilities | Grazing, State Highway 33, Lost Hills Road, Natural Gas Pipeline |
| MP 22.8 - 30.8 | County of Kern, Caltrans (State Highway 58) | Agriculture, Public Facilities and Utilities | Grazing, Crop Production, State Highway 58, Petroleum Settling Ponds and Pipelines, Natural Gas Pipeline, California Aqueduct, Unnamed Drainages |
| MP 30.8-35.0 | County of Kern, Caltrans (State Highway 58) | Agriculture, Public Facilities and Utilities | Crop Production, West Side Canal, (Kern River Flood Canal), Unnamed Canals, Elk Grove Road, Unnamed Road, Palomas Road, Buttonwillow Drive, Mirasol Avenue, Southern Pacific Railroad, State Highway 58,Midway Substation; individual residences |

# 3.3 Construction Methods

## 3.3.1 Reconductoring

In general, reconductoring is accomplished by disconnecting an old conductor and using it to pull a sock line (rope) through travelers or sheave blocks (temporary pulleys) mounted on each tower, until the sock line reaches the end of the section to be reconductored. Workers climb the tower or use a helicopter to access the tower in order to place the travelers on each tower and route the old conductor through the travelers. Once in place, the sock line is then used to pull the new conductors into place. An alternative is to connect the old conductor directly to the new conductor and use it to pull the new conductor into place.

The work would involve 20-person work crews on each end of the segment being replaced. Crews would generally be equipped with large tractor/trailer units used to feed out the new line or wind in the old line on trailer-mounted spools. Two or three utility trucks carrying tools and other materials would also be employed. One crew would set up at a “pull site” near a tower at one end of the pull, and the other crew would set up a “tension site” near a tower at the other end of the pull. As a safety precaution, ground rods (copper rods, 5/8-inch in diameter and long enough to be driven to firm

ground with approximately 1 foot protruding above ground) would be installed on each end of designated pull sites prior to pulling and tensioning work and removed once work is complete. Ground rods would also be attached to any equipment used near an energized conductor. The tensioning crew would employ a tensioner truck, which carries a large drum winch that is used to put rear tension on the conductor being pulled. Each pull is generally from 1 to 5 miles in length, and each conductor is pulled separately (one phase of each circuit per pull) until all three phases of a circuit are in place. The tensioning site crew would access the tower and disconnect the old conductor. The old conductor would be attached to a sock line or directly, to the new conductor located on spools on tensioner trucks.

The pull site crew would also climb each tower or be transported to the tower arms via helicopter, disconnect the old conductors, and attach them to take up spools on trucks below the tower. Other crews would set up temporary netting structures across busy roads and other areas as needed to protect those areas in the unlikely event that a conductor breaks and falls to the ground.

Once all protective structures are in place and the pull and tension sites are ready, the pulling crew would begin to wind the old conductors onto spools mounted on trucks, thereby pulling the sock line (or new conductor) through the pulleys. The tensioning crew would keep the old conductor taut, preventing it from sagging to the ground or into other objects in the ROW. If a sock line is used, once the sock line is in place, the crews would repeat the process, winding the sock line onto a take-up reel, thereby pulling the new conductor in place. Once the new conductor is in place, it would be disconnected from the pulleys, relocated to a higher position (if a cage top tower extension was installed), and permanently mounted to the end of new insulator strings.

Generally, new conductors are pulled through 1 to 5 miles of transmission towers at a time, depending on the length of conductor on the reels, the presence of angle towers, and the availability of suitable set-up locations.

Because the work is overhead between the pull and tensions sites, the potential for ground impacts is generally nonexistent between the two sites. Therefore, this analysis focuses particularly on examining potential effects at the pulling and tensioning sites and other locations that could be disturbed by truck movement or helicopter operations. Activities between the pull and tension sites are generally restricted to (1) accessing the towers (by pickup truck to the tower then climbing, by truck-mounted aerial bucket, or by helicopter) to place pulleys, remove the old conductor, and fasten the new conductor once stringing is completed; and (2) work on the tower structure to repair or replace spars that are damaged, or to replace insulators.

Figures 1a-1f show the full range of anticipated pull and tension sites along the 230 kV corridor and Table 3-2 includes preliminary estimates of ground disturbance for the work areas. Some of the criteria used in selecting the final pull and tension sites include accessibility for vehicles; presence of a flat or nearly flat land in-line along the ROW for equipment set-up; and land use, habitat, environmental, or cultural factors that may restrict work at various locations. Pulling and tensioning would normally take place at “deadend” sites, which are towers where the transmission line is physically connected to the tower rather than merely passing through insulator clamps. In general, they are located where one spool of conductor is spliced to the next spool. Dead-end sites are generally located at angle towers (where the alignment changes direction), but also can be located at towers that are in-line with the route, such as where the conductor is spanning long distances across canyons or gorges. Dead-end towers have significant structural strength and resist the forces of pulling. Pull and tension sites could also be established in-line between standard suspension towers

where needed to limit the pulling distance or to address areas that have limited access or setup restrictions. Along the route, pull and tension sites would be located approximately 1 to 6 miles apart.

During reconductoring, work crews replace the insulator strings connected to the towers. This work involves accessing the towers by climbing, truck-mounted aerial bucket, or helicopter in order to get personnel and material to the appropriate position on the tower. For the reconductoring project, depending on terrain and work required by helicopter, approximately nine landing zones would be used. Crews would then remove the old insulator strings and install new ones. The new insulators would be delivered by aerial bucket truck and trailer or by helicopter and held in place by the aerial bucket or rigging attached to the tower. The towers would also be inspected for corrosion prior to reconductoring and, if necessary, would be repaired. Repairs can include corrosion removal by mechanical means, re-galvanizing, and repainting.

Construction equipment would mostly be refueled at landing zones or construction yards along the transmission line. Equipment may be refueled along the transmission line if necessary. This would occur at least 100 feet from drainages, with secondary containment and appropriate clean up equipment onsite in case of a spill.

Once the old conductors and insulators are removed, they would be recycled or disposed of in an appropriate landfill facility.

### 3.3.2 Tower Replacement

For the purposes of the biological assessment, it is assumed that 10 percent of the 171 LSTs (17 towers) would be replaced. Replacement LSTs would generally be erected within 75 feet of the original tower and would be sited to avoid sensitive resources.

As pull and tension sites are generally flexible, their locations would be selected by PG&E upon completion of the biological reconnaissance surveys and cultural resources surveys for the reconductoring project to minimize impacts to sensitive resources. Figures 1a-1f show the preliminary locations of potential tension and pull sites; however, the exact locations would be developed during detailed project engineering. Depending on the terrain and the number of angles and dead-end towers, approximately 17 pull and tension sites and three construction work areas at road crossings would be used. In addition, there would be a work area at each switching station and 6 helicopter landing zones (see Table 3-2). Some pull and tension sites may also be used as staging areas and landing zones. Towers either would be constructed and erected at the tower site using a crane or constructed offsite and transported to the site by helicopter.

The new LSTs would require the installation of new tower foundations, which are typically poured concrete piers. For each lattice structure, four holes would be drilled using a truck-or track-mounted excavator equipped with augers of various sizes depending on the diameter and depth requirements of the hole to be drilled. The final depth of each foundation pier would be determined by soil and geologic conditions and by the design requirements of the tower structure. Each foundation would extend approximately 2 feet above the ground surface for bolting the tower in place.

Drilling, rock hauling, or the use of a rock anchoring or a mini-pile system may be required if solid rock is encountered. The rock anchoring or mini-pile system would be used in areas where site access is limited and sufficient rock is available for proper rock anchoring. Such anchoring systems may also be used where economically and technically justified. In environmentally sensitive areas, a

HydroVac, which uses water pressure and a vacuum, may be used to excavate material into a storage tank. In areas where it is not possible to operate large drilling equipment due to access or environmental constraints, hand digging using compressed air tools may be required. Soil excavated for foundations dug by hand would be distributed locally. At some of these sites it may be necessary to deliver and remove equipment, material, and personnel via helicopter.

At the LST component fabrication plant, structural members would be bundled and shipped by rail or truck to the construction yards, and then trucked to the individual tower sites (if the crane method is to be used) or a central assembly yard (if the helicopter method is to be used). For towers that are to be erected using the crane method, LSTs would be assembled at laydown areas at each site, and then erected and bolted to the foundations. Tower assembly would begin with the hauling and stacking of bundles of steel at tower locations. This activity would require use of several tractors with 40-foot trailers and a rough terrain forklift. After steel is delivered and stacked, crews would proceed with assembly of leg extensions, body panels, boxed sections, and bridges. The steel work would be completed by a combined erection and torquing crew with a lattice boom crane. The construction crew may opt to install insulators and travelers at this time. Ground disturbance would generally be limited to work areas around towers to be replaced, typically 200 feet by 200 feet for individual towers and 300 feet by 300 feet for centralized laydown areas or landing zones.

A minimum 80 ton crane would be used to assemble tower sections in areas where road access is available to tower sites and impacts to biological and cultural resources would be minimal. The crane pad would be set up in-line, within approximately 100 feet to the side of the existing transmission tower.

A helicopter would be used to erect towers at tower sites inaccessible by crane due to terrain or avoidance measures for sensitive resources. Use of helicopters for installation eliminates land disturbance associated with crane pads, tower site laydown areas, and vehicle traffic from steel delivery to structure sites. All construction work in remote work sites would be completed by hand with the assistance of portable compressors, portable hydraulic accumulators, portable concrete mixers, or buckets of ready-mix concrete that would be flown into the tower sites. Remote work sites would be located on disturbed land to avoid biological or cultural impacts or to land where impacts could be reduced to a less-than-significant level with appropriate measures incorporated.

Temporary guard structures would be used if necessary to protect roadways should a non-energized line fall during reconductoring. Guard structures typically consist of two or four wooden poles and cross beams attached to the tow poles. They are generally installed in pairs with a net strung between them, but in some cases a net would not be required. A line truck would be used to auger and set the wood poles. Guard structure poles would be removed following reconductoring and the holes backfilled.

The use of helicopters for the erection of LSTs would be in accordance with PG&E specifications and would be similar to methods detailed in the Code of Safe Practices (CSP Section 11), 2002 Edition, and the PG&E Helicopter Operations Manual, which was completed by PG&E and its International Brotherhood of Electrical Workers (IBEW) Union in 2002.

The operations area of the helicopters would be limited to helicopter staging areas near construction locations (landing zones) that are considered safe locations for take-off and landing and the transmission line corridor. Final siting of helicopter fly yards and staging areas would be conducted with the input of the helicopter contractor, affected private landowners, and land management agencies. Each staging area would be a maximum of 300 feet by 300 feet.

Helicopter fueling would occur at landing zones, and offsite at an existing licensed refueling facilities or airports using the helicopter contractor's fuel truck. Fueling would be supervised by the helicopter fuel service provider, and Storm Water Pollution Prevention Plan measures would be followed, as applicable. The helicopter and fuel truck would stay overnight at a local airport or at a staging area if adequate security is in place.

### 3.3.3 Tower Modifications

The height of approximately every other tower (approximately 85 towers) would be raised by approximately 20 feet in order to accommodate the new conductor and simultaneously satisfy conductor ground clearance requirements. The new conductor would be about the same diameter and weight as the existing conductor, but it would operate at higher operating temperatures, which would cause it to sag more than the existing conductor. In addition, certain towers may require modification of their foundations or superstructures to accommodate the new, higher-temperature conductor as the new conductor would contain a steel core that enables higher tensioning between towers.

To strengthen tower foundations, concrete from the existing footings is broken away to expose the steel reinforcements. A new/replacement concrete footing, called a grade beam, is poured between each existing footing. Superstructures are typically strengthened by replacement, modification, or addition of pieces of steel lattice, as determined by engineering analysis specific to each tower. In a worst-case situation, a new, stronger replacement tower with new foundations would need to be installed, in-line, within approximately 50 to 75 feet of the existing tower.

One of two methods is used to raise the heights of towers, including:

- Adding "mid-cage" or base extensions to the towers, or
- Adding "cage-top" extensions to the top of the tower.

The first method requires lifting the tower at the middle of the cage. A tower lift crane is staged in-line next to the tower, and its four arms are clamped to the four outside tower support legs. The tower support legs are unbolted from the lower tower section mid-cage (below the crane attachment points), the tower is lifted, and the mid-cage extension is installed. Once the mid-cage extension is installed and secured to the lower tower section, the crane is detached, leaving the tower in its new elevated position. If a tower lift crane cannot be used, tower leg extensions can be completed at ground level using a larger crane, manual construction techniques, track style equipment, or helicopters. A level area of approximately 25 by 40 feet would be graded immediately adjacent to the tower to serve as a crane pad. Temporary wood pole support(s) (shoo-fly) would be constructed adjacent to the tower to support the conductors while the crane lifts the tower. The tower extension would then be installed, the conductors replaced, and the temporary wood pole supports removed.

The second method entails installing the new extension at the top of the tower with the use of a crane or helicopter. The cage top extension is installed on the top of the tower, above all the cross arms. For the crane method, a level area of about 25 by 40 feet would be graded immediately adjacent to the tower to serve as a crane pad. Existing conductors would be left in place. During a helicopter cage top extension installation, one 230 kV circuit would remain energized and the other de-energized, but if a crane lifts the cage top into place on the tower, both 230 kV circuits would be de-energized. Once the cage top extensions are installed on a string of towers, the conductors would

be de-energized and elevated to their new position. The new insulator strings and conductor pulleys would be installed at this time to facilitate the reconductoring activities that follow. The old tower arms and insulator strings would be removed once the conductors are relocated to their new positions.

Complete tower replacement would occur where mid-cage, base, or cage top extensions are deemed to be too difficult.

## 3.3.4 Access Road Modification

Existing access roads would be maintained and widened as required for construction activities. Access roads serving towers requiring modification or replacement and roads serving associated pull and tension sites, laydown areas, and landing zones would be evaluated for vegetation removal, repair, and restoration requirements. The roads would be required to be sufficiently wide to accommodate large bucket trucks and semi-truck traffic for delivery of material and large equipment (e.g., cranes, graders, and dozers). Access roads would typically be graded with a six-wheel road grader and/or a D-6 bull dozer to a standard 10-foot width, with possible 12-foot-wide sections required at sharp road angles. Federal jurisdictional waters will be avoided and PG&E would use temporary bridges to span sensitive water crossings during the wet season. Gravel would not typically be used for the road bed except to stabilize soft underlying soils.

## 3.3.5 Switching Stations

Construction of the Solar Switching Station and the interconnection between the existing Morro Bay–Midway 230 kV line and the new station would be undertaken by PG&E. Construction of transmission facilities would be scheduled roughly in parallel with the switching station construction to ensure adequate transmission line capacity is available when the new switching stations become active.

Construction of the loop lines would include disturbance at locations where excavation for tower and pole locations would occur and towers and poles would be installed. Wheeled vehicles for transportation of conductor spools, and line-pulling and tensioning equipment would traverse the transmission line construction area.

## 3.3.6 Optical Ground Wire

A new OPGW would be installed between the Solar Switching Station and Midway Substation. The OPGW is both a static line (lightning protection) and a fiber optic communication line. It would be installed along with a pure static line on the top of the towers using a small tent-like structure for mounting to the tower tops. The static wire and OPGW would be installed at the same time the new conductors would be installed on the tower line and pulled in a similar fashion. Installation of the static wire and OPGW would be finished by the completion of the reconductoring project installation.

## 3.3.7 Ground Disturbance

Estimated ground disturbance associated with access roads, switching stations, tension and pull sites, land zones, line and roadway crossings, and other components are preliminarily estimated in Table 3-2 below and would be finalized during final project engineering and design.

The work areas for each of the anticipated 17 pull sites would be approximately 300 feet by 300 feet (2.1 acres each, 35.7 acres total) and would be located within the ROW outside of the existing access road footprint. Each of the switching stations would require an approximately 9-acre work area, and access roads would disturb approximately 27.2 acres. Landing zones, power line and roadway crossings, and fiber optic stringing would disturb approximately 21 additional acres.

**Table 3-2. Preliminary Areas of Disturbance by Work Area**

| Work Area | County | Dimensions & Site Description |
|---|---|---|
| Solar Switching Station Work Area | SLO | 600 feet x 650 feet (9.0 acres) |
| Tension/Pull (T/P) Sites | SLO and Kern | 300 feet x 300 feet (2.1 acres) each . Approximately 22 T/P sites required (9 in SLO County and 13 in Kern County; 35.7 acres total) |
| Landing Zones | SLO and Kern | 300 feet x 300 feet work area next to PG&E warehouse (2.1 acres) in SLO County . Triangle shape layout (4.5 acres) in SLO County . 300 feet x 300 feet (2.1 acres) in Kern County . 75 feet x 200 feet (0.3 acres) in Kern County . 150 feet x150 feet (0.5 acres) in Kern County . 300 feet x 300 feet (2.1 acres) in Kern County |
| Access Roads | SLO and Kern | Approximately 27.2 acres total |
| Single Distribution Line Crossing | Kern | 50 feet x 50 feet potential disturbance (0.4 acres) each . Approximately 7 separate distribution line crossings required |
| Two Distribution Line Crossings | Kern | 100 feet x 50 feet potential disturbance (0.6 acres) . Approximately 5 separate double distribution line crossings required |
| Foreign Line Crossing | Kern | 100 feet x 50 feet potential disturbance (0.1 acres) |
| Caneras-Taft 70 kV and Temblor-Kernridge 115 kV Transmission Line Crossings | Kern | 100 feet x 50 feet potential disturbance (0.1 acres) |
| Belridge Tap 70 kV Transmission Line Crossing | Kern | 75 feet x 50 feet potential disturbance (0.1 acres) |
| Diablo Midway #2 500 kV Transmission Line Crossing | Kern | 100 feet x 50 feet potential disturbance (0.1 acres) |

| Work Area | County | Dimensions & Site Description |
|---|---|---|
| Fiber Line Stringing | Kern | 1,250 feet x 30 feet (0.9 acres) |
| Road Crossing Work Areas | Kern | Highway 33: 75 feet x 50 feet potential disturbance (0.1 acres) . Highway 58: 50 feet x 50 feet potential disturbance (0.1 acres) . Highway 58: 7.0 acres |

Source: PG&E, 2010; updated April 9, 2010.

# 3.4 Construction Requirements

## 3.4.1 Equipment and Personnel

Reconductoring work, including tower replacement and modification, would be completed primarily by PG&E employees. Some work would likely be contracted out, including helicopter and crane operations, foundation construction, specialty transport, grading and earth work. The construction activities related to this project are expected to take approximately 20 months to complete.

The maximum estimated number of personnel required for construction labor would be approximately 50 individuals. Table 3-3 summarizes required construction equipment and its intended use for construction of access roads, laydown areas, and landing zones and the replacement or removal of towers.

## 3.4.2 Schedule

As described above, reconductoring work, including tower replacement and modification, is expected to last approximately 20 months. According to current plans, construction would begin in August 2011 and would be substantially complete by February 2013. Construction would proceed as follows:

- **Access road modifications.** Beginning in August 2011, access roads serving towers to be modified or replaced and associated tension and pull sites, laydown areas, and landing zones would be graded and widened, as required for construction activities. Road modifications would take approximately 1 month to complete.
- **Fly yards and staging areas.** Beginning in August 2011, crews would spend several days bringing equipment and materials to staging areas within the substations or laydown area/fly yard locations. A given fly yard would be in use during work on the corresponding section of the transmission line. Helicopters would be used for both tower modification work and replacement of conductors along the line, especially in biologically-sensitive and difficult-to access areas. Populating fly yards and staging areas would take approximately 1 month.

- **Tower work.** Beginning in August 2011, tower replacement and modification would occur along the transmission line in advance of reconductoring. The duration of tower replacement and modification work would be approximately 18 months. Construction work on towers would follow multiple steps over the course of several visits to the tower site, as described chronologically below:
    - Initial evaluation and site preparation for construction,
    - Installation of required tower extensions or tower replacement,
    - Raising of existing conductor to new conductor height on the towers,
    - Installation of travelers and insulators on all towers,
    - Reconductoring of the line,
    - Removal of travelers and placement of conductors on the insulators ("clipping" the conductors), and
    - Removal of all unused arms and associated equipment below the new conductor.

Tower work would be complete by approximately February 2013.

- **Guard structures.** From June 1, 2011, to January 1, 2012, any required guard poles (with or without nets) would be placed prior to pulling and tensioning any section of line crossing a state highway or other obstacle in which guard poles and/or nets are deemed necessary. Guard poles and nets would be placed and removed during the dry season to avoid access during the wet season in biologically sensitive areas. Guard poles and nets would be removed between or April 1, 2012, and November 1, 2012.
- **Reconductoring.** Reconductoring would occur over the course of 12 months, beginning by August 2011, and would be completed in sections as towers are raised or replaced. Because the line that would be under construction is an active transmission line, the timing of pulling and tensioning would depend on load conditions and the ability to take the line out of service. This activity would be restricted to low load conditions when line clearances could be achieved and would be complete by December 2012. In some cases, one side (one circuit) of the 230 kV line may be de-energized to enable reconductoring work on that side of the corridor while the other side (second circuit) of the 230 kV line would remain energized. Some work activities may require both circuits to be de-energized. This would be scheduled with PG&E's Transmission Operations group in coordination with the CAISO.
- **Restoration.** Restoration of any temporarily disturbed areas would occur within 1 year of disturbance for all sites. For access roads modified for construction, these would be re-established with an emphasis on long-term erosion control to support long-term operations and maintenance activities. This may involve seeding roads with a native seed mix and/or installing water bars on steep slopes. Road restoration would be in compliance with the General Construction Stormwater National Pollutant Discharge Elimination System Permit. Final restoration of all temporary work sites is expected to occur no later than December 2013.
- **Switching Station.** The area used for the Solar switching station would be cleared and graded during the start of the construction period. The station will be constructed after the site preparation activities are completed. The switching station will be completed during the first year of installation, allowing the proposed solar project to begin operation as soon as the first tracker systems or solar modules are deployed and can generate solar power.

**Table 3-3. Solar-Midway 230 kV Reconductoring Equipment and Intended Use**

| Equipment | Use |
|---|---|
| 1/2-ton pickup trucks | Transport construction personnel |
| 3/4-ton pickup trucks | Transport construction personnel |
| Crew-cab trucks (3/4 to 1 ton) | Transport construction personnel |
| Jeep vehicles | Construction and environmental inspectors |
| Road grader, six wheel | Site grading |
| Dozer with sheepsfoot | Grading/shaping and soil compaction/tensioning support |
| Powered road roller | Subgrade compaction |
| ASV mower | Vegetation clearing |
| Water trucks | Dust and fire control |
| Cranes | Tower installation and reconductoring (one at each end) |
| 2-ton flat bed trucks | Haul materials |
| Flat-bed boom truck | Haul and unload materials |
| Dump trucks (5 to 10 ton) | Haul spoil and import materials |
| Construction trucks and trailers (2 to 60 ton) | Haul materials |
| Tiltbed and lowboy trailers | Haul equipment |
| Rigging truck | Haul tools and equipment |
| Mechanic truck | Service and repair equipment |
| Shop vans | Store tools |
| Crawler-mounted auger | Excavate foundations |
| D6 and D8 Bulldozer | Site grading and excavation |
| Puller (semi-truck and trailer) | Pull conductor wire |
| Tensioner (semi-truck and trailer) | Pull conductor wire |
| Helicopters (Bell 500 Long Ranger, Bell 205 Huey, Sikorsky Skycrane) | Tower installation/transport , cage top transport/installation, personnel and material delivery |
| Semi with wire reel trailer | Haul wire |
| Air compressor | Operate air tools |
| Air tampers | Compact soil around foundations |
| Portable generators | Power tools for tower assembly |
| Fuel trucks | Refuel equipment (helicopters) |
| Aerial lift trucks | String conductor wire |
| Fork Lift | Manage and assemble material at laydown area. |
| 2 large bucket trucks | Pulling sites, insulator replacement, reconductoring |
| Water Truck | Dist control and compaction at grading locations. |
| 2 standard line bucket trucks | Reconductoring activities |
| Fire Suppression Equipment | Laydown Areas, Landing Zones |

# Chapter 4
# Proposed Conservation Measures

As part of PG&E's standard best management practices (BMPs), conservation measures have been incorporated into the project design that will be implemented to avoid or minimize impacts to biological resources. PG&E also has proposed the following general and resource-specific measures to minimize potential adverse effects. These conservation measures are modeled from the conservation measures identified in PG&E's San Joaquin Valley O&M HCP.

## 4.1 General Measures

As part of PG&E's standard construction practices, the following conservation measures will be incorporated into the project design and will be implemented to avoid or minimize the proposed action's impacts on biological resources:

- An environmental awareness education program will be conducted by a qualified biologist for construction crews prior to initiating construction of the proposed action. The program will be conducted for new crew members throughout the duration of the project. The education program will include information about potentially occurring federally listed species (i.e., Kern mallow, valley elderberry longhorn beetle, blunt-nosed leopard lizard, California condor, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox), a review of conservation measures that are being implemented during project construction, and the consequences for noncompliance with environmental laws.
- A qualified biologist will monitor all ground-disturbing construction activity in sensitive areas and near designated resources within the action area. All monitors will be biologists with formal training. The resumes of all biological monitors will be submitted to USFWS for approval. The qualified biological monitor will train an individual or individuals to act as work site construction monitor(s) to assist the qualified biological monitor with overseeing remaining work at work areas after ground-disturbing activities are completed. The biological monitor will have the ability to stop or redirect work activities to ensure protection of sensitive resources and compliance with all environmental permits and conditions of the proposed action. The biological monitor will complete a daily log summarizing activities and environmental compliance, and will prepare a weekly report summarizing the monitoring activities and environmental compliance for the activities performed within the action area. This report will be submitted to the PG&E biologist. The biological monitor will also be the initial contact person for any employee who might inadvertently injure or kill a federally listed species or who finds a dead, injured, or entrapped individual. A communication protocol will be established between the biological monitor, PG&E, and the agencies. The monitor's name and number will be provided to USFWS prior to the initiation of ground-disturbing activities.
- Vehicles will be restricted to established roadways and approved access routes and staging areas within the action area. Cross-country access routes will be clearly marked in the field with appropriate flagging and signs as necessary.
- A vehicle speed limit of 15 miles per hour will be enforced on all non-public access roads.

- All vehicles will be brought into the work areas cleaned and free of weeds prior to entry.
- Staging areas will be set back at least 50 feet from streams, creeks, or other water bodies to avoid impacts on sensitive habitat. All fueling of vehicles will occur at least 100 feet from wetlands and other water bodies.
- If federally listed species are encountered during construction work, activities that could cause direct harm to the species, as determined by the biological monitor will cease until the animal is removed and relocated, or allowed to leave the work site by the USFWS-approved biologist. USFWS and CDFG will be notified within 24 hours of the encounter.
- Photographic documentation of preconstruction habitat conditions will occur at all major work areas, including staging areas, landing zones, and tension/pull sites, prior to the start of construction and immediately after construction activities are performed.
- Construction personnel will not bring firearms or pets to any project-related work areas and will not leave trash on the project site during construction.
- A litter control program will be instituted at each of the work areas. All workers will ensure that their food scraps, paper wrappers, food containers, cans, bottles, and other trash are deposited in covered or closed trash containers. The trash containers will be removed from the work areas at the end of each work day. After completion of the proposed action, all construction materials will be removed from each of the work areas.
- To prevent the inadvertent entrapment of federally listed species during the proposed action, all excavated, steep-walled holes and trenches more than 6 inches deep will be covered at the end of each work day by plywood or similar materials or escape ramps will be installed. In situations where the trenches or holes cannot be covered, earthen escape ramps will be dug into the sides of trenches. All holes and trenches will be thoroughly inspected at the start of each workday for trapped animals before they are filled. If at any time a trapped listed animal is discovered, escape ramps or other appropriate structures will be placed to allow the animal to escape. USFWS will be notified of the incident by telephone and electronic mail within 1 working day.
- A set of BMPs will be developed to control erosion during construction and will be detailed in the project-specific Storm Water Pollution Prevention Plan (SWPPP). All temporarily disturbed areas will be restored as necessary. A project-specific Restoration Plan detailing specific revegetation plans, monitoring guidelines, and success criteria, will be developed as part of the Habitat Mitigation Plan (see below). Together, the SWPPP and Restoration Plan will facilitate the restoration of construction areas and will contain information on site-specific implementation plans.
- Temporary construction disturbances and other types of project-related disturbances to federally listed species will be minimized to the maximum extent practicable and confined to designated work areas. To minimize temporary disturbances, all sensitive habitats will be delineated with highly visible flagging or fencing in order to prevent encroachment of construction personnel and equipment during work activities. At no time will equipment or personnel be allowed to adversely affect areas outside of project work areas, staging areas, or landing zones without authorization from USFWS.
- PG&E will prepare a Habitat Mitigation Plan, which will contain mitigation plans for listed species (Kern mallow, blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox) as well as a restoration plan for sensitive habitats. The purpose of the

Habitat Mitigation Plan will be to provide more detailed information on those measures that will result in the restoration of areas temporarily affected by the proposed action. The Habitat Mitigation Plan will be submitted to USFWS for review prior to the start of construction. The purpose of the Habitat Mitigation Plan is to provide more detailed information on the measures that PG&E will implement to restore areas temporarily affected by the proposed project. The Habitat Mitigation Plan will include how restoration at the work areas will be completed and will include success criteria to ensure that restoration of the work areas is successful.

## 4.2 Kern Mallow

The following conservation measures are proposed as part of the proposed action to directly or indirectly minimize or eliminate potential adverse effects specific to Kern mallow associated with direct or indirect effects of the proposed action.

- To the extent feasible, areas providing suitable habitat for Kern mallow will be avoided. During the habitat assessment, biologists identified certain tension/pull site and landing zones that PG&E proposed that were in areas with substantial populations of Kern mallow. Biologists recommended that these work areas be moved to areas without known populations of Kern mallow. As a result, PG&E agreed to move these tension/pull sites and landing zones to areas without known populations of Kern mallow.
- Some of the work areas were not previously surveyed for the presence of Kern mallow. Surveys for the presence of Kern mallow, according to the most recent agency protocols, will be conducted prior to any construction activities occurring in work areas that were not previously surveyed for Kern mallow. Global positioning system (GPS) coordinates will be taken of newly discovered populations within work areas.
- If populations of Kern mallow are located within work areas, these populations will be avoided to the greatest extent feasible. Populations that can be avoided will be flagged for avoidance prior to the start of construction and a biological monitor will be present to ensure compliance with off-limit areas. Indirect impacts to Kern mallow populations will be minimized by creation of a buffer zone around known populations. The buffer zone will be determined by a qualified biologist in consultation with the USFWS and will be of sufficient size to eliminate potential disturbance that may negatively affect the population. The buffer zone will depend on the proposed action on immediate adjacent lands and will include consideration of the plants' ecological requirements.
- If habitat occupied by Kern mallow will be temporarily impacted, the upper 4 inches of topsoil will be stockpiled separately during excavations or scraping, so that it can be used to re-seed the affected areas during restoration according to the Habitat Mitigation Plan.

## 4.3 Valley Elderberry Longhorn Beetle

The following conservation measures are proposed as part of the proposed action to directly or indirectly minimize or eliminate potential adverse effects associated with direct or indirect effects specific to VELB.

Direct impacts on VELB will be avoided by PG&E ensuring that no road improvement activities occur within 20 feet of the elderberry shrubs. Suitable habitat is considered all elderberry stems larger than 1 inch in diameter when measured at ground-level. Improvements to the access road where the elderberry shrubs were observed will be designed or selected such that elderberry shrubs are avoided whenever possible.

- A qualified biologist will survey for the presence of elderberry plants within 20 feet of the work area and will flag all elderberry shrubs with stems measuring 1 inch or greater in the vicinity of the access route to Tension/Pull Site at Tower 65;
- Orange fencing will be erected at least 20 feet from the shrubs to ensure that no road improvement activities occur within 20 feet of the shrubs;
- Field workers will be briefed on the location of elderberry plants in or near the work area and will review appropriate avoidance, protection, and minimization measures outlined in USFWS' Conservation Guidelines for Valley Elderberry Longhorn Beetle (1999);
- Ground disturbing activities will include erosion control measures that prevent soil from leaving the work area or encroaching on an elderberry shrub;
- PG&E will utilize a water truck to spray the access road during vehicle travel to keep fugitive dust to a minimum.

## 4.4 Blunt-Nosed Leopard Lizard

The following conservation measures are proposed as part of the proposed action to directly or indirectly minimize or eliminate potential adverse effects specific to blunt-nosed leopard lizards associated with direct or indirect effects of the proposed action.

- To the extent feasible, areas providing suitable habitat for blunt-nosed leopard lizard will be avoided. During the habitat assessment, biologists identified certain work areas for tension/pull sites and landing zones that PG&E proposed that were in areas that could significantly affect blunt-nosed leopard lizards because (1) the lizards are known to occur in the work areas based on previous observations or CNDDB records; (2) the large number of burrows occurring within the proposed work areas; and (3) the relatively high density of the shrubs would have made it extremely difficult to see all of the burrows. Biologists recommended that these work areas be moved. As a result, PG&E agreed to move these tension/pull sites and landing zones to areas with significantly fewer burrows and less dense shrubs, thus allowing for greater avoidance of burrows.
- Prior to any ground disturbing activities occurring within suitable habitat, protocol blunt-nosed leopard surveys will occur in those work areas. The work areas that occur within suitable blunt-nosed leopard habitat will be fenced using material that blunt-nosed leopard lizards cannot climb immediately following the protocol surveys. The protocol surveys (involving 17 separate surveys) will be conducted to determine whether blunt-nosed leopard lizards occur within the fenced area. If blunt-nosed leopard lizards do occur, these active burrows will be avoided by a 50-foot buffer. If necessary, a CDFG or USFWS representative will be contacted so that the lizards may be passively relocated.
- When construction vehicles must travel off existing access roads located within suitable habitat, a qualified biologist will walk ahead of the vehicles and identify a route for the vehicles to follow

that will avoid burrows to the greatest extent practicable. To avoid direct mortality of blunt nosed leopard lizards when working in suitable habitat, plywood boards will be placed to cover suitable burrows that occur along the vehicle access routes. These boards will be removed immediately after the construction vehicles have driven over them. To the greatest extent possible, the construction vehicles will avoid parking on burrows.

- If guard crossing poles need to be established within suitable blunt-nosed leopard lizard habitat, a biologist will work with construction crews to ensure that the poles are sited to avoid burrows. When removal of shrubs is necessary to allow vehicle access, it is recommended that the shrubs be removed by hand.
- Surface-disturbing activities will be designed to minimize or eliminate effects to rodent burrows that may provide suitable hibernating and aestivation habitat. Areas with a high concentration of burrows will be avoided by surface-disturbing activities to the maximum extent practicable. In addition, when a concentration of burrows is present in a project site, the area will be staked or flagged to ensure that work crews are aware of their location and to facilitate avoidance of the area.
- A preconstruction survey will be conducted each day immediately preceding construction activity that occurs in designated blunt-nosed leopard lizard habitat or in advance of any activity that may result in take of this species. Vehicles will be inspected each morning before they are moved.
- All suitable habitat for blunt-nosed leopard lizard that is temporarily affected by project-related activities will be restored to pre-project conditions. Site-specific restoration measures and success criteria will be outlined in the Restoration Plan, which will be part of the overall Habitat Mitigation Plan developed for the project.

# 4.5 California Condor and Golden Eagle

The following conservation measures are proposed as part of the proposed action to directly or indirectly minimize or eliminate potential adverse direct or indirect effects of the proposed action specific to California condors and golden eagles.

- All transmission and sub-transmission towers and poles will be designed to be raptor-safe in accordance with PG&E's Avian Protection Plan (PG&E 2007). This will include:
  - Increasing separation of cables to achieve adequate distance for the California condor,
  - Covering energized parts and/or covering grounded parts with materials appropriate for providing incidental contact protection for birds, and
  - Install perch guards on distribution line poles to discourage raptors from perching on the poles.
- All fuels, fluids, and components with hazardous materials/wastes will be handled in accordance with applicable regulations. All such materials will be kept in segregated storage with secondary containment as necessary. Records of storage and inspection will be maintained and will provide for proper offsite disposal. Hazardous materials will be stored in a neat, orderly manner in their appropriate containers in an enclosed and secured location such as portable outdoor hazardous materials storage cabinets equipped with secondary containment to prevent

contact with rainwater. The portable hazardous materials storage cabinets may be moved with each block of development, as deemed necessary.

- Project personnel shall collect all litter, small artificial items, and food waste from the action area on a regular basis.

# 4.6 Giant Kangaroo Rat and Tipton Kangaroo Rat

The following conservation measures are proposed as part of the proposed action to directly or indirectly minimize or eliminate potential adverse effects specific to giant kangaroo rats and Tipton kangaroo rats.

- To the extent feasible, areas providing suitable habitat for giant kangaroo rat and Tipton kangaroo rat will be avoided. During the habitat assessment, biologists identified certain tension/pull sites and landing zones that PG&E proposed that were in areas that could significantly affect giant kangaroo rats and Tipton kangaroo rats because (1) the kangaroo rats are known to occur or have a high probability of occurring in the work areas based on previous observations and CNDDB records; (2) the large number of burrows occurring within the proposed work areas; and (3) the relatively high density of the shrubs would have made it extremely difficult to see all suitable burrows. Biologists recommended that these work areas be moved. As a result, PG&E agreed to move these tension/pull sites and landing zones to areas with significantly fewer burrows and much less dense shrubs, thus allowing for greater avoidance of burrows.
- When construction vehicles must travel off existing access roads within suitable habitat, a qualified biologist will walk ahead and identify a route for the vehicles to follow that will avoid burrows to the greatest extent practicable. To minimize direct mortality to giant kangaroo rats and Tipton kangaroo rats when working in suitable habitat, plywood boards will be placed to cover suitable burrows that occur along the vehicle access routes. These boards will be removed immediately after the construction vehicles have driven over them. To the greatest extent possible, the construction vehicles will avoid parking on burrows.
- If guard crossing poles need to be established within suitable giant kangaroo rat or tipton kangaroo rat habitat, a biologist will work with construction crews to ensure that the poles are sited to avoid burrows. When removal of shrubs is necessary to allow vehicle access, it is recommended that the shrubs be removed by hand.
- If occupied or potentially occupied burrows cannot be avoided, a qualified biologist will stake and flag a work-exclusion zone of at least 30 feet around active burrows prior to covered activities at the job site and remain onsite as a biological monitor. If work must proceed in the exclusion zone, PG&E will pursue techniques to minimize direct mortality. These will include having approved biologists, holding a current ESA 10(a)(1)(A) handling permit for giant kangaroo rats and/or Tipton kangaroo rats, trap and hold species in captivity, and excavating and closing burrows. The trapping and removal of giant kangaroo rats and Tipton kangaroo rats will occur prior to any ground disturbing activities in suitable habitat. In areas that are temporarily disturbed, the approved biologist will release the mammals to areas where they were trapped as soon as possible when the work is complete and habitat is restored.

# 4.7 San Joaquin Kit Fox

The following conservation measures are proposed as part of the proposed action to directly or indirectly minimize or eliminate potential adverse direct or indirect effects of the proposed action specific to San Joaquin kit fox.

- A qualified biologist(s) will conduct preconstruction den surveys no more than 14 days prior to the initiation of work activities in a given area, to ensure that potential kit fox dens are not disrupted by work activities. If potential dens are located within the survey area, the entrance of the dens will be monitored for 3 consecutive nights with tracking medium or an infrared-beamed remote camera prior to the initiation of work activities to determine the status of the potential dens. If San Joaquin kit fox activity is observed at the den during this period, the den will be monitored for at least 5 consecutive days from the time of the observation to allow any resident kit fox to move to another den during its normal activity. Use of the den can be discouraged during this period by partially plugging its entrance(s) with soil in such a manner that any resident animals can escape easily. Only when the den is determined to be unoccupied may the den be excavated under the direction of a qualified biologist. If the animal is still present after 5 or more consecutive days of monitoring, the den may be excavated when, in the judgment of the qualified biologist, it is temporarily vacant (i.e., during the animal's normal foraging activities). USFWS and CDFG encourage hand excavation, but realize that soil conditions may necessitate the use of excavating equipment. Extreme caution will be exercised under these circumstances. Destruction of the den will be accomplished by careful excavation until it is certain that no San Joaquin kit fox or other animals are present. The den will be fully excavated, filled with dirt, and compacted to ensure that kit foxes cannot reenter or use the den during construction period. If at any point during the excavation a San Joaquin kit fox is discovered inside the den, the excavation will cease immediately and monitoring of the den described above will be resumed. Destruction of the den may be completed when, in the judgment of a qualified biologist, the animal has escaped from the partially destroyed den.
- Should it be determined that a den site within a work area is a natal den, destruction of the den will not be permitted until the pups and adults have vacated and then only after consultation with USFWS and CDFG. Project activities at the location of the natal den will be postponed to avoid disturbance.
- Exclusion zones will be established around suitable dens and construction activities will be greatly restricted within these exclusion zones. The radius of these zones will follow current standards or will be as follows:
- Potential den – 50 feet
- Known den – 100 feet
- Natal/pupping den – to be determined on a case-by-case basis in coordination with USFWS and CDFG
- Atypical den – 50 feet
- San Joaquin kit foxes are attracted to den-like structure such as pipes and may enter stored pipe, becoming trapped or injured. All pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored near the work areas for 1 or more overnight periods must be thoroughly inspected for kit foxes before the structure is subsequently buried, capped, or otherwise moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not

be moved until USFWS has been consulted by phone. If necessary, and under direct supervision of a USFWS-approved biologist, the pipe may be moved once to remove it from the path of repair activity, until the fox has escaped.

- All trenches will be covered at the end of each work day, or escape ramps will be installed in the trench at regular intervals to allow San Joaquin kit fox and other animals that fall in the trench means of escape.
- PG&E will restore all areas identified as San Joaquin kit fox habitat that are temporarily disturbed by work activities to pre-project conditions within 12 to 18 months of completion of the proposed action, according to pre-defined vegetative success criteria. Success criteria and the methods used to attain them will be outlined as part of the Habitat Mitigation Plan.

# 4.8 Compensation

Although PG&E will avoid and minimize effects to the extent practicable, some take of habitat is likely to result from project-related activities. To reduce potential impacts on sensitive habitats and species, PG&E will fund the acquisition, enhancement, and maintenance of habitat to conserve and promote the recovery of sensitive species within the action area. The approach to compensation, determination of compensation needs, compensation mechanisms, and attributes and management of compensation land are discussed below.

## 4.8.1 Compensatory Conservation Strategy

The primary goal of the proposed project's conservation strategy is to ensure that the proposed project has no net adverse effect to populations of the federally listed species that will be potentially affected by the proposed project. This goal will be accomplished through the following:

- PG&E will focus on acquiring habitat in the northern Carrizo Plain for temporary and permanent impacts to habitat for giant kangaroo rat, and San Joaquin kit fox that occur in San Luis Obispo County. This may be done in conjunction with First Solar who is also proposing to acquiring habitat in the northern Carrizo Plain to compensate for impacts associated with their solar project.
- PG&E will focus on purchasing credits at a suitable bank in western Kern County for temporary impacts to suitable habitat for Kern mallow, blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox. If a bank is not available, PG&E will contribute monies for habitat restoration and preservation to the Center for Land Management or other conservation entity. The amount that will be given will be determined through consultation with the USFWS and CDFG.

Preactivity surveys will verify the suitable habitat assumptions made in this biological assessment at each of the work areas. Post-construction surveys will be conducted to determine the actual area of disturbances that occurred at each of the work areas. Compensation will be based on these post-construction acreages. All temporary losses of suitable habitat will be mitigated at a 0.5:1 ratio. The compensation for impacts to multiple species can be done simultaneously as long as those lands support all those species.

Prior to the initiation of the proposed project activities, PG&E will provide an irrevocable letter of credit, in a form approved by USFWS and CDFG , to ensure funding for the performance of all

required mitigation, including site preparation, re-vegetation, restoration, and enhancement activities, maintenance activities (e.g., mulching, weeding, and watering), monitoring and reporting activities, and long-term management.

Chapter 5
# Analysis of Effects

## 5.1 Kern Mallow

### 5.1.1 Direct Effects

Planned construction activities in staging areas, pull sites, and temporary access roads are anticipated to temporarily affect 0.11 acre of suitable habitat for Kern mallow in Kern County.

Direct effects to populations of Kern mallow are anticipated on those work areas where populations are known to occur and could occur if individuals are present in work areas not yet surveyed. Individual Kern mallow plants could be lost due to trampling or earth moving. Construction activities could result in removal or modification of Kern mallow seed banks through grubbing and clearing of work sites. Increase of fugitive dust during construction due to movement of vehicles in work areas and on access roads could reduce survivorship and productivity of individual plants close to dust sources by decreasing photosynthetic output, reducing transpiration, and adversely affecting reproductive success.

Conservation measures described in Chapter 4 will be implemented to avoid and minimize direct effects on populations of Kern mallow and compensate for temporary impacts to suitable Kern mallow habitat.

### 5.1.2 Indirect Effects

Noxious weeds could be spread within the project work areas if construction equipment is contaminated with noxious weed seeds. Noxious weeds could adversely affect populations of Kern mallow by increased competition for soil nutrients, competition for growing space, and decreasing photosynthetic output.

Soil compaction, erosion, and sedimentation resulting from construction activities may indirectly affect populations of Kern mallow by altering soil conditions and then what are the effects on Kern mallow due to alteration of soil conditions.

## 5.2 Valley Elderberry Longhorn Beetle

### 5.2.1 Direct Effects

Road improvements on the access Tower 65 could directly impact elderberry shrubs by smothering shrubs with soil that is pushed down-slope from the access road which in turn could adversely affect valley elderberry longhorn beetle. Direct effects to valley elderberry longhorn beetle could occur if these shrubs were lost or greatly stressed due to construction activities. All of the conservation measures described in Chapter 4 will be implemented to avoid and minimize direct effects on valley

elderberry longhorn beetle. PG&E will ensure that no road improvements occur within 20 feet of the elderberry shrubs to avoid any direct impacts to the elderberry shrubs.

### 5.2.2 Indirect Effects

Indirect effects to valley elderberry longhorn beetle could result from increased fugitive dust during and changes in hydrology due to movement of vehicles on the access roads. Fugitive dust could reduce survivorship and productivity of the elderberry shrubs by decreasing photosynthetic output, reducing transpiration, which could affect the health of the shrub and may lead to the death of the shrub. This in turn could directly affect valley elderberry longhorn beetle. PG&E will utilize a water truck to spray the access road during travel on the access road to keep the fugitive dust to a minimum.

## 5.3 Blunt-Nosed Leopard Lizard

### 5.3.1 Direct Effects

Planned construction activities in staging areas, pull sites, and temporary access roads are anticipated to temporarily affect 20.15 acres of suitable habitat for blunt-nosed leopard lizards in Kern County and temporarily affect 4.12 acres of suitable habitat in San Luis Obispo County.

Direct effects will include injury or mortality if blunt-nosed leopard lizards are hit by construction equipment or vehicles. Blunt-nosed leopard lizards are more likely to be hit by vehicles or construction equipment when weather is cool, causing blunt-nosed leopard lizards to be less active because of low body temperature.

Direct mortality could result by entombment of blunt-nosed leopard lizards in burrows that may collapse during construction activity.

Installation of buried power and communication cables in suitable habitat could directly affect blunt-nosed leopard lizards by creating impassable barriers between burrows and foraging areas. Additionally, blunt-nosed leopard lizards could fall into deep, steep-walled trenches and not be able to escape. The lizards would be vulnerable to predation, starvation, or entombment.

All of the conservation measures described in Chapter 4 will be implemented to avoid and minimize direct effects on blunt-nosed leopard lizards and compensate for potential temporary impacts to suitable blunt-nosed leopard lizard habitat.

### 5.3.2 Indirect Effects

Potential indirect temporary habitat loss or degradation could result from habitat disturbances that increase the likelihood of colonization by invasive weeds. Blunt-nosed leopard lizards need open areas in which to bask, move, and catch prey. Invasive weeds often out-compete with native plants and can establish themselves in open areas. These open areas can become over-run with invasive plants, which make the movement of blunt-nosed leopard lizards and the ability to catch prey much more difficult Implementation of conservation measures to discourage the introduction of weeds would reduce the potential of invasive weeds colonizing suitable blunt-nosed leopard lizard habitat.

Blunt-nosed leopard lizards may be passively displaced from work sites and adjacent occupied habitat by human activity and noise associated with construction activities. Such temporary displacement could be considered take by harassment under the federal ESA.

# 5.4 California Condor and Golden Eagle

## 5.4.1 Direct Effects

Construction activities associated with the project are expected to temporarily directly affect foraging habitat for California condor and golden eagle, although the amount of foraging habitat that will be affected is small compared to the amount of foraging habitat that is available in the Carrizo Plain (roughly 20 acres of compared to 1,000s of acres of suitable foraging habitat). The project entails reconductoring of an existing power line that has existed as part of the landscape for approximately 50 years. The new reconductor will not change the location of this line nor will it change the configuration of the line. All of the conservation measures described in Chapter 4 will be implemented to avoid and minimize direct effects to individual California condors and golden eagles.

## 5.4.2 Indirect Effects

Project construction activities could potentially introduce microtrash (i.e. glass, plastic trash, and small pieces of metal). Condors are very inquisitive birds and have been known to collect microtrash. This waste is either ingested or brought back to nest sites where young condors ingest the material. This can lead to mortality of adults and young birds in the nest. Additionally, vehicle use and maintenance can result in the spill of toxic fluids. Ingestion of toxic fluids by condors and golden eagles can result in death. The potential for these impacts will be avoided or minimized with implementation of conservation measures indentified in Chapter 4 that are incorporated into the project.

# 5.5 Mountain Plover

## 5.5.1 Direct Effects

Construction activities associated with the project are expected to temporarily directly affect foraging habitat for mountain plovers, although the amount of foraging habitat that will be affected is small compared to the amount of foraging habitat that is available in the Carrizo Plain (roughly 20 acres of compared to 1,000s of acres of wintering habitat). Construction activities will not affect nesting mountain plovers because mountain plovers do not nest in California,

## 5.5.2 Indirect Effects

No indirect effects to mountain plovers will occur as a result of the project.

# 5.6 Giant Kangaroo Rat and Tipton Kangaroo Rat

## 5.6.1 Direct Effects

Planned construction activities in staging areas, pull sites, and temporary access roads within the action area are anticipated to temporarily affect 17.48 acres of suitable giant kangaroo rat habitat in Kern County and temporarily affect 4.12 acres of suitable habitat in San Luis Obispo County.

Planned construction activities in staging areas, pull sites, and temporary access roads are anticipated to temporarily affect 0.22 acres of suitable Tipton kangaroo rat habitat in Kern County.

In giant kangaroo rat precincts or Tipton kangaroo rat burrow complexes that will be impacted to the extent that mortality of individuals will occur, individuals will be trapped and kept to be released once construction activities have been completed and habitat restored. There is potential for injury or mortality of individuals during this process.

Direct effects will include injury or mortality if giant kangaroo rats or Tipton kangaroo rats are hit by construction equipment or vehicles. The extent to which giant kangaroo rats and Tipton kangaroo rats are susceptible to vehicular strikes is dependent on the extent of nighttime construction. More frequent nighttime construction activities in suitable giant kangaroo rat and Tipton kangaroo rat habitat could result in greater potential direct take of giant kangaroo rats and Tipton kangaroo rats by running them over with construction equipment and personal vehicles traveling to and from the work areas.

Direct mortality could result by entombment of giant kangaroo rats or Tipton kangaroo rats in burrows that may collapse during construction activity.

Vehicles and construction equipment could damage vegetation and degrade food resources.

Installation of buried power and communication cables in suitable habitat could directly affect giant kangaroo rat or Tipton kangaroo rats by creating impassable barriers between burrows and foraging areas within the action area. Additionally, giant kangaroo rats or Tipton kangaroo rats could fall into deep, steep-walled trenches and not be able to escape. The kangaroo rats would be vulnerable to predation, starvation, or entombment.

All of the conservation measures described in Chapter 4 will be implemented to avoid and minimize direct effects on giant kangaroo rats and Tipton kangaroo rats and compensate for permanent and temporary impacts to suitable giant kangaroo rat habitat and temporary impacts to suitable Tipton kangaroo rat habitat.

## 5.6.2 Indirect Effects

Giant kangaroo rats or Tipton kangaroo rats displaced from the action area due to disturbance-related construction activities may increase competition for prey and living spaces with kangaroo rats in other areas.

There is potential for increased predation of giant kangaroo rats or Tipton kangaroo rats by red foxes, coyotes, or domestic dogs that might be attracted to food scraps and other trash discarded within the work areas by construction personnel.

The use of pesticides or rodenticides to control noxious weeds or rodents within work areas could result in poisoning giant kangaroo rats or Tipton kangaroo rats.

Spills or leaks of vehicle fluids, lubricants, or other toxic fluids could result in poisoning of giant kangaroo rats or Tipton kangaroo rats, their seed base, or their habitat.

# 5.7 San Joaquin Kit Fox

## 5.7.1 Direct Effects

Planned construction activities in staging areas, pull sites, and temporary access roads are anticipated to temporarily affect 20.15 acres of suitable San Joaquin kit fox habitat in Kern County and temporarily affect 4.12 acres of suitable habitat in San Luis Obispo County within the action area.

Direct effects will include injury or mortality if San Joaquin kit foxes are hit by construction equipment or vehicles. The extent to which San Joaquin kit foxes are susceptible to vehicular strikes depends on the extent of nighttime construction.

Construction activities could result in disturbance of active dens close to work areas or destruction of active dens within work areas.

San Joaquin kit foxes could fall into deep, steep-walled trenches dug for the installation of buried power and communication cables and not be able to escape. The kit foxes would be vulnerable to predation, starvation, or entombment.

Noise generated by construction activities could temporarily exceed the hearing sensitivity thresholds of San Joaquin kit foxes. Even temporary loss or reduction of hearing ability could negatively affect foraging success as San Joaquin kit foxes primarily rely on hearing to locate prey and detect predators. Noise and human activity in work areas may also cause kit foxes to permanently emigrate from work sites, and possibly enter areas where they would be more susceptible to predation (areas with fewer escape burrows) or to areas with lower prey base.

All of the conservation measures described in Chapter 4 will be implemented to avoid and minimize direct effects on San Joaquin kit foxes and compensate for permanent and temporary impacts to suitable habitat for San Joaquin kit foxes.

## 5.7.2 Indirect Effects

Kit foxes displaced from the project area due to disturbance-related construction activities may increase competition for prey and living spaces with kit foxes in other areas.

There is potential for increased predation of San Joaquin kit foxes by red foxes, coyotes, or domestic dogs that might be attracted to food scraps and other trash discarded within the action area by construction personnel.

The use of pesticides or rodenticides to control noxious weeds or rodents could result in secondary poisoning of San Joaquin kit foxes.

Spills or leaks of vehicle fluids, lubricants, or other toxic fluids could result in poisoning of kit foxes, their prey, or their habitat.

# 5.8 Critical Habitat

Critical habitat has not been designated for Kern mallow, blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox. Therefore, no adverse effects to critical habitat for these species will occur as a result of the proposed action.

Critical habitat that has been designated for valley elderberry longhorn beetle is located along the lower American River in Sacramento. No designated critical habitat for valley elderberry longhorn beetle is located in or in near the action area. Therefore, the Project will not affect critical habitat for valley elderberry longhorn beetle.

The nearest designated critical habitat for California condor is the East Unit of the Hi Mountain-Beartrap Condor Area, approximately 7.1 miles west of the western end of the action area, where captive-raised condors were formerly released. Therefore, the Project will not affect critical habitat for California condor because none of the proposed project activities will occur within designated critical habitat.

# 5.9 Interrelated Actions

PG&E's Carrizo-Midway 230kV Power Line Reconductoring Project is interrelated to the Topaz Project because PG&E would not need to reconductor the transmission line were it not necessary to do so to accommodate the final 150 megawatts of power to be generated by the Topaz Project and the power that would be generated by another proposed solar project in the region.. First Solar has prepared a biological assessment that describes its project and identifies their project impacts to federally listed plant and wildlife species (Althouse and Meade, Inc. November 2010). First Solar has included mitigation measures to avoid and minimize direct and indirect affects to federally listed plant and wildlife species and has proposed to compensate for temporary and permanent impacts to habitat for these species. The mitigation measures identified in this biological assessment are similar to those proposed in First Solar's biological assessment for those species that would be affected by PG&E's reconductoring project and the Topaz Project. PG&E has also include mitigation measures to avoid and minimize impacts to species that are not addressed in First Solar's biological assessment because they either only occur in Kern County (Kern mallow, valley elderberry longhorn beetle, and Tipton kangaroo rat) and has proposed compensatory mitigation for temporary impacts to habitat in Kern County.

# 5.10 Interdependent Actions

An interdependent action is one with no independent utility apart from the action under consultation. No interdependent actions are associated with the proposed action.

# 5.11 Cumulative Effects

Cumulative effects as defined in the Section 7 implementing regulations include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in the biological opinion. Effects of future federal actions that are unrelated to the proposed action are not considered cumulative impacts in the Section 7 consultation process.

The proposed Carrizo-Midway 230 kV Power Line Reconductoring Project, in combination with other projects in the area and other activities that affect the species that are affected by this project, could contribute to cumulative effects on vegetation communities, common plant and animal species, and federally listed plant and animal species. The geographic extent for the analysis of cumulative impacts related to biological resources includes the Carrizo Plain and the larger Ciervo-Panoche region, including areas of western Fresno County, regions of western Kern County in the San Joaquin Valley, eastern San Luis Obispo County, and northern Santa Barbara County. The areas included in this cumulative analysis contain suitable and occupied habitat for species potentially affected by the Carrizo-Midway 230 kV Reconductoring Project, including the San Joaquin kit fox, giant kangaroo rat, Tipton kangaroo rat, California condor, blunt-nosed leopard lizard, and Kern mallow. Each of these locations may also support core, critical, or unique populations essential to recovery and long-term survival of these species (U.S. Fish and Wildlife Service 1996, 1998, 2010a, 2010b, 2010c, 2010d).

Between 1987 and 2006, approximately 120 projects were permitted by USFWS for take of blunt-nosed leopard lizards. These projects impacted approximately 21,200 acres of suitable habitat for blunt-nosed leopard lizard (U.S. Fish and Wildlife Service 2010a). Between 1987 and 2008, USFWS authorized permanent alteration of more than 6,300 acres and temporary disturbance of nearly 3,000 acres of giant kangaroo rat habitat (U.S. Fish and Wildlife Service 2010b). Since 1988, USFWS evaluated 50 projects affecting Tipton kangaroo rats. These projects resulted in permanent impacts to 14,824 acres and temporary impacts to 5,896 acres of suitable habitat (U.S. Fish and Wildlife Service 2010c). Projects permitted by USFWS between 1988 and 2007 have resulted in permanent alteration of over 118,000 acres of San Joaquin kit fox habitat (with an additional 20,000 acres affected by temporary disturbance) for large-scale water storage and conveyance, urban development, agriculture, oil and gas development, and other developments (U.S. Fish and Wildlife Service 2010d). This loss of habitat is substantial and yet includes only the loss of habitat to large projects that required and received environmental review by federal and state resource agencies.

The continued incremental loss of habitat to smaller-scale land conversion is more difficult to quantify and yet may be as substantial or even more substantial. It is apparent that a significant portion of the remaining occupied habitat for these species is on private land and is highly vulnerable to incompatible land use; although typically smaller scale, collectively, incompatible land uses may result in significant and often undetermined cumulative effects.

# Chapter 6
# Conclusion and Determination

The Carrizo-Midway 230 kV Reconductoring Project will result in the temporary loss of Kern mallow habitat. The project also will result in the permanent loss of denning, foraging, and dispersal habitat for San Joaquin kit fox and will temporarily affect habitat potentially used by blunt-nosed leopard lizards, giant kangaroo rats, Tipton kangaroo rats, and San Joaquin kit foxes for denning, foraging, and dispersal. The project also will affect potential foraging habitat for California condors and could affect elderberry shrubs that provide suitable habitat for valley elderberry longhorn beetles.

Through project design and implementation of conservation measures, the project will avoid or minimize effects to these species to the greatest extent practicable. Furthermore, with implementation of conservation measures, many of which were modeled from PG&E's San Joaquin Valley O&M HCP, the project is not expected to contribute to cumulative impacts to these species.

## 6.1 Kern Mallow

PG&E has designed its project to avoid Kern mallow to the greatest extent practicable. However, because the project will occur in habitat with known populations of Kern mallow, there is potential for loss of individuals during construction. A take permit for Kern mallow is requested because the proposed action is likely to adversely affect Kern mallow. PG&E will avoid and minimize direct and indirect effects on populations of Kern mallow through implementation of conservation measures described in Chapter 4 of this BA.

## 6.2 Valley Elderberry Longhorn Beetle

Direct effects on valley elderberry longhorn beetles will be avoided through implementation of conservation measures described in Chapter 4 of this BA. Therefore, the project will not adversely affect valley elderberry longhorn beetles.

## 6.3 Blunt-Nosed Leopard Lizard

PG&E has designed its project to avoid blunt-nosed leopard lizards to the greatest extent practicable. However, because the project will affect suitable habitat for blunt-nosed leopard lizards a take permit for blunt-nosed leopard lizard is requested because the proposed action is likely to adversely affect blunt-nosed leopard lizards. PG&E will avoid direct take and minimize direct impacts to suitable blunt-nosed leopard lizard habitat and indirect effects to blunt-nosed leopard lizards through implementation of conservation measures described in Chapter 4 of this BA.

## 6.4 California Condor and Golden Eagle

The project will exchange the conductors on an existing power line that has been part of the landscape for approximately 50 years without changing the location of the line. PG&E will also implement guidelines in its Avian Protection Plan. Therefore the project will not adversely affect individual California condors or golden eagles. The project will directly affect California condor and golden eagle foraging habitat, though the amount of foraging habitat that will be affected is small compared to the amount of foraging habitat that is available in the Carrizo Plain. Furthermore, the loss of foraging habitat will not affect the recovery of the California condor due to the extent of available foraging habitat that is available.

## 6.5 Mountain Plover

Direct effects to suitable mountain plover habitat will be minimal and will be temporary. The amount of habitat that will be affected is small compared to the amount of habitat that is available in the Carrizo Plain. Construction activities will not affect nesting mountain plovers because mountain plovers do not nest in California, Therefore, the project will not adversely affect mountain plovers.

## 6.6 Giant Kangaroo Rat and Tipton Kangaroo Rat

PG&E has designed its project to avoid giant kangaroo rats and Tipton kangaroo rats to the greatest extent practicable. However, because the project will affect suitable habitat for giant kangaroo rats and Tipton kangaroo rats and there is potential for loss of individuals during construction, a take permit for giant kangaroo rat and Tipton kangaroo rat is requested because the proposed action is likely to adversely affect giant kangaroo rats and Tipton kangaroo rats. PG&E will avoid and minimize direct and indirect effects to giant kangaroo rats and Tipton kangaroo rats through implementation of conservation measures described in Chapter 4 of this BA.

## 6.7 San Joaquin Kit Fox

PG&E has designed its project to avoid San Joaquin kit foxes to the greatest extent practicable. PG&E will avoid and minimize direct and indirect effects to San Joaquin kit foxes through implementation of conservation measures described in Chapter 4 of this BA. However, because the project will affect suitable habitat for San Joaquin kit fox and there is potential for loss of individuals during construction, a take permit for San Joaquin kit fox is requested because the proposed action is likely to adversely affect San Joaquin kit foxes.

Appendix A

# Species List for the Carrizo-Midway 230kV Power Line Reconductoring Project in Kern and San Luis Obispo Counties, California

These buttons will not appear on your list.

Revise Selection

Print this page

Print species list before going on to letter.

Make Official Letter

## U.S. Fish & Wildlife Service

# Sacramento Fish & Wildlife Office

**Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested**

**Document Number: 100928094942**

**Database Last Updated: April 29, 2010**

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### Quad Lists

**Listed Species**

**Invertebrates**

- Branchinecta longiantenna
  - longhorn fairy shrimp (E)
- Branchinecta lynchi
  - vernal pool fairy shrimp (T)
- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)

**Fish**

- Hypomesus transpacificus
  - delta smelt (T)

**Amphibians**

- Ambystoma californiense
  - California tiger salamander, central population (T)
- Rana draytonii
  - California red-legged frog (T)

**Reptiles**

- Gambelia (=Crotaphytus) sila
  - blunt-nosed leopard lizard (E)
- Thamnophis gigas
  - giant garter snake (T)

**Birds**

- Gymnogyps californianus
  - California condor (E)

**Mammals**

- Dipodomys ingens
  - giant kangaroo rat (E)
- Dipodomys nitratoides nitratoides
  - Tipton kangaroo rat (E)
- Sorex ornatus relictus
  - Buena Vista Lake shrew (E)
- Vulpes macrotis mutica
  - San Joaquin kit fox (E)

**Plants**

- Caulanthus californicus
  - California jewelflower (E)
- Eremalche kernensis
  - Kern mallow (E)
- Monolopia congdonii (=Lembertia congdonii)
  - San Joaquin woolly-threads (E)

**Quads Containing Listed, Proposed or Candidate Species:**

BUTTONWILLOW (241B)

LOKERN (242A)

BELRIDGE (242B)

CARNEROS ROCKS (243A)

MCKITTRICK SUMMIT (243D)

LA PANZA NE (244A)

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## County Lists

No county species lists requested.

**Key:**

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

## Important Information About Your Species List

### How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

### Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

### Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

**Your Responsibilities Under the Endangered Species Act**

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

**Take incidental to an otherwise lawful activity may be authorized by one of two procedures:**

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.
- During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.
- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.
- Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

**Critical Habitat**

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

**Candidate Species**

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

**Species of Concern**

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

**Wetlands**

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

**Updates**

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be December 27, 2010.

# BIOLOGICAL OPINION

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825

In Response Reply To:
81420-2011-F-0625

22 July 2011

Ms. Angela F. Colamaria
U.S. Department of Energy
Loan Programs Office
Environmental Compliance Division
1000 Independence Avenue, S.W., LP-10
Washington, DC 20585

Ms. Jane M. Hicks
Department of Army
San Francisco District
U.S. Army Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Subject: Biological Opinion on the Proposed Topaz Solar Farm, San Luis Obispo County, California

Dear Ms. Colamaria and Ms. Hicks:

This letter is in response to the Department of Energy's (DOE) letter dated February 17, 2011, and the U.S. Army Corps of Engineers' (Corps) letter dated July 12, 2011, requesting formal consultation with the Fish and Wildlife Service (Service) on the DOE's Federal Loan Guarantee for the construction and start-up of the Topaz Solar Farm Project (Topaz Project) by Topaz Solar Farms LLC (Topaz) and the associated infrastructure in San Luis Obispo County, California. This response is provided in accordance with the Endangered Species Act of 1973, as amended (16 USC 1531 *et seq.*) (Act).

The Service has been notified by DOE, pursuant to 50 CFR § 402.07, that this section 7 consultation is being conducted on behalf of both DOE and the Corps, and that DOE is acting as the lead federal agency. We understand that the Corps will be utilizing and relying upon this consultation in connection with its decision on whether to issue a discharge fill permit for jurisdictional waters of the U.S. for the Topaz Project. Both agencies will be incorporating the terms and conditions of this consultation into their respective decisions and permits, and DOE and the Corps have agreed that DOE will have primary responsibility for monitoring compliance and reporting. DOE and the Corps will sometimes be collectively referred to herein as "Action Agencies."

TAKE PRIDE IN AMERICA

The proposed Topaz Solar Farm is a 550-megawatt (MW) solar photovoltaic (PV) energy plant, on approximately 3,520 acres in eastern San Luis Obispo County, California. The Topaz Project includes construction and start-up of the following project elements: 1) the 550 MW Topaz Solar Farm (TSF) where the solar array complexes and facilities will be located; and 2) the 5-acre substation to step up electricity generated by the solar generation facility to 230kV. For purposes of this biological opinion, the Project also includes 3) the 6.3-acre Pacific Gas and Electric (PG&E) Solar Switching Station adjacent to the substation and connected by 200-foot connection lines, which transfers electricity from the TSF to an existing PG&E transmission line; 4) proposed fill in the Corps' jurisdictional waters of the U.S.; and 5) the preservation, enhancement, and maintenance of Off-Site Conservation Lands to support a regional strategy for the conservation of the San Joaquin kit fox in the Carrizo Plain. The 3,520-acre Project Footprint area includes the first three project elements described above. For purposes of this biological opinion, all activities are part of a single federal action and are collectively referred to as the Proposed Action.

Network upgrades to the existing Pacific Gas and Electric Company (PG&E) Morro Bay to Midway transmission line are required to accommodate the interconnection of the Topaz Project to the electrical grid, as well as to accommodate other generation projects in the region. PG&E prepared a Biological Assessment for the PG&E Reconductoring Project (ICF International 2010) and a small portion (2 of 35 miles) of the reconductoring action is within the Action Area of the Topaz project. The Service completed a biological opinion (Service file 81420-2011-F-0511) on the adjacent California Valley Solar Ranch Project which included the entire PG&E reconductoring as part of the proposed action (U.S. Fish and Wildlife Service 2011b), therefore those proposed actions have been fully analyzed with respect to species listed pursuant to the Act and are not addressed further here.

This biological opinion is based on information from the following sources: Biological Assessment for the Topaz Solar Farm Project (Althouse and Meade, Inc. 2011a and ICF International 2010 and 2011); San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse and Meade, Inc. 2011b); Final Biological Report for the Topaz Solar Farm, California Valley (Althouse and Meade, Inc. 2010a); Biological Report Technical Appendix, Volumes 1, 2 and 3. (sub-consultant and other protocol reports cited in the July 2010 Final Biological Report for the Topaz Project) (Althouse and Meade, Inc. 2010b); Biological Report Technical Appendix, Volume 4 (sub-consultant and other protocol reports cited in the July 2010 Final Biological Report for the Topaz Project) (Althouse and Meade, Inc. 2010c); July 2011 Revised Biological Assessment (Althouse and Meade, Inc. 2011c), the Corp's July 12, 2011 request for consultation, meetings and site visits conducted with the Project proponents; and additional information submitted by the Action Agencies and their consultants. A complete administrative record of this consultation is on file at the Sacramento Fish and Wildlife Office.

DOE made an initial determination that the Proposed Action may affect and is likely to adversely affect the following federally listed species:

Federally listed endangered:

- San Joaquin kit fox (*Vulpes macrotis mutica*)
- longhorn fairy shrimp (*Branchinecta longiantenna* )

Federally listed threatened:

- vernal pool fairy shrimp (*Branchinecta lynchi*)

DOE made an initial determination that the Proposed Action may affect and is not likely to adversely affect the:

- mountain plover (*Charadrius montanus*), a Federal candidate that was proposed for listing as threatened at the time this consultation was initiated.

In the initiation letter you indicated that adverse effects to vernal pool fairy shrimp and longhorn fairy shrimp are "unlikely" to occur in the areas of construction and operation. The regulations that implement §7 of the Act indicate that an adverse effect is one that is likely to occur (50 CFR 402.12(a)). Rigorous and complete surveys to identify all wetlands that will provide breeding habitat for vernal pool crustaceans have been conducted to our satisfaction. The Service determines that additional surveys for wetlands that could be occupied by vernal pool species are not necessary or warranted. The measures identified in the biological assessment include avoidance of all wetlands that are known to be or could be occupied by vernal pool species and a biological monitor onsite during construction and operation to assure these measures are carried out. The effects identified in the biological assessment conclude in several places that direct and indirect effects to hydrology and wetlands are unlikely or are avoided altogether. These measures proposed are rigorous and conclusive and indicate that adverse effects are not reasonably foreseeable and thus are not likely to occur. The likelihood that vernal pool crustaceans will occur in areas other than the identified wetlands is unlikely and therefore adverse impacts are unlikely to occur. After a review of the biological assessment where measures are described that avoid and minimize the potential for adverse effects to these vernal pool species, we have determined that the Proposed Action is not likely to adversely affect vernal pool fairy shrimp and/or longhorn fairy shrimp. No critical habitat for these species is within the project area; therefore, none will be affected.

Mountain plover do or are likely to occur in the Proposed Action area during the winter for foraging. However, based on surveys of the Proposed Action area, documentation of known locations, measures to minimize and avoid effects during construction and operation activities, and the proposal to have a Service approved biologist on site during construction to assure avoidance of known or suspected occurrences of this species, we concur with your determination that the Proposed Action is not likely to adversely affect the mountain plover. In addition, on May 11, 2011, the Service withdrew its proposal to list the mountain plover as threatened because we determined listing was not warranted (U.S. Fish and Wildlife Service 2011a); therefore, the mountain plover will not be considered further in this consultation.

Your initiation letter did not address the federally endangered California condor (*Gymnogyps californianus*), although it is mentioned in Appendix A to the Topaz Solar Farm Biological Assessment (Althouse and Meade, Inc. 2011a). The California condor has not been observed on the Proposed Action area; however, the condor does range widely and is known to occur in the broader region of the mountains surrounding the Carrizo Plain, San Joaquin Valley and the region. Two new towers will be constructed near the switching station and approximately 300 poles will be constructed throughout the project area for the medium-voltage electrical collection system. These towers and poles will be designed in such a manner that if a condor were to perch

it will not be electrocuted. The potential for a collision is low, given the rarity of the species in the area, the ubiquitous nature of towers in the species range and the rare incidence of collisions known for this species. Based on the nature of the solar facility (low lying panels on the valley floor), and the habitat use of the condor (mountainous areas surrounding the valleys) we do not expect the California condor to be affected by this project's construction and operation. Therefore, we have determined that the California condor is not likely to be adversely affected by the proposed action. No critical habitat for the California condor occurs in the Proposed Action area; therefore, none will be affected.

Your initiation letter did not address the federally endangered giant kangaroo rat (*Dipodomys ingens*), although it was briefly addressed in the biological assessment (Althouse and Meade, Inc. 2011a). The giant kangaroo rat has not been observed on the 3,520- acre Project Footprint area for the solar facility; however it is known from the northern Carrizo Plain region and has been documented on a few disjunct sites within the proposed 12,154-acres of Off-Site Conservation Lands. It will be unlikely for the giant kangaroo rat to move onto the project area during construction because this site appears to be unsuitable for the species due to rainfall, soil conditions, and the lack of occurrences in the area. In the event the giant kangaroo rat did move onto the project area during construction, pre-construction surveys and other minimization measures will protect the giant kangaroo rat from adverse effects. Giant kangaroo rats on the Off-Site Conservation Lands are not likely to be adversely affected by proposed activities associated with managing the conservation land in perpetuity due to the measures you have proposed to avoid and minimize the potential for adverse effects. Therefore, we have determined that the giant kangaroo rat is not likely to be adversely affected by the proposed action. No critical habitat for the giant kangaroo rat occurs in the Proposed Action area; therefore, none will be affected.

You also discuss effects to the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*). The Service has a legal mandate and trust responsibility to maintain healthy, migratory bird populations for the benefit of the American public pursuant to the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703 et seq.) and the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d). Information from your biological assessment indicates that golden and bald eagles do or may occur in the vicinity of the proposed action. We understand you have contacted our Regional Migratory Bird Program to review your proposed Avian and Bat Protection Plan (ABPP) incorporating avoidance, minimization and mitigation measures into the project. An ABPP would be viewed as good faith effort to comply with MBTA and BGEPA, although it would not abrogate liability inherent to the regulations. A well designed ABPP could ensure the Project's effects on eagles are consistent with the Service's goal of stable or increasing populations and would be consistent with any request for a golden eagle programmatic take permit, when they become available. Please contact Ms. Heather Beeler, Eagle Permit Specialist, at heather_beeler@fws.gov or 916/414-6651 to discuss this process.

In summary, our biological opinion will address the adverse effects to the San Joaquin kit fox on the Proposed Action area. Critical habitat has not been designated for the San Joaquin kit fox and no critical habitat for any federally listed species occurs in the Proposed Action area; therefore, none will be affected.

**Consultation History**

| | |
|---|---|
| *April 1, 2009*: | The Service met with the Topaz Solar Farm team in Sacramento to discuss Project concept and federally listed species which have the potential to occur on or near the Project. |
| *April 6, 2010*: | Topaz Solar Farm team attends a meeting in Fresno with the California Department of Fish and Game (CDFG) and the Service. Meeting topics include project design and regulatory process. |
| *May 26, 2010*: | The Service met with the Topaz Solar Farm team in Sacramento to discuss biological resources findings and the regulatory process. |
| *July 21, 2010*: | Topaz Solar Farm team attends a meeting with the Service in Sacramento to discuss the proposed San Joaquin Kit Fox Mitigation Plan and other listed species. |
| *Sept. 16, 2010*: | The Service and the Topaz Solar Farm team participated via conference call to discuss proposed options for off-site land mitigation for kit fox and other listed species. |
| *Oct. 18-19, 2010:* | The Service and CDFG toured the proposed Topaz Solar Farm and proposed mitigation lands with the Topaz Solar Farm team. |
| *Dec. 14, 2010*: | Topaz Solar Farm team has meeting/telephone call with the Service, DOE, and CDFG regarding a full range of section 7 consultation issues, including potential compensation lands, at the Service office in Sacramento. |
| *Dec. 17, 2010*: | Service staff tour the project site with the Topaz Solar Farm team. |
| *Jan. 18, 2011:* | Topaz Solar Farm team conference call with the Service, CDFG, the County of San Luis Obispo (County) Planning Department, the County's project consultants (Aspen Environmental Group), and DOE. |
| *Jan. 26, 2011:* | The Service, the County, and its project consultants, and DOE participated in a conference call with the Topaz Solar Farm team. |
| *Feb. 1, 2011:* | The Topaz Solar Farm team met with managers from the Service's Sacramento Fish and Wildlife Office and the Pacific Southwest Regional Office in Sacramento to discuss the project. |
| *Feb. 17, 2011:* | DOE provided the Service with the final biological assessment with a request to initiate formal section 7 consultation for the Topaz Solar Farm Project. |
| *Feb. 18 – Present*: | Conference calls and coordination continued among the Service, DOE, Corps, CDFG, PG&E, and the Topaz Solar Farm team, and included updates and clarifications to the project description. |

## BIOLOGICAL OPINION

### Description of the Proposed Action

#### *Project Background*

The purpose of DOE's Proposed Action is to comply with its statutory mandate to select and fund eligible projects that meet the goals of the Energy Policy Act of 2005 (Public Law 109-58), as amended by the American Recovery and Reinvestment Act (ARRA) of 2009. The Energy Policy Act of 2005 established a federal loan guarantee program for eligible energy projects with two principal goals to "encourage commercial use in the U.S. of new or significantly improved energy related technologies" and to "achieve substantial environmental benefits." DOE proposes to provide a loan guarantee to Topaz Solar Farms LLC (applicant) to finance the construction and start-up of the Topaz Solar Farm (TSF) in eastern San Luis Obispo County, California. DOE has also proposed to provide a loan guarantee to High Plains Ranch II LLC (HPR II), a wholly owned subsidiary of SunPower Corporation Systems to finance the construction and start-up of the California Valley Solar Ranch (CVSR) Project, located approximately 4 miles to the east of the TSF, also in the northern Carrizo Plain. A common feature of both projects is to upgrade and increase the electrical transmission capacity of the existing PG&E Morro Bay-Midway 230 kilovolt (kV) transmission line from the proposed Solar Switching Station at the point of interconnection of the TSF Project in San Luis Obispo County to the existing Midway Substation in Kern County, California (PG&E Reconductoring Project) to accommodate the increase in electricity generated by the TSF and the CVSR projects. Although DOE is consulting on both of these projects simultaneously, they are not dependent upon each other.

Topaz has applied to the Corps for a Clean Water Act (CWA) Section 404 permit for the Topaz Project and is included in this section 7 consultation. The Corps is also participating as a cooperating agency in the NEPA process conducted by DOE. The Corps will rely upon and utilize this biological opinion for its permit decision. The CWA Section 404(b)(1) Guidelines provide substantive criteria that the Corps uses to determine whether a proposed site is suitable for discharge of dredged or fill material and whether a proposed discharge of dredged or fill material (activity) is eligible for authorization under Section 404 of the CWA. To minimize impacts on wetlands and other Waters of the United States, the Corps requires applicants to: (1) avoid impacts where possible; (2) minimize unavoidable impacts; and (3) compensate for any remaining impacts that can neither be avoided nor minimized such that overall project impacts on the aquatic environment are minimal on both an individual and cumulative basis.

DOE and the Service conducted a separate section 7 consultation that addressed the effects to listed species from the construction and start-up of the CVSR Project, which is analyzed in our biological opinion dated June 24, 2011 (U.S. Fish and Wildlife Service 2011b). DOE's request for consultation for each solar project included the reconductoring portion of the project. We addressed the entire reconductoring project in the CVSR biological opinion (U.S. Fish and Wildlife Service 2011b), except for the Solar Switching Station and associated tower work, which is part of the proposed TSF. We will address the Solar Switching Station and associated tower work in this biological opinion.

The DOE Loan Guarantee Program typically only funds construction and start-up of each project. The loan guarantee lasts until the loan is repaid which is typically five to 30 years, which means the repayment period may be less than the proposed 30 or more years of project operation. During the loan repayment period, the loan applicant is required to submit certain quarterly and/or annual reports certifying compliance with applicable environmental laws/regulations as well as any project-specific agreements, such as contained in this biological opinion. DOE also will be copied on any communications required of their loan applicants in the biological opinion. DOE will incorporate the Service's reporting requirements contained in this biological opinion into the final Loan Agreement between the DOE and the applicant. DOE's authority to ensure compliance with the biological opinion is limited to during the loan repayment period.

The Corps will incorporate the Service's reporting requirements contained in this biological opinion into the final permit. The Corps' authority to ensure compliance with the biological opinion terminates when the action is completed for which the 404 permit was issued.

The following project description, including the proposed conservation measures, was provided by DOE and is summarized below with modifications for reasons of clarity and brevity by the Service. A complete description of the Proposed Action can be found in the "Biological Assessment for the Topaz Solar Farm Project" (Althouse and Meade, Inc. 2011a), which includes as appendices the "San Joaquin Kit Fox Conservation and Monitoring Plan," (Althouse and Meade, Inc. 2011b), the "Biological Assessment for the Carrizo-Midway 230 kV Reconductoring Project" (ICF International 2010 and 2011), and the July revision to the biological assessment (Althouse and Meade, Inc. 2011c).

***General Project Description***

For purposes of this biological opinion, the Proposed Action includes: 1) construction and operation of the 550 MW Topaz Solar Farm where the solar array complexes and facilities will be located; 2) construction and start-up of the PG&E Solar Switching Station, where transfer of electricity from the TSF to an existing PG&E transmission line will occur; and 3) the preservation, enhancement, and maintenance of Off-Site Conservation Lands to support a regional strategy for the conservation of the San Joaquin kit fox in the Carrizo Plain.

The Topaz Solar Farm is located in the northwest California Valley, in the northern Carrizo Plain in eastern San Luis Obispo County, California. It is situated east of Bitterwater Road and north and south of State Route 58. Elevation varies from approximately 2,000 to 2,080 feet above mean sea level. The fenced solar array complexes, facilities, and Solar Switching Station, encompass approximately 3,520 acres (Project Footprint).

In addition, the project area includes approximately 815 acres of Stewardship Lands. Stewardship Lands are located outside of the fenced array areas and other areas subject to permanent and temporary impacts, and will be managed in accordance with the applicant's conservation measures that are designed to conserve the kit fox, described below. The Stewardship Lands are adjacent to the fenced areas and will provide movement corridors, refuge and other habitat for kit fox that utilize the kit fox features within the fenced areas. These

Stewardship Lands will not be subject to ground disturbance for project construction and will not contain project components; however, their size and fragmented configuration may result in reduced functionality for kit fox. Among other plans, Topaz will implement the San Joaquin kit fox Conservation and Monitoring Plan (Althouse and Meade, Inc. 2011b), the Vegetation Management Plan, and the Wildfire Management Plan that will be developed and implemented to maximize the use of these areas by kit fox. However, for operational reasons, the applicant is not placing the Stewardship Lands under a conservation easement and those lands will not be included in the 12,154-acre land compensation package that has been proposed to the Service.

Activities associated with project implementation will result in the discharge of fill to Waters of the United States under the jurisdiction of the Corps. Therefore, Topaz will provide compensatory mitigation for these fill impacts to jurisdictional waters of the U.S. (drainages), as determined by the U.S. Army Corps of Engineers (Corps) and the Regional Water Quality Control Board (RWQCB) through the restoration of a portion of the main drainage, which flows seasonally. Restoration of the drainage includes contouring eroded areas with low angle slopes, installation of erosion control materials, and revegetation with appropriate species. The area of potential disturbance for this compensatory mitigation is approximately 20 acres in size and is shown on the Action Area map in the July revision to the biological assessment (Althouse and Meade, Inc. 2011c) as the Corps/RWQCB Compensatory Mitigation Site.

All impacts to land within the proposed fenced solar arrays or impacted by Project components (such as roads and electrical lines) outside the fences are considered to be permanent impacts. Land located within an approximate 100-foot buffer surrounding Project fences and other components (485 acres) may be temporarily impacted during construction, but will be restored or allowed to revert to grassland after construction is finished, and are classified as temporary impacts and will no longer be disturbed post construction (Table 1).

In combination, the approximately 3,520 acres of the Project Footprint, the 815 acres of Stewardship Lands, the 485 acres of temporarily impacted areas, and the 20-acre Corps/RWQCB Compensatory Mitigation Site are collectively referred to herein as the "Project Area", which is a total of approximately 4,840 acres in size (Table 1). The term "Off-Site" refers to areas outside the Project Area and the term "On-Site" refers to areas within the Project Area.

The conservation lands proposed for off-site permanent conservation are located outside the Project Area and referred to as the "Off-Site Conservation Lands." These Off-Site Conservation Lands encompass approximately 12,147 acres for the Topaz Solar Farm and 7.16 acres proposed by PG&E for the Solar Switching Station, totaling approximately 12,154 acres and are in the vicinity of the Project Area.

**Table 1. Topaz Solar Farm Project Component Acreages**

| Proposed Project Area | Acreage |
|---|---|
| Fenced Areas, including solar panels, substation and Solar Switching Station | 3,500 |
| Proposed Roads and Electrical Lines outside Fences | 20 |

| | |
|---|---|
| **Subtotal Project Footprint (sum of previous 2 lines)** | **3,520** |
| Stewardship Lands (Excluding 100-foot Buffer Around Project Components and Corps/RWQCB Mitigation Site) | 815 |
| Temporarily Impacted Areas (100-foot Buffer Around Project Components) | 485 |
| Corps/RWQCB Mitigation Site | 20 |
| **Total Project Area (sum of the above)** | **4,840** |
| TSF Conservation Land Action Area | 12,147 |
| PG&E Conservation Land Action Area | 7.16 |
| **Total Off-Site Conservation Land Action Area** | **12,154.16** |
| **Total Proposed Action Area Acreage (sum of Project Area and Conservation Lands)** | **16,994.16** |

Key components of the Proposed Action include:

- Installation of over nine million PV solar modules manufactured by First Solar Inc. within approximately 460 arrays, and associated electrical equipment (e.g. Power Conversion Stations, PV Combining Switchgear houses), an electrical substation and the Solar Switching Station;
- Operations and Maintenance (O&M) facility (11,250 square feet [sq. ft.]);
- Solar Energy Learning Center (900 sq. ft.), either new construction or through payments to the County for maintenance of the existing Simmler Community Center, approximately 4 miles from the Action Area;
- Placement of most medium-voltage feeder lines underground;
- Approximately 9 miles of above-ground medium-voltage (34.5 kV) collector lines;
- Construction of approximately 23 miles of access roads utilizing existing agricultural roads to the extent feasible;
- Construction of three at-grade road crossings through on-site federal jurisdictional drainages to provide access to construct and maintain the Topaz Solar Farm;
- Restoration of portions of the main on-site drainage to Soda Lake as compensation for permitted "fill" of jurisdictional waters of the U.S;
- A leach field and septic system located adjacent to the O&M facility to support the domestic sanitary needs of employees and visitors during operation;

- Four temporary construction staging areas of approximately 10 acres each located within the proposed fenced PV arrays. These will accommodate temporary construction offices, parking, material laydown, and storage area;

- Approximately six temporary water storage basins for dust control during construction (with up to two basins expected at any given time);

- Perimeter fencing around solar arrays will be constructed to provide a 5 to 6 inch gap at the bottom, for the entire length of the fence, for kit fox passage into and through the TSF Project;

- In the Proposed Action area, up to 83 miles of fencing will be removed or improved for wildlife passage, including approximately 12,000 feet of existing cyclone barrier fencing to be removed from Section 27. No interior fences within the perimeter fencing will be present; and

- Off-site permanent conservation of approximately 12,154 acres to provide kit fox habitat.

***Proposed Construction Schedule and Phasing of Implementation of Conservation***

The Proposed Action will be constructed sequentially in up to six overlapping phases over an approximate three or more year period starting in fall 2011. The construction of the PG&E Solar Switching Station and associated tower work is expected to be completed within the first or second phase. The Topaz Solar Farm is expected to begin generating electricity as early as fall 2012 and be fully online by early to mid-2015. Operations and maintenance of the TSF are anticipated to occur for 30 years.

***Site Preparation***

Project Area preparation involves improvement of approximately 23 miles of on-site construction access roads with gravel or other road stabilization material, installation of drainage crossings, setup of construction staging areas, storm-water management work, preparation of land areas for array installation, and other activities needed before installation of the solar arrays can begin. This work will involve trimming of grassland vegetation, agricultural disking, harrowing, and/or rolling of PV array areas, selected compacting and grading, and setup of modular offices and other needed facilities. For the majority of the Project Area, the ground under the PV arrays will not require grading, except for areas that are greater than three percent slope. Preparing the ground beneath PV arrays will begin by trimming existing vegetation as close to the ground as possible by mowing or grazing. An agricultural tool, such as a disk, harrow or cultipacker, will then be used to loosen and smooth the top one to three inches of soil. Finally, a smooth steel drum roller, or similar equipment, will be used to bring the top four to six inches of soil to the appropriate compaction value. Beneath the compacted surface of the soil, the soil will remain at the existing level of compaction, allowing small mammal dens and burrows to remain or reform. Depending on the moisture level of the soil at the beginning of construction, some water may need to be added to the soil one to two days before compaction occurs.

During the approximately three-year construction period, water would be needed for site preparation, compaction of building pads, road preparation, and dust control. One temporary dust mitigation water storage basin may be located within each of the six phases of construction, and an estimated two water storage basins may be operational at any given time during construction. These would provide water trucks with the necessary access to sufficient water for dust mitigation. The basins would be lined with PVC, and would be up to 80 feet by 80 feet in surface area and six feet in depth. The basins would be subject to the provisions of the protective dust control pond design, monitoring and management plan described in the biological assessment (Althouse and Meade, Inc. 2011c), including the requirement that the basins be monitored on an ongoing basis for kit fox use and are fenced to prevent access by kit fox.

***Construction and Installation***

This phase involves installation of the PV solar modules and all the necessary electrical equipment to make the Project operational. Preparation of the ground under the arrays and improvement of the construction access roads will continue throughout the majority of the construction process. PV modules will be mounted on steel support structures and driven into the ground to a depth of four to seven feet below grade. Once mounted, the low edge of the modules will be approximately 1.5 feet above grade, while the rear high edge will be approximately 5.5 feet above grade. The solar arrays have no moving parts for sunlight tracking and utilize no water during operation. Equipment used for system installation will include 4x4 forklifts, ATV vehicles, truck-mounted pile drivers, and pick-up trucks. Trenches will be dug for the underground AC (alternating current) and DC (direct current) cabling, and the foundations for the inverter enclosures and transformers will be prepared. Equipment used for trenching includes small backhoes, small sheepsfoot rollers, and 5 cubic yard dump trucks.

The construction workforce is estimated to be 400 workers on average for the approximately three-year construction period, with a peak of approximately 500 workers. Shuttle buses will bring the construction workforce to the Project Area from the surrounding communities.

***Operations and Maintenance***

The Topaz Solar Farm facility is expected to be operational by mid-2015 and will require 15 permanent employees. While the TSF will largely be self-sufficient upon completion of construction, periodic monitoring and maintenance activities will be required. Key elements of the maintenance and monitoring include monitoring and reporting the performance of the facility, conducting preventative and corrective maintenance, maintaining vegetation density and height, receiving students and other visitors, and maintaining the security of the facility. The Project will operate continuously, seven days a week, during daylight hours.

All exterior lighting will be placed or shielded to avoid lighting open space and solar array areas. No permanent night lighting will be allowed, except for the Solar Energy Learning Center, substation, switching station, and monitoring and maintenance facility. Maintenance and repair, as well as limited construction activities for the TSF Project will be conducted during daylight and dusk hours with limited temporary task lighting only as necessary.

The Project has a minimum expected lifetime of at least 30 years, with possible subsequent equipment replacement and repowering. After its productive lifetime, the TSF Project will be decommissioned in accordance with all local, state, and federal policies. The majority of the facility components are recyclable, and the land will be returned to grassland habitat.

***PG&E Solar Switching Station***

The Solar Switching Station will be constructed and owned by PG&E within the Project Area to interconnect the TSF with the existing PG&E Morro Bay–Midway double-circuit 230 kV transmission line. The Solar Switching Station will encompass 6.3 acres with a buffer zone and will be enclosed by a fence that will not be permeable to San Joaquin kit fox movement. Two new double-circuit lattice steel towers (LSTs) and four tubular steel poles (TSPs) will be installed to interconnect PG&E's 230 kV line to the Solar Switching Station. The two LSTs will be located within or adjacent to the existing PG&E transmission line ROW. The four TSPs will be located on either side of the new Solar Switching Station. Night lighting will be installed at the switching station for security purposes.

Solar Switching Station Equipment - Two short transmission line segments will be required to connect the proposed switching station to the existing transmission lines. These line segments will require facility modifications on the 230 kV and potentially on the 115 kV lines, as described below.

Modifications to the existing PG&E 115 kV transmission line facilities involve removing two existing 115 kV towers and installing two low-profile, horizontally configured towers. Modifications to the existing Morro Bay–Midway 230 kV double-circuit transmission line facilities will involve installing two new 230 kV dead-end towers, and removing one existing tangent lattice tower.

Construction of new 230 kV transmission line facilities will include installing two new tangent double-circuit, steel monopole towers midway between the existing Morro Bay–Midway 230 kV transmission line and the proposed switching station (one tangent tower will be required in each line segment). The proposed towers may be up to 150 feet in height.

Microwave Tower and Reflector - An approximately 175-foot-tall microwave tower will be installed at the Solar Switching site. The microwave tower will be a lattice steel structure. At least one microwave reflector will be required off-site, and it is possible that one microwave reflector will suffice for both of the switching stations on the CVSR and the TSF Projects. The location of the microwave reflector for the Solar Switching Station is unknown at this time. The reflector will be mounted on a structure approximately 30 feet tall and will be approximately the size of a billboard. A typical microwave reflector is approximately 10 feet by 24 to 32 feet.

Construction and installation of the Solar Switching Station and several new towers will result in 6.46 acres of permanent habitat loss and 1.38 acres of temporary habitat loss.

***Proposed Conservation Measures***

To reduce potential effects to sensitive biological resources, construction Best Management Practices and avoidance and minimization measures are proposed in the Proposed Action area. Measures to compensate for effects to the San Joaquin kit fox and its habitat through the permanent protection and management of habitat through Off-Site Conservation Lands are also proposed. DOE will incorporate these measures into the final Loan Agreement between the DOE and the applicant, and the Corps will incorporate these measures into the permit it issues to the applicant for Project activities conducted in its jurisdiction.

Avoidance and Minimization Measures for the Topaz Solar Farm

The following avoidance and minimization measures will be implemented for the San Joaquin kit fox:

- A qualified biologist(s) will conduct preconstruction den surveys no more than 14 days prior to the initiation of work activities. Pre-construction surveys will consist of three phases: den location surveys, work area clearance surveys, and daily work area surveys to avoid injury or death of kit foxes during construction. Construction activities will be adjusted to avoid active dens, as determined by pre-construction surveys and avoid direct mortality of kit fox. The monitor will assure the amount of take addressed in the biological opinion is not exceeded. Additional description of these pre-construction surveys is included in the San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse & Meade 2011b).

- Worker education programs containing information on kit fox identification, life history and habits, population status, protection measures, and penalties under the Act for unauthorized take of kit fox will be provided for all construction and operational employees.

- During construction, pre-construction survey and monitoring measures will be conducted specific to the Project that meet the standard San Joaquin kit fox mitigation measures approved by the County of San Luis Obispo, Service, and CDFG for projects in San Luis Obispo County.

- Biological monitors will be present in the Project Area daily during the construction phase and intermittently post construction to conduct the proposed monitoring and management and assure that the amount of take addressed in the biological opinion is not exceeded. The monitors will be responsible for ensuring that impacts to special-status species, native vegetation, wildlife habitat, or unique resources will be avoided to the fullest extent possible. Where appropriate, monitors will flag the boundaries of areas where activities need to be restricted to protect native plants and wildlife, or special-status species. These restricted areas will be monitored to ensure their protection during construction.

- Prior to Project groundbreaking, the applicant shall submit to the Service and CDFG for their review and approval the qualifications of its qualified biological monitors. The monitors will be given the authority to stop any work that may result in direct mortality or exceeding the take addressed in the biological opinion. If the monitors exercise this authority, the Service will be notified by telephone and electronic mail within one (1) working day. The on-site biologist will be the contact for any employee or contractor who may inadvertently kill or injure a listed species, or anyone who finds a dead, injured, or entrapped individual of these species. The on-site biologist shall possess a working cellular telephone whose number will be provided to the Service.

- During construction, any disturbance activities after dusk shall be prohibited unless coordinated through the Service, during which additional kit fox minimization measures may be required. Workers and worker shuttles will be instructed to arrive at the construction site no earlier than one-half hour before sunrise and depart from the site no later than one-half hour after sunset. Delivery of materials by truck will be restricted to daylight hours between sunrise and sunset.

- Speed signs of 20 mph will be posted for all on-site construction traffic to minimize the probability of road mortality of the San Joaquin kit fox.

- All excavations, steep-walled holes and trenches in excess of two feet in depth will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Trenches will also be inspected for entrapped kit fox each morning prior to onset of field activities and immediately prior to covering with plywood at the end of each working day. Any kit fox found shall be allowed to escape before field activities resume, or be removed from the trench or hole by a qualified biologist and allowed to escape unimpeded.

- During construction, any pipes, culverts, or similar structures with a diameter of four inches or greater, stored overnight will be thoroughly inspected for trapped San Joaquin kit foxes before the subject pipe is subsequently buried, capped, or otherwise used or moved in any way.

- During construction, all food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of only in closed containers. These containers will be regularly removed from the Project Area.

- No pets will be allowed on the Project Area, and no rodenticides will be allowed within the Proposed Action Area, which includes Off-Site Conservation Lands. Working dogs necessary for livestock operations are allowable.

- Best Management Practices (BMP's) will be used to reduce the risk of spills and other accidental exposure to hazardous materials and waste during construction and operation of the Proposed Action and such materials will be handled and disposed of in accordance with local, State and federal regulations.

- Perimeter fencing around solar arrays will be constructed to provide a 5 to 6 inch gap at the bottom for the entire length of the fence to allow kit fox passage into and through the TSF Project. No interior fences within the perimeter fencing will be present. Cross fencing and wildlife wire fencing will be removed from corridors outside of the solar arrays where feasible.

- At least 11 artificial 2-chambered dens (two per square mile) capable of supporting kit fox pairs and pups, and 22 artificial escape dens (four per square mile), will be installed within the solar array fences at appropriate locations. Additional artificial escape dens will be installed outside the TSF Project perimeter fence at a rate of one den per 1,000 linear feet.

- No permanent night lighting will be allowed, except for the TSF Project's Solar Energy Learning Center, substation, monitoring and maintenance facility, and the Solar Switching Station. All exterior lighting will be placed or shielded to avoid lighting open space and solar array areas.

- The ground under and between the solar arrays will be vegetated with a dominant cover of grasses and herbs to promote a more natural habitat that supports kit fox prey. Vegetation height will be controlled by pulse grazing or other means not hazardous to kit fox. A managed grazing regime will be implemented to maintain vegetation height suitable for kit fox use and their prey.

Proposed Conservation Measures for the PG&E Solar Switching Station

The following conservation measures were contained in the biological assessment for the reconductoring portion of the Project which describes the construction of the Solar Switching Station and the towers to be constructed or modified on the TSF (ICF International 2010 and 2011). These activities will be conducted within the PG&E project area. These measures are summarized here for clarity by the Service.

*General Avoidance and Minimization Measures for the PG&E Solar Switching Station*

- An environmental awareness education program will be conducted by a qualified biologist for construction crews prior to initiating construction of the Proposed Action. The program will be conducted for all new crew members throughout the duration of the project. The education program will include information about potentially occurring federally listed species, a review of conservation measures that are being implemented during project construction, and the consequences for noncompliance with environmental laws.

- A qualified biologist will monitor all ground-disturbing construction activity in sensitive areas and near designated resources within the PG&E project area. All monitors will be biologists with formal training. The resumes of all biological monitors will be submitted to the Service for approval. The qualified biological monitor will train an individual or

individuals to act as work site construction monitor(s) to assist the qualified biological monitor with overseeing remaining work at work areas after ground-disturbing activities are completed. The biological monitor will have the ability to stop or redirect work activities to ensure protection of sensitive resources and compliance with all environmental permits and conditions of the Proposed Action. The biological monitor will complete a daily log summarizing activities and environmental compliance, and will prepare a weekly report summarizing the monitoring activities and environmental compliance for the activities performed within the PG&E project area. This report will be submitted to the PG&E biologist. The biological monitor will also be the initial contact person for any employee who might accidentally injure or kill a federally listed species or who finds a dead, injured, or entrapped individual. A communication protocol will be established between the biological monitor, PG&E, and the Service. The monitor's name and number will be provided to the Service prior to the initiation of ground-disturbing activities.

- Vehicles will be restricted to established roadways and approved access routes and staging areas within the PG&E project area. Cross-country access routes will be clearly marked in the field with appropriate flagging and signs as necessary.

- A vehicle speed limit of 15 mph will be enforced on all non-public access roads.

- All vehicles will be brought into the work areas cleaned and free of weeds prior to entry.

- Staging areas will be set back at least 50 ft from streams, creeks, or other water bodies to avoid impacts on sensitive habitat. All fueling of vehicles will occur at least 100 ft from wetlands and other water bodies with secondary containment and appropriate clean up equipment onsite in case of a spill.

- Photographic documentation of preconstruction habitat conditions will occur at all major work areas, including staging areas, landing zones, and tension/pull sites, prior to the start of construction and immediately after construction activities are performed.

- Construction personnel will not bring firearms or pets to any project-related work areas and will not leave trash on the Project Area during construction.

- A litter control program will be instituted at each of the work areas. All workers will ensure that their food scraps, paper wrappers, food containers, cans, bottles, and other trash are deposited in covered or closed trash containers. The trash containers will be removed from the work areas at the end of each work day. After completion of the project activities, all construction materials will be removed from each of the work areas.

- A set of BMPs will be developed to control erosion during construction and will be detailed in the project-specific Storm Water Pollution Prevention Plan (SWPPP). All temporarily disturbed areas will be restored to pre-project conditions. A project-specific Restoration Plan detailing specific revegetation plans, monitoring guidelines, and success criteria, will be developed as part of the Habitat Management Plan (see below).

Together, the SWPPP and Restoration Plan will facilitate the restoration of construction areas and will contain information on site-specific implementation plans.

- Temporary construction disturbances and other types of project-related disturbances to the kit fox will be minimized to the maximum extent practicable and confined to designated work areas. To minimize temporary disturbances, all sensitive habitats will be delineated with highly visible flagging or fencing in order to prevent encroachment of construction personnel and equipment during work activities. At no time will equipment or personnel be allowed to adversely affect areas outside of project work areas, staging areas, or landing zones without authorization from the Service.

- PG&E will prepare and implement a Habitat Management Plan, which will contain mitigation plans for the kit fox as well as a restoration plan for sensitive habitats. The Habitat Management Plan will be submitted to the Service for review and approval prior to the start of construction. The purpose of the Habitat Management Plan is to provide more detailed information on the measures that PG&E will implement to restore areas temporarily affected by the proposed project. The Habitat Management Plan will include how restoration at the work areas will be completed and will include success criteria to ensure that restoration of the work areas is successful. Restoration of any temporarily disturbed areas as a result of PG&E project activities will occur within one year of disturbance for all sites.

*San Joaquin Kit Fox Avoidance and Minimization Measures for the PG&E Solar Switching Station*

- A qualified biologist(s) will conduct preconstruction den surveys no more than 14 days prior to the initiation of construction or operation activities in a given area, to ensure that potential kit fox dens are not disrupted by work activities. If potential dens are located within the survey area, the entrance of the dens will be monitored for 3 consecutive nights with tracking medium or an infrared beamed remote camera prior to the initiation of work activities to determine the status of the potential dens. If San Joaquin kit fox activity is observed at the den during this period, the den will be monitored for at least 5 consecutive days from the time of the observation to allow any resident kit fox to move to another den during its normal activity. Use of the den can be discouraged during this period by partially plugging its entrance(s) with soil in such a manner that any resident animals can escape easily. Only when the den is determined to be unoccupied may the den be excavated under the direction of a qualified biologist. If the animal is still present after 5 or more consecutive days of monitoring, the den may be excavated when, in the judgment of the qualified biologist, it is temporarily vacant (i.e., during the animal's normal foraging activities). The Service encourages hand excavation, but realizes that soil conditions may necessitate the use of excavating equipment. Extreme caution will be exercised under these circumstances. Destruction of the den will be accomplished by careful excavation until it is certain that no San Joaquin kit fox or other animals are present. The den will be fully excavated, filled with dirt, and compacted to ensure that kit foxes cannot reenter or use the den during construction period. If at any point during the excavation a San Joaquin kit fox is discovered inside the den, the excavation will

cease immediately and monitoring of the den described above will be resumed. Destruction of the den may be completed when, in the judgment of a qualified biologist, the animal has escaped from the partially destroyed den.

- Should it be determined that a den site within a work area is a natal den, destruction of the den will not be permitted until the pups and adults have vacated and then only after consultation with the Service and CDFG. Project activities at the location of the natal den will be postponed to avoid disturbance. Exclusion zones will be established around suitable dens and construction activities will be greatly restricted within these exclusion zones. The radius of these zones will follow current standards or will be as follows:
  - Potential den – 50 ft.
  - Known den – 100 ft.
  - Natal/pupping den – to be determined on a case-by-case basis in coordination with the Service
  - Atypical den – 50 ft.

- To prevent the inadvertent entrapment of federally listed species during the Proposed Action, all excavated, steep-walled holes and trenches more than two feet deep will be covered at the end of each work day by plywood or similar materials or escape ramps will be installed. In situations where the trenches or holes cannot be covered, earthen escape ramps will be dig into the sides of trenches. All holes and trenches will be thoroughly inspected at the start of each workday for trapped animals before they are filled. If at any time a trapped listed animal is discovered, escape ramps or other appropriate structures will be placed to allow the animal to escape. The Service will be notified of the incident by telephone and electronic mail within one working day.

- If the kit fox is encountered during construction work, activities that could cause direct harm to the species, as determined by the biological monitor, will cease until the animal is allowed to leave the work site. The Service and CDFG will be notified within 24 hours of the encounter.

- PG&E will restore all areas identified as San Joaquin kit fox habitat that are temporarily disturbed by work activities to pre-project conditions within 12 months of completion of disturbance, according to pre-defined vegetative success criteria. Success criteria and the methods used to attain them will be outlined as part of the Habitat Mitigation Plan.

The following is a summarized list of the mitigation, management, and monitoring plans that will be developed by the applicant and approved by the Service prior to their implementation:

| **TOPAZ SOLAR FARM** | |
|---|---|
| **Habitat Restoration and Revegetation Plan (HRRP)** | The HRRP will identify methods and timing for restoration of all areas temporarily disturbed by the Project to pre-construction conditions or better. The HRRP will also address restoration and revegetation after decommissioning of the project should it be required. |

| | |
|---|---|
| **Habitat Mitigation and Monitoring Plan (HMMP)** | A Habitat Mitigation and Monitoring Plan will be developed for the Topaz Solar Farm Project to ensure the successful integration of management techniques designed to protect and enhance Off-Site Conservation Lands. This Plan will describe the measures to be implemented across the Off-Site Conservation Lands to enhance and restore habitat for kit fox. This Plan will also include detailed measures to monitor vegetative communities, plants, and wildlife for the long term health and persistence of these elements. Specific success criteria will be outlined to ensure that adaptations to the management strategy are implemented in response to adverse monitoring data. A detailed analysis of funds necessary to implement the various management and monitoring tasks within the Plan will be completed to ensure that a sufficient endowment fund is established for the Off-Site Conservation Lands. |
| **San Joaquin Kit Fox Conservation and Monitoring Plan** | The SJKF Conservation and Monitoring Plan describes the kit fox survey methods and findings in the Project Area and vicinity. The document describes measures that will be implemented to avoid, minimize and monitor any adverse effects to kit fox during construction and operation of the Topaz Solar Farm, and includes worker education, Best Management Practices (BMPs), monitoring, and reporting requirements. |
| **Vegetation Management Plan (includes Weed Management and Grazing Management)** | This plan provides information and management actions regarding vegetation resources and invasive weeds that occur on the Topaz Solar Farm Project Area. Vegetation management goals, monitoring and adaptive management details will be included. The Vegetation Management Plan (VMP) will be implemented during construction and operation of the Project.<br><br>The Weed Management element of the VMP will identify weeds on-site and prescribe a control plan aimed at avoiding and minimizing ecological damage related to undesirable weed infestations that may be potentially caused or worsened by construction and operation of the Proposed Action and that lower the suitability of habitat for kit foxes.<br><br>The Grazing Plan element of the VMP will provide specific management guidelines to ensure that vegetative communities on the Project Area are maintained in appropriate conditions for the kit fox. The plan is adaptive and will incorporate annual monitoring to adjust the grazing prescriptions to maximize benefits to target species. |
| **Wildfire Management Plan** | The Wildfire Management Plan outlines goals specific to |

| | |
|---|---|
| | prevention of fire and management of potential fire hazards around project infrastructure. Management of on-site vegetation through weed control and prescribed grazing will assist in meeting fire safety goals by reducing fuel loads. |
| **Avian and Bat Protection Plan (ABPP)** | The purpose of the ABPP is to provide energy project developers a tool for assessing the risk of potential impacts to avian and bat species, and for designing and operating a bird- and bat-friendly renewable-energy facility. |
| **PG&E SOLAR SWITCHING STATION** | |
| **Habitat Management Plan (includes Restoration Plan and a Mitigation Plan)** | The Habitat Management Plan will provide detailed information on the measures that PG&E will implement to restore areas temporarily affected by their activities in the Project Area. This plan also describes mitigation and management actions and will include success criteria to ensure that restoration of the work areas is successful. |

Monitoring of Adverse Effects and Take

Actions incorporated into the avoidance and minimization measures in the San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse and Meade, Inc. 2010) and the Topaz Solar Farm Habitat Mitigation and Management Plan, to be developed by the applicant and approved by the Service prior to implementation, will allow for a "real time" monitoring of impacts and take of San Joaquin kit fox during construction and operations (Table 2). These monitoring activities shall assure that adverse effects and take, beyond what is analyzed in the biological opinion, is not exceeded.

***Methodology***

The following methodology, or similar approaches further developed through technical coordination with the Service prior to construction, will be used to:

- determine pre-project population levels of San Joaquin kit fox within the Project area (within and outside the fenced arrays);
- document annual changes in the relative abundance and habitat use of kit fox within the Project Area and at a reference population within the off-site conservation lands.

***Monitoring Program***

The primary goal of the monitoring program will be to assure that adverse effects and take, beyond what is analyzed in the biological opinion, is not exceeded. Components of the San Joaquin Kit Fox Conservation and Monitoring Plan described above will be implemented prior, during, and after completion of construction and include documentation of occupancy, distribution, and total minimum population sizes for San Joaquin kit fox and document the extent of take, should it occur.

Methods to detect kit fox will include the use of remote wireless digital cameras with active links to a base station. A qualified kit fox biologist will establish remote camera stations at artificial dens and at selected roads. Camera locations will be adjusted as necessary to optimize detection of kit fox. Cameras will be checked weekly and images downloaded. Wildlife captured on photos will be tallied and numbers included in monitoring reports. Any occurrence of kit fox will be reported within one week to CDFG and the Service.

Kit fox scat surveys will be conducted to include the Project Area once per year to determine number of kit fox individuals, family groups, and areas of use.

Monthly kit fox den surveys will be conducted by a qualified kit fox biologist for the first five years after TSF project completion to determine kit fox use, and be conducted annually for the duration of operation. In addition, all on-site project personnel will be required to report any observation of kit fox and activity at den sites to the kit fox biologist. Records will be kept of den locations with respect to TSF Project components (e.g. solar arrays), fences, vegetation type and height, and adjacent open spaces.

The qualified biologist will inspect all fences in the Project Area once annually to insure fences allow passage by kit fox and to inspect the Stewardship Lands and other areas within the Project Area for sign of kit fox. Other methods to detect kit fox may be used with review and approval by the Service.

**Table 2. San Joaquin Kit Fox Monitoring Methods and Schedule**

| Task | Type | Equipment | Monitoring Frequency | Personnel | Reporting |
|---|---|---|---|---|---|
| Artificial den condition | Visual inspection, surface and fiber optic | | Once annually | Kit fox biologist | Annual report |
| Den utilization | Remote camera | 14 cameras, base station, computer | Weekly download, monthly maintenance | O&M | Data, all images to kit fox biologist. Information included in annual report |
| New dens | Visual inspection | | Normal daily operations | O&M, kit fox biologist | Information included in annual report |

| Task | Type | Equipment | Monitoring Frequency | Personnel | Reporting |
|---|---|---|---|---|---|
| Kit fox population | Scat survey, DNA analysis | | Annual | Scat dogs, Center for Conservation and Evolutionary Genetics (or alternate organization with comparable expertise) | Written annual report |

***Adaptive management***

Adaptive management of den sites and fence passages will be conducted if new information concerning kit fox use of the Project Area is obtained. Any modifications to habitat management activities as a result of new information will be subject to review and approval by the Service prior to their implementation.

San Joaquin kit fox utilization of the Project Area at the same or higher density level for five years after completion of construction when compared to utilization levels prior to TSF Project construction will indicate the site continues to successfully support kit fox and that the on-site conservation measures were generally successfully implemented during that performance period. Documentation of kit foxes within the solar array fence, or passing through fenced solar array areas would indicate the fences are functioning to allow kit fox passage. Implementation of the monitoring measures for the duration of the project will assure that any adverse effects and take, beyond what is analyzed in the biological opinion, is not exceeded.

***Monitoring reports***

A qualified kit fox biologist will submit annual monitoring reports to the County, the CDFG, and the Service. Any kit fox located within fenced solar array areas will be reported to CDFG, USFWS, and the County within one week of sighting. Monitoring reports will include date of all site visits, survey methods, survey results, and recommendations.

Topaz Solar Farm's Proposed Preservation and Management of Off-Site Conservation Lands

The Action Agencies propose to implement a conservation package to compensate for impacts to the San Joaquin kit fox from the Proposed Action. The conservation package and measures are outlined in the San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse and Meade, Inc. 2011b), the Biological Assessment for the Carrizo-Midway 230 kV Reconductoring Project (ICF International 2010), and the Topaz Solar Farm Biological Assessment (Althouse and Meade, Inc. 2011a) and revised biological assessment (Althouse and Meade, Inc. 2011c) and in Table 3 & Figure 1 in this Biological Opinion. The conservation package includes On-Site and Off-Site measures to benefit the kit fox. A Habitat Mitigation and Monitoring Plan will be developed and submitted to the Service for review and approval prior to implementation, and

will specify Off-Site Conservation Land management goals and tasks and be implemented to benefit kit fox.

The San Joaquin kit fox may continue to use the areas occupied by the solar arrays and within a 100-foot-buffer of the solar arrays after installation, however, habitat beneath the solar array areas and buffers are considered in this biological opinion to be affected acreage for which conservation measures will be provided elsewhere and lands within the solar array and buffer boundaries will not be considered to provide conservation habitat.

The primary focus of the conservation measures will be the permanent protection of Off-Site Conservation Lands (through fee title acquisition, conservation easement, management plan implementation, or other approved conservation mechanism) that provide high value habitat for the kit fox. These lands will provide a significant contribution to regional preservation efforts by preserving and restoring lands that currently provide low value (primarily farmed lands) in key areas within a regional context. All such lands will be managed to optimize suitability to the kit fox.

Lands will be protected with a Service-approved easement, endowment and management plan commensurate with a phased implementation approach. The Topaz Solar Farm will be constructed sequentially in overlapping phases consistent with the phasing plan starting in summer 2011. The Topaz Solar Farm is expected to begin generating electricity as early as 2012 and be fully online by mid-2015. Prior to the start of construction, the applicant will define and submit to the Service an initial construction phase comprised of various Project elements (e.g., substation, array, O&M facility, access roads, etc.). The following conservation actions will be completed within 90 days of the initial ground disturbance associated with the first phase and within 90 days of the initial ground disturbance for each subsequently defined phase:

> 1) A Service-approved conservation easement to meet the compensatory conservation measures will be recorded on all Off-Site Conservation Lands.
> 2) An acceptable management plan for these Off-Site Conservation Lands will be approved by the Service.
> 3) An acceptable analysis of the management costs and endowments required to fund the plan will be approved by the Service.
> 4) The endowment for the plan will be fully funded prior to Project completion and consistent with the phasing plan.

Each phase of construction will receive separate construction permits from the County. Topaz Solar Farms LLC will record conservation easements on that prorata portion of Off-Site Conservation Lands that is consistent with the ratio described below and at least commensurate with the impacts for each phase, plus at least 15 percent additional acreage (except for the final phase). At a minimum, Topaz Solar Farms LLC shall complete all compensatory mitigation requirements separately and in their entirety for each construction Phase of the Project prior to commencing ground-or-vegetation-disturbing activities for the next Project Phase and no later than the end of the 90-day period specified above. The installation of water wells required by the County to satisfy conditions precedent to the start of actual construction is not considered ground-or-vegetation disturbing activities in this context.

The overall ratio of mitigation land area to permanently impacted area is 3.45 to 1. The applicant will provide 3.45 times as much conservation land acreage as impacted acreage for each Project phase. In addition, with respect to construction Phases 1 through 5 (i.e., all phases except the last phase), the applicant will increase the amount of conservation land by 15% after the ratio is applied in order to provide a buffer with respect to the timing of acquisition of conservation land, but this timing buffer shall not increase the overall amount of conservation land that will be provided for the TSF Project. For example, if Phase 1 includes a permanent impact to 100 acres of Project land, the Applicant will record conservation easements on at least 397 acres of Off-Site Conservation Lands. This conservation total for Phase 1, in this example, would then be calculated as follows:

Example: 100 impacted acres * 3.45 ratio = 345 conservation acres * 1.15 (15% buffer) = 397 conservation acres for Phase 1 (in this example)

Initial ground disturbance associated with subsequent phases will not begin until conditions 1 through 4 (identified above) have been completed for the prior phase.

The primary goal of the TSF Project's conservation package is to ensure the Project has no net adverse effect to the kit fox, and preferably has a net benefit in terms of restoring unsuitable or low suitability lands and managing all Off-Site Conservation Lands to increase the amount and quality of habitat available to the species in the vicinity of the Project Area. This goal will be accomplished through the following:

- Avoidance and minimization of impacts to individual kit foxes (as described in the previous avoidance and minimization sections), both to minimize take of individuals and to retain individuals on and near the Project Area as a source of colonists for preserved and enhanced on-site and off-site habitats.

- Management of on-site habitat in the Project Area. While the majority of the 4,840 Project Area (which includes Stewardship Lands), will be taken up by solar arrays and facilities, the TSF Project design allows the potential for kit fox denning opportunities and movement through much of the solar facility. A vegetation management plan and a habitat restoration and re-vegetation plan will be implemented to enhance and manage vegetation under and around the arrays to create conditions within the Project Area suitable for kit fox and their prey. Monitoring and reporting of kit fox use will be conducted as prescribed in the Topaz Solar Farm Habitat Restoration and Revegetation Plan to be developed by the applicant and submitted to the Service for review and approval prior to implementation.

- Preservation and management of off-site habitat. Topaz Solar Farms LLC or its successor will acquire or preserve, and manage in perpetuity, approximately 12,154 acres of off-site habitat through fee or a conservation easement prior to completion of construction consistent with the phasing plan, to benefit kit fox within the northern Carrizo Plain. PG&E will acquire, manage, and protect in perpetuity an additional 7.16 acres of conservation land, described later. Lands to be conserved shall be subject to the

review and approval of the Service, CDFG, and the County of San Luis Obispo. The conservation areas will support suitable habitat for kit fox and will provide a movement corridor to connect core habitat areas. Through land use changes and targeted management for the kit fox (e.g., by removing active discing, barrier fencing, and reseeding and/ or introducing managed grazing), kit fox habitat quality will be improved. Monitoring and reporting will be conducted as prescribed in the Topaz Solar Farm Habitat Mitigation and Monitoring Plan to be developed by the applicant and submitted to the Service for review and approval.

Off-Site Conservation Lands Site Selection and Justification

The proposed off-site conservation lands will provide habitat appropriate to sustain resident kit fox and protect and enhance corridors for movement into and out of the Carrizo Plain region. Most of the proposed Off-Site Conservation Lands are contiguous to the Project Area. These areas include grassland and cropland habitats. Much of this land has been surveyed for biological resources by Althouse and Meade, Inc. (Althouse and Meade 2011b). Survey data show that current utilization of these potential Off-Site Conservation Lands by kit fox varies by habitat quality and is expected to change to benefit kit fox if land use is changed from cropland or heavily grazed land to properly managed grassland.

An index score was created by Althouse and Meade, Inc. (2011b) to evaluate potential conservation lands according to factors that contribute to conservation value. Factors include:

1) suitability of existing habitat,
2) enhancement potential,
3) kit fox presence,
4) importance to movement corridor,
5) location as per the SC Wildlands habitat suitability model (Penrod et al. 2010),
6) location as per the Phillips-Cypher habitat suitability model (Cypher et al. 2007), and
7) slope of the parcel.

This ranking provides an index to compare Proposed Action area properties and to gauge how the selected conservation properties compare with on-site land being impacted (reference sites from within the Project Area are included in Table 3). The ranking exercise shows that selected off-site conservation parcels provide a range of habitat quality comparable to or better than the Project Area. Conservation lands consist of almost 7,100 acres of grassland and approximately 5,100 acres of cropland (Table 3). Cropland areas provide the opportunity for recovery of these lands to usable kit fox habitat within a few years. The conversion of cropland to grassland will increase the acreage of quality habitat for kit fox and other species in the region.

At least twenty-three parcels are offered as Off-Site Conservation Lands. Habitat types found on these parcels range from well-maintained California annual grassland to plowed cropland. Conservation properties with grassland habitat are primarily (88.4 percent) on flat ground (slopes 0 to 10 percent), and support kit fox. Conservation properties on cropland are also mostly on flat ground (75.7 percent), and have the potential to support kit fox after enhancement. Properties that have little to no slope are considered most valuable for kit fox. The Off-Site Conservation

Lands under consideration are shown in Figures 5 through 9, in the San Joaquin Kit Fox Conservation and Monitoring Plan (Althouse and Meade, Inc. 2011b).

The Topaz Solar Farm Project Footprint will utilize 3,520 acres of land, of which 76.2 percent is cropland, 23.5 percent is grassland, and less than 0.3 percent is anthropogenic habitat. Of the 3,520 acres, approximately 3,255 acres is considered lower suitability habitat (mostly cropland and recently retired cropland with index scores less than 75), and approximately 265 acres considered higher suitability habitat (grassland with an index score higher than 75).

Of the total 12,147 acres within the Off-Site Conservation Lands, 53.4 percent, or 6,490 acres, are higher suitability and 46.6 percent, or 5,657 acres, are lower suitability when a ranking of 75 is utilized as the break between higher and lower suitability. The ratio of higher to lower value Off-Site Conservation Lands is therefore 1.15 for all the Off-Site Conservation Lands under consideration (Table 3). A larger number indicates higher suitability. Using grassland and cropland habitat types as a general proxy for suitability in the Proposed Action Area, the ratio of 1.15 for conservation land compares favorably with a higher to lower suitability ratio of 0.08 for the Project Footprint. Therefore, the Off-Site Conservation Lands are rated higher suitability than the Project Footprint (Table 3). In addition, many of the lower suitability lands used for conservation will be enhanced from currently disturbed conditions to higher quality grassland habitat, resulting in additional higher suitability conservation lands (Althouse and Meade, Inc. 2011b).

PG&E's Proposed Preservation and Management of Off-Site Conservation Lands

Construction and installation of the Solar Switching Station and several new towers is anticipated to result in 1.38 acres of temporary habitat loss and 6.46 acres of permanent habitat loss. All permanent losses of suitable habitat for the kit fox kit fox will be compensated for at a 1:1 ratio and temporary losses of suitable habitat will be mitigated at a 0.5:1 ratio. This results in permanent compensation for 7.16 acres (6.46 acres permanent plus 0.69 acre temporary habitat loss) of kit fox habitat.

The primary goal of PG&E's conservation strategy for this project is to ensure that the proposed project has no net adverse effect to the San Joaquin kit fox that will be affected by the PG&E's project activities. This goal will be accomplished through the following:

- Topaz Solar Farms LLC has set aside up to 40 acres of occupied kit fox habitat approximately 4 miles east of the TSF within one of its conservation areas for PG&E to acquire for kit fox mitigation. PG&E will use that land to mitigate for 7.16 acres of impacts to the kit fox as a result of construction of the Solar Switching Station and associated infrastructure on the TSF. This parcel is located in the NW ¼ of the NE ¼ of Section 5 in T30S, R19E (MDBM), as described in the biological assessment revision (Althouse and Meade, Inc. 2011c). PG&E will use the remainder of this parcel (32.84 acres) to mitigate for some of its kit fox impacts from the other sections of its reconductoring project (addressed in the biological opinion for the California Valley Solar Ranch). The proposed PG&E mitigation parcel is located within an area of high quality kit fox habitat with documented occurrences of kit fox presence including several natal and sheltering dens. This habitat that will be protected in perpetuity in fee title with

conservation easements and managed specifically for the benefit of the kit fox. The PG&E mitigation parcel is also located within open rangeland providing connectivity and the other benefits discussed in the Effects of the Conservation Proposal section.

Prior to the initiation of the proposed project activities, PG&E will provide an irrevocable letter of credit, in a form approved by the Service and CDFG, to ensure funding for the performance of all required mitigation, including site preparation, re-vegetation, restoration, and enhancement activities, maintenance activities (e.g., mulching, weeding, and watering), monitoring and reporting activities, and long-term management.

**Table 3. The Action Agencies' Proposed Off-Site Conservation Lands for the TSF Project (Althouse and Meade, Inc. 2011b, 2011c).** Factors that contribute to conservation land value for wildlife are listed in top row. Total Index Score (column 2) provides a relative habitat quality ranking for each parcel. Desirable conservation land is not just the highest scored parcels. Low scoring parcels may present high opportunity for habitat enhancement. Rankings show that Off-Site Conservation Lands contain similar habitat to lands in the TSF Project Footprint. Parcels listed by section number at the bottom of the table are within the Topaz Project Footprint; these are not proposed Off-Site Conservation Lands, they are listed for comparison to the proposed Off-Site Conservation Lands. In addition, a proposed PG&E mitigation parcel is included for reference.

| Map Label (Figure 5) | Total Index Score 100 pts maximum | Site-Specific Habitat Suitability (Althouse & Meade) 40 pts | Enhance-ment Potential 10 pts | Kit Fox Presence 10 pts (5 if not surveyed, 0 if absent in surveys) | Within Movement Corridor 10 pts | SC Wildlands Suitability Map 10 pts | Phillips-Cypher Suitability Map 10 pts | Slope 10 pts (10=flat) | Notes | Approx. Conservation Land Size (Acres) |
|---|---|---|---|---|---|---|---|---|---|---|
| L | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat, SJKF | 40 |
| J4 | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 39 |
| J3 | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 41 |
| J2 | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 158 |
| J1 | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 84 |
| I | 89 | 40 | 2 | 10 | 10 | 9 | 10 | 8 | Grassland with kit fox, low hills | 2,714 |
| C2 | 86 | 35 | 6 | 10 | 10 | 7 | 10 | 8 | Grassland, low hills, kit fox present | 40 |
| G | 84 | 40 | 2 | 10 | 10 | 10 | 2 | 10 | Grassland with kit fox, flat | 930 |
| H1 | 83 | 40 | 2 | 8 | 10 | 5 | 8 | 10 | Grassland, flat | 343 |
| D | 83 | 38 | 3 | 10 | 9 | 7 | 6 | 10 | Grassland, small cropland areas, flat | 1,150 |
| C3 | 83 | 35 | 5 | 8 | 10 | 5 | 10 | 10 | Grassland, flat | 82 |

| Map Label (Figure 5) | Total Index Score 100 pts maximum | Site-Specific Habitat Suitability (Althouse & Meade) 40 pts | Enhance-ment Potential 10 pts | Kit Fox Presence 10 pts (5 if not surveyed, 0 if absent in surveys) | Within Movement Corridor 10 pts | SC Wildlands Suitability Map 10 pts | Phillips-Cypher Suitability Map 10 pts | Slope 10 pts (10=flat) | Notes | Approx. Conservation Land Size (Acres) |
|---|---|---|---|---|---|---|---|---|---|---|
| F | 82 | 40 | 2 | 10 | 6 | 10 | 8 | 6 | Grassland with kit fox, some hills | 623 |
| H2 | 78 | 30 | 6 | 10 | 10 | 6 | 6 | 10 | Cropland and grassland with kit fox, flat | 246 |
| C1 | 74 | 30 | 5 | 10 | 10 | 3 | 8 | 8 | Grassland with kit fox, tall grass | 656 |
| E1 | 73 | 40 | 2 | 10 | 5 | 3 | 3 | 10 | Grassland | 95 |
| O | 67 | 26 | 7 | 5 | 10 | 5 | 5 | 9 | Cropland and grassland, flat | 60 |
| H6 | 65 | 20 | 5 | 5 | 10 | 5 | 10 | 10 | Half grass, half crop | 75 |
| H4 | 63 | 10 | 10 | 10 | 10 | 3 | 10 | 10 | Cropland, flat | 40 |
| H5 | 59 | 10 | 10 | 10 | 10 | 3 | 8 | 8 | Cropland, low hills | 165 |
| B | 59 | 15 | 8 | 10 | 8 | 3 | 5 | 10 | Cropland with smaller grassland area, flat | 2,400 |
| A | 59 | 12 | 10 | 5 | 10 | 4 | 8 | 10 | Cropland with small grassland area, flat | 1,290 |
| N | 54 | 10 | 10 | 10 | 8 | 3 | 3 | 10 | Cropland, flat | 120 |
| C4 | 54 | 10 | 10 | 10 | 10 | 3 | 3 | 8 | Cropland with kit fox | 165 |
| H3 | 53 | 10 | 10 | 10 | 10 | 3 | 3 | 7 | Cropland, hilly | 162 |
| K | 50 | 10 | 10 | 5 | 10 | 3 | 2 | 10 | Cropland, flat | 319 |
| M | 48 | 10 | 10 | 5 | 9 | 2 | 2 | 10 | Cropland, flat | 40 |

| Map Label (Figure 5) | Total Index Score 100 pts maximum | Site-Specific Habitat Suitability (Althouse & Meade) 40 pts | Enhance-ment Potential 10 pts | Kit Fox Presence 10 pts (5 if not surveyed, 0 if absent in surveys) | Within Movement Corridor 10 pts | SC Wildlands Suitability Map 10 pts | Phillips-Cypher Suitability Map 10 pts | Slope 10 pts (10=flat) | Notes | Approx. Conservation Land Size (Acres) |
|---|---|---|---|---|---|---|---|---|---|---|
| E2 | 46 | 10 | 10 | 5 | 5 | 3 | 3 | 10 | Cropland | 70 |
| | | | | | | | | | **Total Acres of Conservation Land** | **12,147** |
| Proposed PGE Mitigation Parcel | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 40 (7.16 acres of the parcel is proposed for conservation) |
| Topaz Section 34 | 85 | 40 | 2 | 10 | 10 | 10 | 3 | 10 | Grassland with kit fox, flat | -- |
| Topaz Section 28 | 72 | 25 | 10 | 10 | 10 | 4 | 3 | 10 | Grassland with kit fox, flat | -- |
| Topaz Section 33 | 67 | 20 | 8 | 10 | 10 | 2 | 7 | 10 | Cropland with kit fox, flat | -- |
| Topaz Section 27 | 67 | 20 | 8 | 10 | 10 | 2 | 7 | 10 | Cropland with kit fox, flat | -- |
| Topaz Section 32 | 56 | 10 | 10 | 10 | 10 | 3 | 3 | 10 | Cropland with kit fox, flat | -- |
| Topaz Section 19 | 53 | 10 | 10 | 10 | 7 | 3 | 3 | 10 | Cropland with kit fox, flat | -- |

**Action Area**

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for this biological opinion encompasses all areas that may be directly or indirectly affected as a result of construction and operation activities for the Proposed Action, and the broader area that, while outside and adjacent to the construction zone, may be directly or indirectly affected by vibrations, noise, dust, or movement associated with the Proposed Action. The action area also includes areas that may be affected by the implementation of the conservation measures.

The 16,994.16-acre action area for the Proposed Action consists of:

- Lands within the 3,520-acre Project Footprint that contain the solar generation facility and switching station and associated infrastructure, 485 acres of temporarily-impacted buffer lands within 100 feet of the fenced areas, 815 acres of Stewardship Lands in the spaces outside and between fenced array areas, and the 20-acre Corps/RWQCB compensatory mitigation site; all collectively referred to as the Project Area. This is an area of approximately 4,840 acres (Table 1).
- Approximately 12,147 acres plus an additional 7.16 acres (12,154.16 acres total) of Off-Site Conservation Lands adjacent to and near the Topaz site in San Luis Obispo County (Tables 1 and 3). These lands are identified and described in the June 2011 amendment to the biological assessment (Althouse and Meade, Inc. 2011c).

**Analytical Framework for the Jeopardy Analysis**

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies upon four components: (1) the *Status of the Species*, which evaluates the San Joaquin kit fox range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of San Joaquin kit fox in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the San Joaquin kit fox; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on kit fox; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on kit fox.
In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the San Joaquin kit fox current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of San Joaquin kit fox in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of San Joaquin kit fox and the role of the action area in the survival and recovery of San Joaquin kit fox as the context for evaluating the significance of

the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

**Status of the Species**

***San Joaquin Kit Fox***

A thorough discussion of the current status of the San Joaquin kit fox can be found in the 5 year review for the species (U.S. Fish and Wildlife Service 2010); and in the U.S. Fish and Wildlife Service's Recovery Plan for Upland Species of the San Joaquin Valley, California (U.S. Fish and Wildlife Service 1998). The following discussions on the species are largely taken from these sources and are included in the file for this biological opinion.

The San Joaquin kit fox was listed as an endangered species on March 11, 1967 (U.S. Fish and Wildlife Service 1967) and was listed by the State of California as a threatened species on June 27, 1971. This is the umbrella species for the Recovery Plan for Upland Species of the San Joaquin Valley, California (U.S. Fish and Wildlife Service 1998).

The kit fox (*Vulpes macrotis*) is the smallest canid species in North America and the San Joaquin kit fox (*V. macrotis mutica*) is the largest subspecies in skeletal measurements, body size, and weight. Adult males average 80.5 centimeters (31.7 inches) in total length, and adult females average 76.9 centimeters (30.3 inches in total length (Grinnell et al. 1937). Kit foxes have long slender legs and are approximately 30 centimeters (12 inches) high at the shoulder. The average weight of adult males is 2.3 kilograms (5.0 pounds), and the average of adult females is 2.1 kilograms (4.6 pounds) (Morrell 1972).

General physical characteristics of kit foxes include a small, slim body, relatively large ears set close together, narrow nose, and a long, bushy tail tapering slightly toward the tip. The tail is typically carried low and straight.

Color and texture of the fur coat of kit foxes varies geographically and seasonally. The most commonly described colorations are buff, tan, grizzled, or yellowish-gray dorsal coats (McGrew 1979). Two distinctive coats develop each year: a tan summer coat and a silver-gray winter coat (Morrell 1972). The ear pinna (external ear flap) is dark on the back side, with a thick border of white hairs on the forward-inner edge and inner base. The tail is distinctly black-tipped.

In the San Joaquin Valley before 1930, the range of the San Joaquin kit fox extended from southern Kern County north to Tracy, San Joaquin County, on the west side, and near La Grange, Stanislaus County, on the east side (Grinnell et al. 1937; U.S. Fish and Wildlife Service 1998). Historically, this species occurred in several San Joaquin Valley native plant communities. In the southernmost portion of the range, these communities included Valley Sink Scrub, Valley Saltbush Scrub, Upper Sonoran Subshrub Scrub, and Annual Grassland. In the central portion of the range, these communities included Valley Sink Scrub, Interior Coast Range Saltbush Scrub, Upper Sonoran Subshrub Scrub, Annual Grassland and the remaining native grasslands. In the

northernmost portion of the range kit foxes are commonly associated with Annual Grassland and Valley Oak Woodland.

Kit foxes currently inhabit some areas of suitable habitat on the San Joaquin Valley floor and in the surrounding foothills of the coastal ranges, Sierra Nevada, and Tehachapi Mountains, from southern Kern County north to Contra Costa, Alameda, and San Joaquin counties on the west, and near La Grange, Stanislaus County on the east side of the Valley, and some of the larger scattered islands of natural land on the Valley floor in Kern, Tulare, Kings, Fresno, Madera, and Merced counties.

The largest extant populations of kit foxes are in western Kern County on and around the Elk Hills and Buena Vista Valley, Kern County, and in the Carrizo Plain, San Luis Obispo County. Though monitoring has not been continuous in the central and northern portions of the range, populations were recorded in the late 1980s at San Luis Reservoir, Merced County (Briden et al. 1987); North Grasslands and Kesterson National Wildlife Refuge (NWR) area on the Valley floor, Merced County (Paveglio and Clifton 1988); and in the Los Vaqueros watershed, Contra Costa County in the early 1990s (U.S. Fish and Wildlife Service 1998). Smaller populations are also known from other parts of the San Joaquin Valley floor, including Madera County and eastern Stanislaus County (Williams 1990). Kit foxes occur at varying densities in the areas between the core populations (e.g., Kettleman Hills), providing linkages between core populations, and also probably with smaller, more isolated populations in adjacent valleys and in the Kreynhagen Hills and Anticline Ridge around Coalinga and Avenal.

Kit foxes prefer loose-textured soils (Grinnell et al. 1937; Hall 1946; Egoscue 1962; Morrell 1972), but are found on virtually every soil type. Dens appear to be scarce in areas with shallow soils because of the proximity to bedrock (O'Farrell and Gilbertson 1979; O'Farrell et al. 1980), high water tables (McCue et al. 1981), or impenetrable hardpan layers (Morrell 1972). However, kit foxes will occupy soils with high clay content, such as in the Altamont Pass area in Alameda County, where they modify burrows dug by other animals (Orloff et al. 1986). Sites that may not provide suitable denning habitat may be suitable for feeding or providing cover.

Kit foxes are adapted to arid environments, typically occurring in deserts throughout North America (Cypher 2003). Accordingly, in the San Joaquin Valley, optimal habitats for San Joaquin kit foxes generally are those in which conditions are more desert-like. These include arid shrublands and grasslands (U.S. Fish and Wildlife Service 1998). These areas are characterized by sparse or no shrub cover, sparse ground cover with patches of bare ground, short vegetative structure (herbaceous vegetation less than 18 inches tall), and sandy to sandy-loam soils.

Tall and/or dense vegetation generally is less optimal for foxes (Smith et al. 2005). Such conditions make it difficult for foxes to detect approaching predators or capture prey. Kit foxes also tend to avoid rugged, steep terrain. Predation risk apparently is higher for foxes under such topographic conditions (Warrick and Cypher 1998). In general, flat terrain or slopes under 5 percent are optimal, slopes of 5-15 percent are suitable, and slopes greater than 15 percent are

unsuitable. For this reason, the foothills of the Coast Ranges generally are considered to demark the western boundary for suitable kit fox habitat. Finally, kit foxes appear to be strongly linked ecologically to kangaroo rats. Kit foxes are especially well adapted for preying on kangaroo rats (*Dipodomys* ssp.), and consequently, kit fox abundance and population stability are highest in areas where kangaroo rats are abundant (U.S. Fish and Wildlife Service 1998; Cypher 2003). Kangaroo rats also are adapted to arid environments, and thus, reach their greatest densities in the San Joaquin Valley in arid habitats.

Certain types of agricultural lands inherently present challenges for kit foxes. Where ground disturbance is frequent (e.g., tilling, maintenance, harvesting), dens are vulnerable to destruction. Also, most agricultural lands in the San Joaquin Valley are irrigated, which can flood and collapse dens. Agricultural lands also are subject to intensive chemical applications, including fertilizers, pesticides, and defoliants. Use of rodenticides is common in some agricultural environments and is particularly problematic for kit foxes due to the potential for secondary poisoning. Finally, all of the factors above in addition to the relative sterility of most agricultural fields (e.g., weed suppression) result in a lack of prey availability for kit foxes.

Another detrimental attribute of agricultural lands is the presence of coyotes and non-native red foxes (*Vulpes vulpes*). Coyotes are the primary cause of mortality for kit foxes in most areas (Cypher et al. 2003). The threat to kit foxes from red foxes is still being evaluated, but the potential for both interference and exploitative competition is high (Cypher et al. 2001). Coyotes and kit foxes are highly adaptable species that are able to persist in agricultural lands. They are not dependent on dens for cover, they are highly mobile which facilitates avoiding dangers and locating food, and they are highly omnivorous. Also, kit foxes are more vulnerable to predation in actively farmed agricultural areas due to the relative scarcity of den sites, as described previously. Thus, some agricultural lands are generally not suitable for long-term occupation by kit foxes, although lands adjacent to natural habitats may be used for occasional foraging (Warrick et al. 2007).

The diet of the San Joaquin kit fox varies geographically, seasonally, and annually, based on temporal and spatial variation in abundance of potential prey. In the southern portion of their range, kangaroo rats, pocket mice (*Perognathus* ssp.), white-footed mice (*Peromyscus* spp.), and other nocturnal rodents comprise about one-third or more of their diets. Kit foxes are also known to prey on California ground squirrel (*Spermophilus beecheyi*), black-tailed hares (*Lepus californicus*), Nelson's antelope squirrel (*Ammospermophilus nelsoni*), desert cottontails (*Sylvilagus audubonii*), ground nesting birds, and insects (Scrivner et al. 1987a).

Adult San Joaquin kit foxes are usually solitary during late summer and fall. In September and October, adult females begin to excavate and enlarge natal dens (Morrell 1972). Typically, pups are born between February and late March following a gestation period of 49 to 55 days (Egoscue 1962; Morrell 1972). Mean litter sizes reported for San Joaquin kit fox range from 2.0 (White and Ralls 1993) to 3.8 individuals at the Naval Petroleum Reserve (Spencer et al. 1992; Spiegel and Tom 1996; Cypher et al. 2000). Pups appear above ground at about age three to four weeks, and are weaned at age six to eight weeks.

Although most young kit foxes disperse less than eight kilometers (Scrivner et al. 1987b), dispersal distances of up to 122 kilometers have been documented for the San Joaquin kit fox (Scrivner et al. 1993; U.S. Fish and Wildlife Service 1998). Dispersal can be through disturbed habitats, including agricultural fields, and across highways and aqueducts. The age at dispersal ranges from four to 32 months (Cypher et al. 2000). Among juvenile kit foxes surviving to July 1 at the Naval Petroleum Reserve, 49 percent of the males dispersed from natal home ranges while 24 percent of the females dispersed (Koopman et al. 2000). Among dispersing kit foxes, 87 percent did so during their first year of age. Some kit foxes delay dispersal and may inherit their natal home range.

Estimates of fox density vary greatly throughout its range, and have been reported as high as 1.2 animals per square kilometer in optimal habitats in good years (U.S. Fish and Wildlife Service 1998). At the Elk Hills in Kern County, density estimates varied from 0.7 animals per square kilometer in the early 1980s to 0.01 animals per square kilometer in 1991 (U.S. Fish and Wildlife Service 1998). Kit fox home ranges vary in size from approximately 2.6 square kilometers to 3.2 square kilometers (Spiegel and Tom 1996; U.S. Fish and Wildlife Service 1998). Knapp (1979) estimated that a home range in agricultural areas is approximately 2.5 square kilometers. Individual home ranges overlap considerably, at least outside the core activity areas (Morrell 1972; Spiegel 1996a).

San Joaquin kit foxes are primarily nocturnal, although individuals are occasionally observed resting or playing (mostly pups) near their dens during the day (Grinnell et al. 1937). A mated pair of kit foxes and their current litter of pups usually occupy each home range. Other adults, usually offspring from previous litters, also may be present (Koopman et al. 2000), but individuals often move independently within their home range (Cypher et al. 2000). Average distances traveled each night range from 9.3 to 14.6 kilometers and are greatest during the breeding season (Cypher et al. 2000).

Factors controlling kit fox density include territorial spacing, the ratio of adults to juveniles, and food availability (White and Garrott 1999; Cypher et al. 2000). Kit foxes maintain core home range areas that are exclusive to mated pairs and their offspring (White and Ralls 1993; Spiegel 1996b; White and Garrott 1997). This territorial spacing behavior eventually limits the number of foxes that can inhabit an area owing to shortages of available space and per capita prey. Hence, as habitat is fragmented or destroyed, the carrying capacity of an area is reduced and a larger proportion of the population is forced to disperse. Increased dispersal generally leads to lower survival rates and, in turn, decreased abundance because greater than 65 percent of dispersing juvenile foxes dies within 10 days of leaving their natal range (Koopman et al. 2000). Kit fox juvenile survival reported for the Carrizo Plain is 64 percent, ranging from 50 percent to 74 percent for the years 1989 – 1991 (Cypher et al. 2000). In Lokern, a wide range of juvenile survival has been documented ranging between 20 percent and 81 percent (Cypher et al. 2000). Factors contributing to kit fox survival include precipitation amounts and prey availability (Cypher et al. 2000).

The San Joaquin kit fox seems to prefer more gentle terrain and decreases in abundance as terrain ruggedness increases (Grinnell et al. 1937; Morrell 1972; Warrick and Cypher 1998). The kit fox is often associated with open grasslands, which form large contiguous blocks within the eastern portions of the range of the animal. San Joaquin kit foxes also exhibit a capacity to utilize habitats that have been altered by humans. San Joaquin kit foxes can utilize some types of active agricultural areas (e.g. orchards and alfalfa), although the long-term suitability of these habitats is unknown (Jensen 1972; U.S. Fish and Wildlife Service 1998). Orchards sometimes support prey species if the grounds are not manicured; however, denning potential is typically low and kit foxes can be more susceptible to predation by coyotes within the orchards (Orloff 2002). Alfalfa fields provide an easily accessible prey base (Woodbridge 1998; Young 1989), and berms adjacent to alfalfa fields sometimes provide good denning habitat (Orloff 2002).

Kit foxes use some types of agricultural land (e.g., rangeland) where uncultivated land is maintained, allowing for denning sites and a suitable prey base (Knapp 1978; Hansen 1988; Warrick et al. 2007). Managed grazing can promote the short-grass conditions necessary for kit fox movement and predator avoidance (Cypher, et al. 2007). In the Lost Hills area, radio collared kit foxes predominantly used natural habitat remaining in the California Aqueduct right-of-way (Warrick et al. 2007), even though this habitat had lower availability relative to other habitats. Orchards were the second most frequently used habitats, followed by row crops and other habitats (residential, grassland, and fallow fields). Kit foxes were documented to travel a maximum distance of 1.5 kilometers into orchards and 1.1 kilometers into row crops (Warrick et al. 2007). No dens were observed in the agricultural areas. Kit foxes appear reluctant to cross these lands due to insufficient refugia from predators (Cypher et al. 2005a). The lack of kit fox occupancy in farmland is in contrast to observations of the closely related swift fox in western Kansas (Jackson and Choate 2000; Matlack et al. 2000). Differences in habitat use between the species may be due to differences in farming practices (Warrick et al. 2007). Farmland in the San Joaquin Valley is more heavily disturbed. The farmlands are irrigated, and fields are not left fallow for as long as a duration as the farmlands in Kansas. These practices in California likely result in a sparse prey base and unsuitable habitat for denning, discouraging the kit fox from occupying active agricultural lands.

Dens are used by kit foxes for temperature regulation, shelter from adverse environmental conditions, and escape from predators. Kit foxes are reputed to be poor diggers, and their dens are usually located in areas with loose-textured, friable soils (Morrell 1972; O'Farrell 1984). However, the depth and complexity of their dens suggest that they possess good digging abilities, and kit fox dens have been observed on a variety of soil types (U.S. Fish and Wildlife Service 1998). Some studies have suggested that where hardpan layers predominate, kit foxes create their dens by enlarging the burrows of California ground squirrels or badgers (*Taxidea taxus*) (Jensen 1972; Morrell 1972; Orloff et al. 1986). In parts of their range, particularly in the foothills, kit foxes often use ground squirrel burrows for dens (Orloff et al. 1986). Kit fox dens are commonly located on flat terrain or on the lower slopes of hills. About 77 percent of all kit fox dens are at or below midslope (O'Farrell 1984), with the average slope at den sites ranging from 0 to 22 degrees (CDFG 1980; O'Farrell 1984; Orloff et al. 1986). Natal and pupping dens are generally found in flatter terrain. Common locations for dens include washes, drainages, and

roadside berms. Kit foxes also commonly den in human-made structures such as culverts and pipes (O'Farrell 1984; Spiegel and Tom 1996).

A kit fox can use more than 100 dens throughout its home range, although on average, an animal will use approximately 12 dens a year for shelter and escape cover (Cypher et al. 2001). Kit foxes typically use individual dens for only brief periods, often for only one day before moving to another den (Ralls et al. 1990). Possible reasons for changing dens include infestation by ectoparasites, local depletion of prey, or avoidance of coyotes. Kit foxes tend to use dens that are located in the same general area, and clusters of dens can be surrounded by hundreds of hectares of similar habitat devoid of other dens (Egoscue 1962). In the southern San Joaquin Valley, kit foxes were found to use up to 39 dens within a denning range of 129 to 195 hectares (Morrell 1972). An average den density of one den per 28 to 37 hectares was reported by O'Farrell (1984) in the southern San Joaquin Valley.

The distribution and abundance of the kit fox have decreased since its listing in 1967. This trend is reasonably certain to continue into the foreseeable future unless measures to protect, sustain, and restore suitable habitats, and alleviate other threats to their survival and recovery, are implemented. Threats that are seriously affecting kit foxes are described in further detail in the following paragraphs.

Less than 20 percent of the habitat within the historical range of the kit fox remained when the subspecies was listed as endangered in 1967, and there has been a substantial net loss of habitat since that time. Historically, San Joaquin kit foxes occurred throughout California's Central Valley and adjacent foothills. Extensive land conversions in the Central Valley began as early as the mid-1800s with the Arkansas Reclamation Act. By the 1930s, the range of the kit fox had been reduced to the southern and western parts of the San Joaquin Valley (Grinnell et al. 1937). The primary factor contributing to this restricted distribution was the conversion of native habitat to irrigated cropland, industrial uses (e.g., hydrocarbon extraction), and urbanization (Laughrin 1970; Jensen 1972; Morrell 1972; 1975). Approximately one-half of the natural communities in the San Joaquin Valley were tilled or developed by 1958 (U.S. Fish and Wildlife Service 1980).

This rate of loss accelerated following the completion of the Central Valley Project (CVP) and the State Water Project, which diverted and imported new water supplies for irrigated agriculture (U.S. Fish and Wildlife Service 1995). Approximately 7,972 square kilometers of habitat, or about 267 square kilometers per year, were converted in the San Joaquin region between 1950 and 1980 (CDFG 1988). The counties specifically noted as having the highest wildland conversion rates included Kern, Tulare, Kings and Fresno, all of which are occupied by kit foxes. From 1959 to 1969 alone, an estimated 34 percent of natural lands were lost within the then-known kit fox range (Laughrin 1970).

The majority of the documented loss of habitat has been the result of conversion to irrigated agriculture. In 1979, approximately 369,915 acres out of a total of approximately 8,500,391 acres on the San Joaquin Valley floor remained as undeveloped land (Williams 1985; U.S. Fish and Wildlife Service 1980). During 1990 to 1996, a gross total of approximately 71,500 acres of

habitat were converted to farmland in 30 counties (total area 23.1 million acres) within the Conservation Program Focus area of the CVP. During the same time period, approximately 101,700 acres were converted to urban land use within the Conservation Program Focus area (California Department of Conservation [CDC] 1994, 1996, 1998). Because these assessments included a substantial portion of the Central Valley and adjacent foothills, they provide the best scientific and commercial information currently available regarding the patterns and trends of land conversion within the kit fox's geographic range.

More than one million acres of suitable habitat for kit foxes have been converted to agricultural, municipal, or industrial uses since the listing of the kit fox in 1967. In contrast, less than 500,000 acres have been preserved or are subject to community-level conservation efforts designed, at least in part, to further the conservation of the kit fox (U.S. Fish and Wildlife Service 1998).

Land conversions contribute to declines in kit fox abundance through direct and indirect mortalities, displacement, reduction of prey populations and denning sites, changes in the distribution and abundance of larger canids that compete with kit foxes for resources, and reductions in carrying capacity. Kit foxes may be buried in their dens during land conversion activities (C. Van Horn Job, pers. comm. 2000), or permanently displaced from areas where structures are erected or the land is intensively irrigated (Jensen 1972; Morrell 1975).

Dens are essential for the survival and reproduction of kit foxes that use them year-round for shelter and escape and in the spring for rearing young. Kit foxes generally have dozens of dens scattered throughout their territories. However, land conversion reduces the number of typical earthen dens available to kit foxes. Denning opportunities on land converted to agriculture are limited due to certain agricultural practices, such as cultivation, irrigation, chemical treatments, and other disturbances. The loss of denning habitat can impede successful migration of kit fox across agricultural lands because of greater vulnerability to predation resulting from a lack of possible escapes.

Kit foxes use some types of agricultural land where uncultivated land is maintained, allowing for denning sites and a suitable prey base (Jensen 1972; Knapp 1979; Hansen 1988). Kit foxes also den on small parcels of native habitat surrounded by intensively maintained agricultural lands (Knapp 1979), and adjacent to dryland farms (Jensen 1972; Kato 1986; Orloff et al. 1986).

Extensive habitat destruction and fragmentation have contributed to smaller, more isolated populations of kit foxes. Small populations have a higher probability of extinction than large populations because their low abundance renders them susceptible to stochastic (i.e., random) events such as high variability in age and sex ratios, and catastrophes such as floods, droughts, or disease epidemics (Lande 1988; Frankham and Ralls 1998; Saccheri et al. 1998). Similarly, isolated populations are more susceptible to extirpation by accidental or natural catastrophes because the likelihood of recolonization has been diminished. These chance events can adversely affect small, isolated populations with devastating results. Extirpation can even occur when the members of a small population are healthy, because whether the population increases

or decreases in size is less dependent on the age-specific probabilities of survival and reproduction than on chance (sampling probabilities). Owing to the probabilistic nature of extinction, many small populations will eventually go extinct when faced with these stochastic risks (Caughley and Gunn 1996).

Vehicles appear to be the primary cause of mortality for urban kit foxes, and most strikes occur on arterial roads, which have higher traffic volumes and speed limits (Bjurlin et al. 2005; Cypher et al. 2005a, 2005b). Two-lane roads may not be as dangerous for kit foxes as are major arterial roads (Cypher et al. 2005a, 2005b). Kit foxes are more frequently struck near intersections between major roads and other linear rights-of-way (e.g., railroads, canals, other roads), which most likely function as movement corridors for kit foxes, and the foxes do not appear to avoid roads for denning sites (Bjurlin et al. 2005).

Several species prey upon San Joaquin kit foxes. Predators (such as coyotes, bobcats, non-native red foxes, badgers, and golden eagles) will kill kit foxes (Briden et al. 1992; Cypher et al. 2000). Badgers, coyotes, and red foxes also may compete for den sites (U.S. Fish and Wildlife Service 1998). The diets and habitats selected by coyotes and kit foxes living in the same areas are often quite similar (Cypher and Spencer 1998). Hence, the potential for resource competition between these species may be quite high when prey resources are scarce such as during droughts (which are quite common in semi-arid, central California). Land conversions and associated human activities have led to changes in the distribution and abundance of coyotes, which compete with kit foxes for resources.

Coyotes occur in most areas with abundant populations of kit foxes and, during the past few decades, coyote abundance has increased in many areas owing to a decrease in ranching operations, favorable landscape changes, and reduced control efforts (Orloff et al. 1986; Cypher and Scrivner 1992; White and Ralls 1993; White et al. 1996). Although coyotes are common in both natural and agricultural landscapes, they pose a greater predation threat to the kit fox on agricultural lands because of the decreased availability or absence of escape dens and vegetative cover (Cypher et al. 2005a, 2005b). Coyotes may kill kit foxes in an attempt to reduce resource competition. Coyote-related injuries accounted for 50 to 87 percent of the mortalities of radio collared kit foxes at Camp Roberts, the Carrizo Plain Natural Area, the Lokern Natural Area, and the Naval Petroleum Reserves (Cypher and Scrivner 1992; Standley et al. 1992; Ralls and White 1995; Spiegel 1996a, 1996b).

Coyote-related deaths of adult kit foxes appear to be largely additive (i.e., in addition to deaths caused by other mortality factors such as disease and starvation) rather than compensatory (i.e., tending to replace deaths due to other mortality factors; White and Garrott 1997). The survival rates of adult foxes decrease significantly as the proportion of mortalities caused by coyotes increase (Cypher and Spencer 1998; White and Garrott 1997), and increases in coyote abundance may contribute to significant declines in kit fox abundance (Cypher and Scrivner 1992; Ralls and White 1991 and 1995; White et al. 1996). There is some evidence that the proportion of juvenile foxes killed by coyotes increases as fox density increases (White and Garrott 1999). This density-dependent relationship will provide a feedback mechanism that reduces the amplitude of

kit fox population dynamics and keeps foxes at lower densities than they might otherwise attain. In other words, coyote-related mortalities may prevent fox population growth, and may instead prolong population declines.

Land-use changes have also contributed to the expansion of non-native red foxes into areas inhabited by kit foxes. Historically, the geographic range of the red fox did not overlap with that of the San Joaquin kit fox. By the 1970s, however, introduced and escaped red foxes had established breeding populations in many areas inhabited by San Joaquin kit foxes (Lewis et al. 1993). Red foxes are rarely observed in natural settings, and are much more abundant on agricultural lands. They appear to be dependent on the presence of water (Cypher et al. 2001), a resource readily available on irrigated farmlands, while kit foxes do not drink free water (Golightly and Ohrnart 1983). The larger and more aggressive red foxes are known to kill kit foxes (Ralls and White 1995), and could displace them, as has been observed in the arctic when red foxes expanded into the ranges of smaller arctic foxes (Hersteinsson and Macdonald 1992). The increased abundance and distribution of non-native red foxes is perhaps a greater threat to kit foxes than coyotes because red foxes and kit foxes have not evolved in the presence of each other, are closer morphologically and taxonomically, and will likely have higher dietary overlap, potentially resulting in more intense competition for resources.

Wildlife diseases do not appear to be a primary mortality factor that consistently limits kit fox populations throughout their range (McCue and O'Farrell 1988; Standley and McCue 1992). However, central California has a high incidence of wildlife rabies cases (Schultz and Barrett 1991), and high seroprevalences of canine distemper virus and canine parvovirus indicate that kit fox populations have been exposed to these diseases (McCue and O'Farrell 1988; Standley and McCue 1992). Hence, disease outbreaks could potentially cause substantial mortality or contribute to reduced fertility in seropositive females, as was noted in closely-related swift foxes (*Vulpes velox*).

For example, there are some indications that rabies virus may have contributed to a catastrophic decrease in kit fox abundance at Camp Roberts, San Luis Obispo County, California, during the early 1990s. San Luis Obispo County had the highest incidence of wildlife rabies cases in California during 1989 to 1991, and striped skunks (*Mephitis mephitis*) were the primary vector (Barrett 1990; Schultz and Barrett 1991; Reilly and Mangiamele 1992). A rabid skunk was trapped at Camp Roberts during 1989 and two foxes were found dead due to rabies in 1990 (Standley et al. 1992). Captures of kit foxes during annual live trapping sessions at Camp Roberts decreased from 103 to 20 individuals during 1988 to 1991. Captures of kit foxes were positively correlated with captures of skunks during 1988 to 1997, suggesting that some factor(s) such as rabies virus was contributing to concurrent decreases in the abundances of these species. Also, captures of kit foxes at Camp Roberts were negatively correlated with the proportion of skunks that were rabid when trapped by County Public Health Department personnel two years previously. These data suggest that a rabies outbreak may have occurred in the skunk population and spread into the fox population. A similar time lag in disease transmission and subsequent population reductions was observed in Ontario, Canada, although in this instance the transmission was from red foxes to striped skunks (Macdonald and Voigt 1985).

Some methods of pest and rodent control pose a threat to kit foxes through direct or secondary poisoning, and these threats are often encountered in agricultural settings. Kit foxes may be killed if they ingest rodenticide in a bait application, or if they eat a rodent that has consumed the bait. Even sublethal doses of rodenticides may lead to the death of these animals by impairing their ability to escape predators or find food. Pesticides and rodenticides may also indirectly affect the survival of kit foxes by reducing the abundances of their staple prey species. For example, the California ground squirrel, which is the staple prey of kit foxes in the northern portion of their range and on agricultural lands, was thought to have been eliminated from Contra Costa County in 1975, after extensive rodent eradication programs. Field observations indicated that the long-term use of ground squirrel poisons in this county severely reduced kit fox abundance through secondary poisoning and the suppression of populations of its staple prey (Orloff et al. 1986).

Historically, kit foxes may have existed in a metapopulation structure of core and satellite populations, some of which periodically experienced local extinctions and recolonization (U.S. Fish and Wildlife Service 1998). Today's populations exist in an environment drastically different from the historic one, however, and extensive habitat fragmentation will result in geographic isolation, smaller population sizes, and reduced genetic exchange among populations, thereby increasing the vulnerability of kit fox populations to extirpation. Populations of kit foxes are extremely susceptible to the risks associated with small population size and isolation because they are characterized by marked instability in population density. For example, the relative abundance of kit foxes at the Naval Petroleum Reserves, California, decreased ten-fold during 1981 to 1983, increased seven-fold during 1991 to 1994, and then decreased two-fold during 1995 (Cypher and Scrivner 1992; Cypher and Spencer 1998).

Many populations of kit fox are at risk of chance extinction owing to small population size and isolation. This risk has been prominently illustrated during recent, drastic declines in the populations of kit foxes at Camp Roberts and Fort Hunter Liggett. Captures of kit foxes during annual live trapping sessions at Camp Roberts decreased from 103 to 20 individuals during 1988 to 1991. This decrease continued through 1997 when only three kit foxes were captured (White et al. 2000). A similar decrease in kit fox abundance occurred at nearby Fort Hunter Liggett, and only two kit foxes have been observed on this installation since 1995 (L. Clark, pers. comm.; February 15, 2000). It is unlikely that the current numbers of kit foxes at Camp Roberts and Fort Hunter Liggett will increase substantially in the near future because there is limited potential for recruitment. The chance of substantial immigration is low because the nearest core population on the Carrizo Plain is distant (greater than 25.7 kilometers) and separated from these installations by barriers to kit fox movement such as roads, developments, and irrigated agricultural areas. Also, there is a relatively high abundance of sympatric predators and competitors on these installations that contribute to low survival rates for kit foxes and, as a result, may limit population growth (White et al. 2000). These populations at Camp Roberts and Fort Hunter Liggett may therefore be on the verge of extirpation.

The destruction and fragmentation of habitat could also eventually lead to reduced genetic variation in populations of kit foxes that are small and geographically isolated. Genetic

assessments indicate that historic gene flow among populations was quite high, and that gene flow between populations is still occurring (Schwartz et al. 2005). Kit fox dispersal likely still maintains genetic variation throughout the range of the kit fox. Disruption of kit fox dispersal abilities through habitat loss, however, could result in an increase in inbreeding and a loss of genetic variation. These factors could increase the extinction risk for small, isolated populations of kit foxes by interacting with demography to reduce fecundity, juvenile survival, and lifespan (Lande 1988; Frankham and Ralls 1998; Saccheri et al. 1998).

The impacts of genetic isolation may already be apparent in the Camp Roberts and Panoche populations. Genetic data revealed low allelic diversity at these locations. The population in the Camp Roberts region may have been historically small, as evidenced by the lack of historical occurrences. Relatively low allelic diversity could be the result of a few individuals recolonizing the Camp Roberts area (founder event), and a subsequent low number of migrants contributing to genetic diversity. The Panoche population is located in a small, relatively isolated valley, and also appears to be experiencing a low number of migrants into the population (Schwartz et al. 2005).

Arid systems are characterized by unpredictable fluctuations in precipitation, which lead to high frequency, high amplitude fluctuations in the abundance of mammalian prey for kit foxes (Goldingay et al. 1997; White and Garrott 1999). Because the reproductive and neonatal survival rates of kit foxes are strongly depressed at low prey densities (White and Ralls 1993; White and Garrott 1997, 1999), periods of prey scarcity owing to drought or excessive rain events can contribute to population crashes and marked instability in the abundance and distribution of kit foxes (White and Garrott 1999). Frequent, rapid decreases in kit fox density can increase the extinction risk for small, isolated populations.

The Recovery Plan for Upland Species of the San Joaquin Valley, California (US Fish and Wildlife Service 1998) describes the primary goal of the recovery strategy for kit foxes is to establish a complex of interconnected core and satellite populations throughout their range. The long-term viability of each of these core and satellite populations depends partly upon periodic dispersal and genetic flow between them. Therefore, kit fox movement corridors between these populations must be preserved and maintained. The core populations are the Ciervo Panoche area, the Carrizo Plain area, and the western Kern County population. Satellite populations are found in the urban Bakersfield area, Porterville/Lake Success area, Creighton Ranch, Pixley Wildlife Refuge, Allensworth Ecological Reserve, Semitropic/Kern NWR, Antelope Plain, eastern Kern grasslands, Pleasant Valley, western Madera County, Santa Nella, Kesterson NWR, and Contra Costa County. Major corridors connecting these population areas are on the east and west side of the San Joaquin Valley, around the bottom of the Valley, and cross-valley corridors in Kern, Fresno, and Merced counties.

Kit fox subpopulations in the western Kern County and Carrizo Plain core areas appear to be most robust, but fluctuate greatly in abundance on an inter-annual basis, depending on climatic conditions. Population modeling using long-term monitoring data has indicated these subpopulations are at risk of extirpation in 3 or 4 years under poor conditions that reduce prey

populations. In these core areas new development, including expanded oil and gas development and the construction of solar farms, threaten suitable habitat for kit fox.

Although the Service and cooperating public, non-profit, and private stakeholders are working to conserve habitat through the establishment of preserves, conservation banks, and conservation easements, the species is a wide-ranging predator and insufficient protected habitat currently exists to adequately sustain kit fox for the foreseeable future. Without further progress in these efforts, the kit fox remains vulnerable to extinction through continued and ongoing loss of kit fox habitat to agricultural and urban development, the continued threats from pesticide exposure, competitive exclusion by other canids, the highly fluctuating population dynamic of most kit fox populations, the isolation and loss of small subpopulations due to stochastic events and habitat fragmentation, vehicle strikes, and loss of prey.

**Environmental Baseline**

The following information was largely provided by the action agency and their consultants and is summarized below with modifications for clarity and brevity by the Service. A complete description of the survey methods and findings can be found in the "Biological Assessment for the Topaz Solar Farm Project" and its appendices (Althouse and Meade, Inc. 2011a, 2011b). There are no previous section 7 consultations or existing section 10 habitat conservation plans within the Topaz Solar Farm action area. The Service conducted a section 7 consultation on the California Valley Solar Ranch Project (U.S. Fish and Wildlife Service 2011b); however, the lands in the action area for the CVSR project do not overlap with the TSF action area.

The Proposed Action area is located north of the Carrizo Plain National Monument (CPNM), which is one of three core kit fox populations and is considered to be the largest single kit fox population. All three core populations are geographically distinct, and together with about a dozen smaller satellite populations comprise the entire San Joaquin kit fox metapopulation (U.S. Fish and Wildlife Service 1998). The kit fox population that occurs in the Project Area is likely a continuum of the CPNM core population, given its proximity of about eight miles. A population viability analysis indicated that the species' recovery will be improved if a core population is maintained in the Ciervo-Panoche region to the north, and that the Carrizo Plain and western Kern County core populations are both critical to the long-term survival of the species. The analysis also indicated that the risk of extinction increases dramatically if either the Carrizo Plain or western Kern County population were eliminated (U.S. Fish and Wildlife Service 1998).

During project development and site assessment activities, the applicant surveyed biological resources within a 9,700-acre Project Study Area (PSA) that includes the Project Area. Major vegetation types within the PSA include cropland (6,205 acres) and California annual grassland (3,463 acres), with the remainder comprised of natural or man-made ephemeral water bodies (4.3 acres) and anthropogenic (non-habitat) areas (28 acres). Kit fox primarily utilize California annual grasslands and croplands, thus the majority of the TSF Project Study Area supports habitat for the San Joaquin kit fox. Cropland within the Project Study Area is typically plowed

every year and planted to crops on alternate years. After harvest, the croplands are grazed by cattle. Grazing land and grasslands are grazed by stock every year (every three years for lands in the USDA Conservation Reserve Program). Grassland vegetation composition differs within the parcels depending on how intensively they are grazed with lower plant species diversity in the more heavily grazed parcels.

San Joaquin kit fox survey methods. Presence of San Joaquin kit fox in the Project Study Area was examined primarily by two scat surveys, one conducted in 2009 and one conducted in 2010 by Dr. Debbie Smith and Alice Whitelaw of Working Dogs for Conservation Foundation (Smith and Whitelaw 2010; and 2011), and DNA analysis of scat by Dr. Jesus Maldonado and Tammy Wilbert at the Center for Conservation and Evolutionary Genetics, Smithsonian Institution (Maldonado 2010; Maldonado and Wilbert 2011). The scat survey methodology provides an estimate of individuals, and is regarded as more thorough than other population estimation methods (Kohn, et al. 1999, Harrison et al. 2002; Smith et al. 2003; Smith et al, 2005; and Smith and Whitelaw 2010).

In 2009, the scat survey was separated into two parts, one in August and September 2009 and one in November 2009. A total of 64.19 miles of transects within an approximately 16-square mile area was surveyed in 2009, and 67.13 miles were surveyed in 2010 using dogs trained to locate kit fox scat. The 2010 surveys covered 15.15 square miles and included an additional 10.9 linear miles of surveys outside of the Project Study Area to inspect potential conservation land. Survey routes for both 2009 and 2010 were determined by Dr. Smith to provide complete coverage of the Project Study Area to detect scat of every kit fox that utilized the property during a sixteen day period.

In addition to scat surveys, daytime visual surveys were conducted concurrently with other biological surveys in the Project Study Area. Visual surveys primarily consisted of gathering information on recent signs of kit fox activity, including dens. Occupied dens or dens showing sign of recent activity were mapped in the field using hand-held Garmin GPS units. Where observations of the foxes were insufficient to determine natal versus post-natal, it was identified as a natal den.

Motion-detecting cameras (Cuddeback® Digital Expert 2006) were installed at various locations within and around the Project Study Area to identify and document wildlife. Eleven cameras were placed at 33 locations in 2009 and 2010 and were active from April 2 to July 20, 2009. Cameras for the 2010 season were installed on January 15 and were in place through July 8. The primary target was kit fox, which was photographed 23 times, with detections at six locations. Kit fox surveys included the 9,700 acre PSA and the 4,840-acre Project Area that is entirely within the PSA.

San Joaquin kit fox survey results. In 2009, 414 kit fox scats were detected and 153 fresh scats (eight days old or less) were sent for genetics analysis. The kit fox scat survey was repeated in November 2010 and 63 fresh and 199 old kit fox scats were found.

In 2009, genetic analyses of collected scat indicated that 19 individual kit foxes occur in the approximately 16-square mile kit fox survey area, 14 of which were detected within and adjacent to the 4,840-acre Project Area (fenced solar arrays). Of those 14 foxes detected in 2009, 1 was detected more than 10 times, but most were detected 1 to 4 times. There were no detections of transient foxes that were not related to the residents. The 2009 scat detections were in the southern two-thirds of the area, with no detections north of the high-voltage power lines along Tracy Lane. Within the larger 16-square mile kit fox study area, average kit fox density was 1.19 kit fox per square mile.

In 2010, less than half the number of scat were found than in 2009, reflecting the time of the year (November) the survey was conducted, as the 2010 survey did not include surveys in the August to September period. The 2010 kit fox survey area was approximately 15.15 square miles, slightly smaller than in 2009 due to refinement of the Project Study Area. Genetic identity analyses from the scat found 7 individual kit foxes within Project Study Area (Smith 2011; Maldonado and Henry 2011) which equals 0.46 foxes per square mile. Two of the kit foxes were detected ten or more times, 2 were detected five to nine times, and 3 were detected one to four times. The three foxes detected within the 4,840-acre Project Area were found four, six, and seven times, all in Sections 4 and 5. This results in 0.4 kit foxes per square mile on the 4,840-acre Project Area (7.6 square miles) and 3 kit foxes total over the Project Area, if average density is used.

Scat survey detections in 2010 also were in the southern third of the Project Study Area. Other scat detections were east of the Project Area in sections 34 and 35. The 3 foxes detected within the Project Area were found four, six, and seven times. These foxes were all detected in the southern portion of the Project Area in Sections 4 and 5. But because much of the southern third of the Project Area is cropland (except Sections 34 and most of Sections 4 and 5), the 3 kit fox likely used higher quality habitat to the west, east, and south outside of the Project Area. The northwest portion of the Project Area, where active croplands are dominant, had no detections of kit fox either year.

During the 2009 and 2010 surveys, a total of 23 known dens plus 6 natal and/or post-natal dens (3 different natal dens each year) were located within the Project Study Area. Three of the known dens and none of the natal dens are located within the Project Area (including Project Footprint, 100-foot temporary impact buffer, and Stewardship Lands). The majority of dens were located to the east and south of the proposed fenced array areas. At least 3 kit fox family groups were observed in the Project Study Area these two years. Therefore, for the time period surveyed, the surveys substantiate the conclusion that there are 3 resident pairs on the Project Area. Additional individuals that may be resident of adjacent lands likely include the Project Area within their home range as well.

High spatial variation exists for kit fox use of the Project Study Area. Both the 2009 and 2010 scat studies found evidence of kit fox predominately on eastern and southern areas of the Project Study Area. Other areas of the Project Study Area had fewer detections (one or more scats), and Sections 7, 16, 17 and 18 in the northern and western portion of the Project Study Area had no

scat detections in 2009. In 2010, there were no detections in Sections 7, 8, 16, 17, 18 19, 20, 21, 22, 27, 28, and 29. In general, the sections in the northwest portion of the Project Study Area (Sections 17, 18, 19, 20, 21 and portions of Sections 7 and 8), are considered poor quality. These parcels have been in cropland about 70 years. Higher quality habitat occurs in the eastern and southern portions of the Project Study Area consisting of all or portions of Sections 22, 26, 27, 28, 34, 35, 4 and 5. These areas contain habitat that has not been cropped for up to 25 years. Sections 34 and 35 had relatively low abundance of kit fox prey, possibly due to grazing practices that reduce the naturalized seed crop. Sections 4 and 5 had low small mammal abundance that is partially attributable to a shallow to moderately deep bedrock layer (25 to 100 cm) that causes water to perch and flood burrows and may have limited the ability for small mammals to become established despite the absence of tilled agriculture for more than 25 years. Although prey abundance was low on Sections 4 and 5, several kit fox dens were detected there. Section 16 is recovering grassland habitat following the end of cropping in 2006, and Section 15 contains good quality grassland habitat. Kit foxes in the Project Study Area used grassland habitat for foraging and denning and walked regular routes along fencelines.

Low levels of detection of some kit fox individuals indicate the density estimates presented above include both resident kit fox and kit fox that may be at the edge of their home range and just occasional within the study area. Some may have a larger proportion of their home range outside of the study area than in the study area. Therefore, these density estimates do not infer these kit fox individuals are completely supported by the habitat within the survey areas.

In the Carrizo Plain region, kit fox density is estimated to be one fox pair per 3 to 6 square miles in average habitat areas and one pair per 2 square miles in highest quality habitat area (Brian Cypher, pers. comm. 2010). By way of comparison, the 2010 survey of the Little San Juan Ranch property (Parcel I on Figure 5 in the SJKF Conservation and Management Plan (Althouse and Meade Inc. 2011b)) found four individual kit fox on 2,680 acres of annual grassland, or a minimum density of 0.95 foxes per square mile in only one survey pass.

The proposed Off-Site Conservation Lands currently consist of about 7,100 acres of grassland and approximately 5,100 acres of cropland (Table 3). Only a portion of these lands have been surveyed for kit fox presence. Based on presence of suitable habitat, at the estimated 2010 kit fox density in the 2010 kit fox study area (0.46 per square mile), 8.7 foxes, or approximately four breeding pairs will be supported on the 19 square miles of proposed Off-Site Conservation Lands under current land uses. Based on estimated average density of kit fox within the 2009 kit fox study area (1.19 per square mile), 22.6 kit foxes, or 11 breeding pairs will be supported on these lands.

South Coast Wildlands (Penrod et al. 2010) mapped suitable kit fox habitat within potential Off-Site Conservation Lands. The off-site conservation lands are agricultural lands which are currently dry-land farmed or were previously dry-land farmed and are currently grazed. Approximately 12,154 acres (inc. 7.16 acres of PG&E lands) of occupied grassland and shrubland kit fox habitat will be conserved and managed for kit fox within this area. Of that area, approximately 5,100 acres of dry-land farmed or periodically tilled land will be restored to

grassland habitat and managed for kit fox, with managed grazing. All of these lands are within the kit fox corridor identified by South Coast Wildlands (Penrod et al. 2010).

Threats to San Joaquin kit fox. Threats to the San Joaquin kit in the Proposed Action area include ongoing farming operations, conversion of native habitat and rangeland to farmland and large-scale solar energy facilities. Threats also include the use of rodenticides, predation by non-native red fox and coyote, which have been documented onsite, and habitat fragmentation from roads and transmission lines.

Summary. Overall, the kit fox present within the action area are a part of the Carrizo core population (1 of 3 core populations). Maintenance and enhancement of the core populations are very important and the animals that occur in the action area are important to the genetic diversity and viability of the core population. The Recovery Plan indicates the private land that can be restored and/or protected and managed for these species will be important to maintain the metapopulation in Carrizo area (U.S. Fish and Wildlife Service 1998). While only 47 percent of the acreage within the combined 3,520-acre Project Footprint and the 12,154-acre proposed Off-Site Conservation Lands is considered medium or high-quality habitat (Althouse and Meade, Inc. 2011c), this total acreage would represent up to 0.10 and 0.36 percent, respectively, of the estimated 3.4 million acres of high and moderate quality kit fox habitat remaining.

**Effects of the Proposed Action**

Based on all available information, the San Joaquin kit fox discussed in this biological opinion is reasonably certain to occur in the action area. The Service determines that the San Joaquin kit fox will be adversely affected from various components of the Proposed Action and from both direct and indirect effects of the action. Critical habitat has not been designated for the San Joaquin kit fox, therefore the Proposed Action will not adversely affect critical habitat for the San Joaquin kit fox.

***General Discussion on Effects***

The effects analysis for the construction of the proposed solar arrays is unique in that grassland habitat potentially suitable for the species will still be present around and under the solar arrays, and most areas under the on-site towers and electrical lines post-construction. Since no rigorous scientific studies have been completed on the effects to breeding, feeding, and sheltering of the kit fox from the construction of this type of facility, and based on information included in the biological assessment, we use the precautionary principle and postulate that these "unnatural" structures will alter the habitat in such a way that the species may not use the habitat in the same way, or at all, as prior to the project. Although, for the purposes of our analysis, we are assuming that the habitat underneath the solar arrays will not be used by San Joaquin kit fox after construction, the question remains as to whether the solar arrays will result in a shading and temperature change that will negatively affect the habitat in such a way that the species will alter their behavior and/or use of the area.

The Service's biological opinion for the proposed 250 MW California Valley Solar Ranch (CVSR) (U.S. Fish and Wildlife Service 2011b) and the biological assessment for the proposed CVSR (H.T. Harvey and Associates 2010) contain an evaluation of the potential effects of SunPower's proposed solar arrays on vegetation and wildlife resulting from microclimatic changes within the arrays. The CVSR is located approximately four miles east of the TSF. We reference their analyses of the effects of solar panels on grassland species in these documents for broad applicability to the TSF Project. However, the specific analyses from SunPower's project may not be directly applicable to the TSF Proposed Action because each solar project will utilize different PV technologies and will have a different configuration and areal extent of their solar arrays. In addition, in contrast to the existing conditions at the CVSR Project Site, the TSF Project Area is mostly sited on actively disturbed cropland habitat.

**Shading:** On the TSF Project Area, the PV modules will be laid out in rows parallel to one another to create an array, with space between each row to avoid one row shading the next. In contrast to the CVSR Project, the modules are fixed and do not rotate or track the movement of the sun or require water for panel washing. Some portion of the ground under the arrays will be shaded at all times of the day, but most of the ground will likely receive at least some sun during various parts of the day. The smallest area of shade under the arrays will occur when the sun is highest in the sky with maximum shading occurring when the sun is lower in the sky such as in the early mornings and late afternoons, and during winter months. Shading will affect approximately 800 acres of existing grassland. The remaining 2,700 acres that will be shaded by the arrays is currently cropland that will be converted to grassland under the arrays.

Concerns have been raised regarding potential impacts that shading could have on the composition and structure of the annual grassland and how these impacts may affect wildlife. Studies have shown that shading can enhance the production of herbaceous vegetation (Frost and McDougald 1989), cause a shift from small to large seeded grasses and legume species (Amatangelo et al. 2008), and suppress native perennial grasses (Dyer and Rice 1999). Other research indicates that light availability is not as important in structuring grassland communities as other factors such as litter input (Lamb 2008) and precipitation (St. Clair et al. 2009). Many abiotic factors have a significant influence on the existing grassland's composition and structure. The project vicinity receives limited precipitation with 8 to 10 inches of annual precipitation on average (Natural Resource Conservation Service [NRCS] 2003) with extreme year-to-year variability. Most precipitation falls between November and May with minimal rainfall during the summer months. The potential evaporation rate of the grassland in the Carrizo Plain is very high, in excess of 100 inches per year; as the soil reflectance value is high and is frequently windy. Thus, observations suggest that the TSF Project Area vicinity experiences a wide range of environmental conditions and significant abiotic stressors that are likely the predominant factors that influence the grassland species composition and structure, with light/shade only being a single factor.

Germination of plant species is driven more by changes in light quality (i.e., ratio of red to infrared) than it is by quantity, and we do not anticipate changes in light quality. Light scatter is relatively high at the site due to its high soil reflectance and abundance of suspended particulates

in the air. Even if a plant is situated beneath a panel, solar input should be sufficient to drive photosynthesis. The minor drop in soil surface temperatures during the winter and spring months will likely have minimal impacts since the majority of the plant species only grow for a few months, germinating with the first rains and then completing their life cycle by late April. The density of non-native weeds may increase; however, the shading will probably cause a shift in plant stature, chlorophyll concentration, leaf size and etiolation. Reduced evapotranspiration and water stress from partial shading and water input from dew collection on the panels will likely result in changes in composition of both native and non-native plant species as well as increased height and density of plants from increased moisture and shading.

Preliminary findings from vegetation sampling study under a test block of First Solar's panels on the TSF Project Area show increases in some native grasses species such as nodding needlegrass (*Nassella cernua*) and bluegrass (*Poa secunda*), as well as an increase in nonnative mustard (*Brassica* sp.) and decreases in nonnative wild oats (*Avena* sp.) (Althouse and Meade, Inc. 2011c). Through time, the species composition could shift slightly to a larger percentage of shade-tolerant species, but it is inconclusive whether the shift will be toward greater or less abundance of native plant species. Taller vegetation would also reduce permeability for kit fox movement, and increase potential predation on kit fox by coyote and red fox.

Cropland and grassland that will be used for the solar arrays that will be disturbed by construction will be revegetated and will take into account the post-construction site conditions (i.e., shadier). The species mix will be composed of native and naturalized species that occur in the vicinity of the Project Area and will also be compatible with the special-status wildlife species of concern. The precise species mix will be developed based upon a more in-depth analysis of the revegetation approach and adaptively managed over the life of the project to maintain the best composition of vegetation for listed species.

In summary, with the conversion of cropland to grassland under the arrays and the implementation of a focused grazing management regime within the solar arrays, the potential exists to maintain on the TSF a grassland community with suitable vegetative structure that could support kit fox and their prey, however, the potential exists that use by these species may not occur. For the purposes of our analysis we are assuming the species will not use these areas for most of their needs.

***San Joaquin kit fox***

Virtually the entire Proposed Action area contains suitable habitat of varying quality for the San Joaquin kit fox. Surveys were conducted and the results are discussed in the biological assessment (Althouse and Meade Inc. 2011a, 2011b, 2011c). The majority of kit fox breeding, feeding, and sheltering have primarily been observed in the southern and eastern portions of the Project Area.

**Direct effects**

Direct effects on the San Joaquin kit fox from the Proposed Action are as follows:

- Construction of the Proposed Action will result in the direct loss and/or permanent modification of 3,520 acres of suitable San Joaquin kit fox habitat within the Project Footprint. This includes project components such as the solar arrays, the substation and the PG&E Solar Switching Station and its associated infrastructure, and the access roads and electrical collection system lines which will be located outside the fenced array areas.

- A 100-foot-buffer around the solar array perimeter fences may be temporarily impacted during construction, encompassing an additional 485 acres. This area will be stabilized and re-vegetated following grading or disturbance.

- Mortality, injury, and harassment of San Joaquin kit foxes by vehicles, heavy equipment, excavation, and grading could occur during construction activities. Construction traffic is anticipated to last for a period of approximately three years.

- Direct destruction of a den or disturbance of a den in or near construction areas could result in the loss or abandonment of active San Joaquin kit fox dens. None of the six natal/post-natal dens observed in 2009 and 2010 in the Proposed Action area are located within the Project Area, but the Project Area does include shelter den sites. Active natal or shelter dens may also be abandoned if covered by solar arrays.

- Mortality or injury of kit foxes could occur due to vehicle strikes from traffic in the action area during O&M activities. The potential for vehicle strikes will be greatest if Project personnel and service vehicles travel the Project Area at dawn and dusk.

- Injury or mortality of individual San Joaquin kit foxes could occur as a result of predation by or competition with species such as the red fox, coyote, or domestic dogs that might be attracted to the Proposed Action area by trash discarded by personnel during construction, and O&M activities, or if the Proposed Action activities cause an increase in prey availability for these species.

**Indirect effects**

The indirect effects of construction of the Topaz Solar Farm and associated infrastructure include:

- The solar arrays could alter San Joaquin kit fox habitat to the extent that it may exclude or reduce the species' use of the 3,520-acre Project Footprint which includes the solar arrays plus project components outside the fenced arrays. Changes include conversion of current land uses (77 percent in active tilling, 23 percent heavy grazing) to grassland that

will be partially shaded by solar panels and have reduced long-range visibility for the kit fox. Kit foxes are known to frequent areas with existing structures, such as orchards, active oil field operations, and the fringes of urban development. Based on the amount of light that will still penetrate below the solar arrays, the ground is expected to continue to be vegetated, and small mammal prey may remain within the solar arrays.

- Indirect effects may occur on 815 acres of Stewardship Lands located outside of the fenced areas and the permanent and temporary impact areas. These Stewardship Lands will not be subject to ground disturbance for project construction and will not contain project components, but they may have reduced functionality for kit fox as a result of their reduced size and fragmented configuration and their adjacency to the fenced areas which will be subject to human-related activities.

- Changing the current grazing regime could affect the abundance of San Joaquin kit fox, and the use of managed grazing is expected to be beneficial to kit fox. Under the current land use in the Proposed Action area, approximately 23 percent is heavily grazed at times which constrains vegetation height, density, and composition, and the active tilling on the remainder of the area (77 percent) greatly reduces habitat quality for kit fox and its prey. The conservation areas that are currently grazed will continue to be grazed by cattle and will be managed specifically for the San Joaquin kit fox; however, the area within the array footprints will be grazed by sheep. Vegetation changes resulting from the cessation of tilling and implementation of managed grazing is expected to be beneficial for kit fox and their prey, but the addition of panels could either be beneficial or detrimental to kit fox prey. Fluctuations in prey populations have been shown to affect kit fox densities (White and Ralls 1993, White et al. 1996).

- Noise and ground vibrations from the use of heavy equipment during construction of the Proposed Action could result in temporary threshold shifts in hearing sensitivity (reduction in hearing ability) that could last for an extended period of time. Noise and ground vibrations from the use of heavy equipment during construction or O&M activities could cause kit foxes to temporarily or permanently leave the impact areas, and kit fox could move to areas where they are more susceptible to injury or mortality from predation, vehicular traffic, or other activities. San Joaquin kit foxes displaced from impact areas due to disturbance-related to construction or O&M activities may increase competition for food and habitat with kit foxes in other areas.

- Placement of solar arrays could influence the scent-marking behavior and disrupt territorial boundaries of San Joaquin kit foxes in the Proposed Action area. As territories shift, interspecific competition and behavior changes could occur.

- The Proposed Action is situated within an approximately 7-mile wide permeable habitat corridor that extends from the Carrizo Plain northward and provides connectivity with the Salinas Valley to the northwest and western Kern County to the northeast for kit fox movement and dispersal (Penrod et al. 2010, ESRP unpublished data). The western and

eastern edges of the corridor are bordered by steep mountain ranges that are regarded as topographic barriers for kit fox. The TSF Project Area lies within the most suitable mapped San Joaquin kit fox corridor (Penrod et al. 2010, ESRP unpublished data) and spans approximately four sections of land or nearly four miles. While this is a large span of the corridor, kit fox surveys show relatively low use by resident kit foxes on the majority of the Project Area, as approximately 80 percent of the Project Area is actively tilled cropland.

- The Proposed Action could also affect movement and dispersal of San Joaquin kit foxes. San Joaquin kit foxes could avoid, to some extent, the areas under and around the arrays (B. Cypher, pers. comm. 2010). Most of the arrays are contiguous or nearly, which may be perceived by kit foxes as "impermeable" barriers to movement within the Project Area. However, fences will have a 5 to 6 inch gap at the bottom thereby allowing kit foxes to move throughout the site during daily movement activities or during dispersal. Adults and juveniles are known to move through partially disturbed habitats such as farm lands, oil fields, and areas with low density roads and highways (Haight et al. 2002). Escape dens within and along the margins of the fenced arrays will provide cover and reduce predation risk for kit foxes, which could facilitate increasing their movement through the Proposed Action area.

The kit fox surveys conducted for the Proposed Action indicate there are three resident pairs in the 4,840-acre Project Area. The average litter size for kit fox is two to six pups with an average of 3.8 pups found at the Naval Petroleum Reserve in Kern County (Cypher et al. 2000). Based on this average, each family group would consist of two adults plus 3.8 pups for a total of 5.8 individuals per family group. Three family groups of approximately 5.8 individuals each would result in a total of 17.4 kit fox individuals using the Project Area to some extent. In contrast, as described previously in this document, approximately four to 11 breeding pairs and their pups are expected to be supported on the 12,154 acres of Conservation Land.

Overall, there will be a loss of habitat used for breeding, feeding, sheltering and dispersal of the San Joaquin kit fox in the action area as a result of the Proposed Action. In addition, there will be a reduction of habitat within the north/south corridor and some reduction of movement possibilities for the San Joaquin kit fox. As a compensatory measure there will be land acquisition and protections for managed and restored habitat adjacent to and around the Project Area that will provide additional (due to restoration) opportunities for breeding, feeding, sheltering, and dispersal of the San Joaquin kit fox. Currently an estimated 3.4 million acres of high and moderate quality habitat remains for the San Joaquin kit fox throughout its range. The impacts to remaining suitable habitat from the Project Footprint represent 0.10 percent of the total remaining range. Conversion of cropland to permanently protected grasslands as a result of the conservation measures represents approximately 0.15 percent improvement in its total remaining range. Therefore, the overall impacts compared to the acreage to be restored and protected offsite is expected to be minimal, and opportunities for dispersal to the north will still be available.

***Effects of the Conservation Measures***

The Proposed Action was designed to avoid, minimize, and fully mitigate potential impacts to San Joaquin kit fox described above. This will be accomplished through the following:

- Avoidance and minimization of impacts to individuals of these species (as described under the headings related to avoidance and minimization in the Project Description), both to minimize take of individuals and, where applicable, to retain individuals on and near the sites as a source of colonists for preserved and enhanced on-site and off-site conservation lands.
- The Proposed Action will preserve in perpetuity approximately 12,154 acres of habitat suitable for the breeding, foraging, and sheltering of the San Joaquin kit fox in and around the Project Area and northern Carrizo Plain. This habitat will not be impacted at all during construction; rather, through design and implementation of conservation measures, the off-site habitat will be undisturbed, and if in cropland will be converted to grassland. A total of 12,154 acres will be protected outside of the Project Area (Althouse and Meade Inc. 2011b, 2011c), not including some potentially usable habitat on the Stewardship Lands between the fenced solar arrays on the Project Area.
- Implementation of the protective dust control pond design, monitoring and management plan described in revised biological assessment (Althouse and Meade, Inc. 2011c), including a requirement that dust control ponds will be encircled with a 6-foot high wildlife exclusion barrier buried 2-feet underground to prevent kit fox and other wildlife from accessing the pond. No areas outside of the fenced solar arrays will be permanently disturbed by the Proposed Action with the exception of access roads and the electrical collection system. Accordingly, the acreage for access roads and the electrical collection system is included in the 3,520-acre Project Footprint.
- With the exception of the area around the 6.3-acre Solar Switching Station, and the adjacent 5-acre substation, no fences will block kit fox movement. Up to 83 miles of fencing will be removed or enhanced in the Project Area and Off-Site Conservation Lands to improve wildlife passage, including up to 12,000 feet of cyclone barrier fencing that will be removed from Section 27.
- Habitats temporarily impacted will be restored following the completion of construction.
- All of the unimpacted and the temporarily impacted land within the Project Area that is subsequently restored will provide suitable habitat that could be used by kit fox during the operation of the Proposed Action. A Habitat Mitigation and Monitoring Plan will specify conservation land management goals and tasks and be implemented to benefit the kit fox.
- Where avoidance and restoration of temporarily impacted land is insufficient to mitigate impacts, compensatory mitigation – preservation, enhancement and management of Off-Site Conservation Lands in perpetuity – as described herein will occur.

To minimize impacts to the kit fox, the Proposed Action's compensatory mitigation strategy is intended to result in a net beneficial effect to the kit fox impacted by the Proposed Action. Permanent loss of habitat for the kit fox as a result of the replacement of habitat with components of the Proposed Action will be compensated by the preservation, enhancement, and management in perpetuity of suitable Off-Site lands outside the Project Area's immediate impact areas. Although the San Joaquin kit fox may continue to use the areas occupied by the solar arrays after installation, the habitat within solar array areas, and the access roads and electrical collection system, all such areas are considered acreage for which compensatory mitigation measures will be provided and lands within and between the solar arrays will not be considered to provide conservation habitat. The proposed conversion of cropland to grassland in the conservation area will improve the quality of habitat for kit fox habitat and its prey and that once protected, it is anticipated the Off-Site Conservation Lands could potentially support a higher density of kit fox than under current conditions.

Under the conservation strategy, approximately 12,154 acres of land will be protected and managed. Managed grazing will be one of the activities implemented under an approved plan to help create optimal habitat for kit fox. The protected lands that are currently in dryland farming will be converted to grassland. The Off-Site Conservation Lands to be protected have been strategically selected to benefit the kit fox regionally. Thus, the effectiveness of the compensatory mitigation strategy is designed to be greater than the raw ratio of lands protected to lands impacted.

All lands proposed for conservation have been or will be surveyed for listed species. The conserved habitats are suitable for San Joaquin kit fox as described in the project description and are either occupied or likely will become occupied because they are located adjacent to occupied habitat and will likely be colonized following restoration.

The conservation habitat that will be used for compensatory mitigation is determined by the quality of habitat impacted by the Proposed Action, with a focus on the replacement and enhancement of lost functions and values through the preservation, enhancement, and management of habitat outside the impact areas. Focusing on functions and values of habitat that will provide mitigation requires the following interrelated considerations:

- Determination of the ratios of acreage impacted to acreage preserved or enhanced
- Specification of selection criteria for the attributes of the preservation/enhancement acreage
- Conservation land enhancement and management measures

The ratio of acres of conservation habitat preserved to acres impacted often varies by species and by project circumstances depending on the species' life history requirements and relative value of the impact and conservation sites. Conservation using highly important lands that provide high value for the species in question or that contribute significantly to regional preservation efforts (e.g., lands that augment large areas of contiguous, preserved habitat), or lands that currently provide very low value but that could be enhanced to increase value considerably, are

most beneficial to species as they have the greatest likelihood of achieving the objective of maintaining or enhancing pre-project conditions and replacing or enhancing lost functions and values. Thus, conserving lands that provide high value for listed species through their significant contribution to regional preservation efforts and/or enhancing lands that currently provide very low value but restore functions and values in key areas within a regional context will be the primary focus of the compensatory conservation. Based on previous observations of kit fox colonization of lands retired from cropping in the Carrizo Plain, it is reasonable to assume the proposed restoration of off-site habitats for San Joaquin kit fox will be successful given the adjacency to occupied lands and the propensity for these species to disburse and occupy suitable unoccupied habitats (Bidlack 2007; White and Ralls 1993).

On-site habitat temporarily impacted will be restored following the completion of construction. All of the unimpacted and the temporarily impacted land that is subsequently restored will provide suitable habitat during the operation of the Proposed Action. Stewardship Lands and Off-Site Conservation Lands, not already in public land, will comprise areas of suitable soil, topography, hydrology, and vegetation occupied by kit fox to ensure the presence and enhancement (through targeted management) of the kit fox population, and habitat that is unoccupied and suitable, or that could be made suitable through restoration or enhancement.

Through land use changes and targeted management for the kit fox (e.g., by removing active discing, reseeding, and/or introducing managed grazing), habitat quality will be improved considerably. We anticipate the natural colonization and/or increased use of these improved and enhanced Off-Site Conservation Lands by kit fox because of their proximity to occupied habitat. We base this on documentation of kit fox in the Project Area in areas that were once in cropland (sections 4, 5, 34, and 35) and now have documented kit fox occurrence and natal dens (Althouse and Meade, Inc. 2011b). In addition, areas on the California Valley Solar Ranch site that were farmed 20 years ago now support kit fox denning. Kit fox also occur on areas in the CPNM that were once farmed and allowed to return to usable habitat for the kit fox (Bidlack 2007; White and Ralls 1993).

The proposed conservation areas will build upon the benefits provided by the management of the kit fox population on the CPNM and link this regional population center with core population in the Ciervo-Panoche area to the north. Proposed conservation areas to the west and east of the Topaz Solar Farm possess extremely important ecological values for San Joaquin kit fox in that those areas will be enhanced to provide higher quality kit fox habitat as well as provide a protected wildlife movement corridor for kit fox between the CPNM and the Ciervo-Panoche core population. The preservation of a movement corridor between the CPNM and kit fox populations to the north is one of the most important ecological factors likely to affect the long term persistence of the species in areas north of the CPNM. The proposed conservation areas provide an opportunity to enhance and permanently protect the connectivity of suitable habitats within the region to maintain habitat and a north-south kit fox movement corridor.

Maintaining connectivity of kit fox corridors within the Carrizo Plain is the primary important ecological goal of the conservation strategy. The potential off-site conservation lands within the

Carrizo Plain surrounding the TSF site are mostly agricultural lands, which are currently dry-land farmed or were previously dry land farmed and are currently grazed. These lands are within the kit fox corridor identified by South Coast Wildlands (Penrod et al. 2010) and contribute to the preservation and enhancement of the corridor in this area by restoring habitat degraded by agricultural practices, preserving substantial areas between the Proposed Action and other proposed projects.

For the purposes of our analysis in this biological opinion, and based on the limited amount of scientific information available, we have determined that kit fox are not likely to use the habitat in and around the TSF and associated infrastructure for breeding, feeding, sheltering, or dispersal by displacing them during construction and operation. However, it is also possible that, during construction and operation, kit fox may utilize the TSF Project Area for any of these life history needs despite the anticipated direct and indirect construction and operation impacts. The Project Proponent is implementing a variety of measures to avoid, minimize and conserve the species on the Project site. The termination of the current active farming, implementation of active habitat management for the benefit of the species, permeable fence design, and placement of escape structures are important measures to achieve these goals and may increase the sites attractiveness to kit fox. If kit fox do use the site for breeding, feeding, sheltering, or dispersal, during construction and operation, we would view this as a positive outcome and not an adverse effect of the proposed action.

Overall, the conservation strategy of the Proposed Action will result in permanent protection of suitable habitat for the San Joaquin kit fox on lands where these habitats are currently vulnerable to conversion to incompatible land uses such as dryland farming or viticulture. The conservation measures will result in the protection and management of lands for the benefit of the kit fox in an area where no lands are currently managed for the benefit of the species, thus providing some certainty of habitat suitability.

***Effects on Recovery of the Species***

The effects of the Proposed Action, including the PG&E Reconductoring Project, as they more specifically relate to the recovery of the San Joaquin kit fox are discussed here. The Recovery Plan for Upland Species of the San Joaquin Valley, California (U.S. Fish and Wildlife Service 1998) (Recovery Plan) addresses recovery goals for the San Joaquin kit fox.

The strategy in the Recovery Plan for San Joaquin kit fox includes the establishment and maintenance of viable complexes of interconnected kit fox populations on private and public lands throughout its geographic ranges, especially the core population on the Carrizo Plain Natural Area (U.S. Fish and Wildlife Service 1998). While the project does impact approximately 4,840 acres of habitat either occupied or suitable for the kit fox on the northern Carrizo Plain, the conservation measures will result in a net increase of lands of the same status and condition by protection, restoration and management of lands that are currently unsuitable and/or unmanaged. The measures incorporated into the Proposed Action include the conservation of approximately 12,154 acres of kit fox habitat in the Carrizo Plain, and relates to

the recovery action of habitat protection and habitat connectivity, thus contributing to the recovery goal of establishing and maintaining a viable interconnected kit fox population on private lands within the Carrizo Plain.

**Cumulative Effects**

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the Proposed Action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act. There are no known future State, Tribal, local or private actions that are reasonably certain to occur within the action area under consideration.

**Conclusion**

For the proposed Topaz Solar Farm Project and the associated infrastructure, we have determined that the amount of take for the San Joaquin kit fox is of an extent and nature that is not expected to appreciably reduce the ability of these species to continue to successfully breed, feed, shelter, and to disperse within and outside of the action area. This project as proposed will result in some limitations on movement of San Joaquin kit fox but is not expected to preclude north and south movements as sufficient corridors of suitable dispersal habitat will occur and will remain around the project as a result of the Off-Site Conservation Lands surrounding the Project Area that will be protected and managed in perpetuity for the kit fox. The only other projects in the vicinity (California Valley Solar Ranch (with the PG&E Reconductoring) are considered a federal action and its effects to listed species were addressed in a separate biological opinion (U.S. Fish and Wildlife Service 2011b). The topography of the landscape is such that additional future projects (beyond the Proposed Project and California Valley Solar Ranch) of this nature in this area will likely adversely impact the environmental conditions that provide for the breeding, feeding, sheltering and dispersal of the San Joaquin kit fox and may present significant barriers to dispersal around and adjacent to the project area and should be carefully considered in future analyses.

After reviewing the current status of the San Joaquin kit fox, the environmental baseline for the action area, the effects of the proposed Topaz Solar Farm Project and associated infrastructure which includes the Solar Switching Station, and Off-Site Conservation Lands and the cumulative effects, it is the Service's biological opinion that the project as proposed, is not likely to jeopardize the continued existence of this species.

**INCIDENTAL TAKE STATEMENT**

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act, prohibit take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. The Service defines harassment as an intentional or negligent act or omission

that creates the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. The Service defines harm to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), take that is incidental to and not intended as part of the agency action is not considered to be prohibited, provided such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Action Agencies, and their applicant, based on commitments described in the project description and through binding conditions of any permit or contract issued to the applicant, in order for the exemption in Section 7(o)(2) to apply. The Action Agencies have the continuing duty to regulate the activity covered by this incidental take statement. If the Action Agencies (1) fail to assume and implement the terms and conditions or (2) fail to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any permit or contract, then the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Lead Agency (DOE) must report the progress of the action and its impact on the species, or ensure that their applicant provides such reports to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

**Amount or Extent of Take**

Upon implementation of the following reasonable and prudent measures the following levels of incidental take of the San Joaquin kit fox will be exempted from prohibitions of take under Section 9 of the Act.

The Proposed Action is likely to result in the incidental take of the San Joaquin kit fox as a result of the following activities:

- Approximately 3,520 acres of suitable San Joaquin kit fox habitat will be permanently impacted by the construction and operation of the Proposed Action (3,500 acres of fenced solar arrays and the switching station, and 20 acres of roads and electrical lines outside the fences). An additional 485 acres of suitable San Joaquin kit fox habitat will be temporarily impacted by construction activities (100-foot buffer around fenced arrays) but will be restored to pre-project conditions following construction. Approximately 815 acres of Stewardship Lands will not be subject to ground disturbance for project construction and will not contain project components, but they may have reduced functionality for kit fox as a result of being fragmented remnants of formerly contiguous habitat. An additional 20 acres of habitat will be restored to meet wetland mitigation requirements by the Corps/RWQCB. The Service estimates that approximately 18 San Joaquin kit fox individuals within the 4,840-acre Project Area will be subject to take in the form of harm and harass as a result of construction and operation of Proposed Action.

**Effect of the Take**

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the San Joaquin kit fox.

**Reasonable and Prudent Measure**

The following reasonable and prudent measure is necessary and appropriate to minimize the impacts of the anticipated amount or extent of the incidental taking resulting from the Project on the San Joaquin kit fox.

1. Adhere to all conservation measures in the biological assessment, and the additional measures as noted in this biological opinion and under the additional terms and conditions noted below.

**Terms and Conditions**

In order to be exempt from the prohibitions of Section 9 of the Act, the Action Agencies and their applicant must comply with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

The following terms and conditions implement the reasonable and prudent measure referenced above.

1. The Action Agencies shall include as a condition of any and all permits or contracts associated with the loan guarantee and/or permit for the Project that the applicant must fully implement and adhere to all conservation measures, and all other conditions and reporting requirements in this biological opinion.

2. The Action Agencies and the project applicant shall minimize the potential for harm, harassment, or killing of federally-listed species resulting from Project related activities by implementation of the conservation measures as described in the biological assessment, and also referenced in the conservation measures section of this biological opinion.

3. Prior to groundbreaking for each phase, site specific information on the location, habitat type, land use, species occurrences, ownership and title, and proposed acquisition or easement type for the off-site Conservation Lands shall be submitted for Service approval.

4. The Action Agencies or their applicant will be responsible for implementing the conservation measures and terms and conditions of this biological opinion, and the Lead Agency or their applicant shall be the point of contact in the field for the Project and shall

maintain a copy of this biological opinion on-site whenever construction is taking place. Their name and telephone number shall be provided to the Service at least thirty (30) calendar days prior to groundbreaking on the Project area. Prior to ground disturbance, the superintendent must submit a letter to the Service verifying that they possess a copy of this biological opinion and have read and understand the terms and conditions.

5. If requested, before, during, or upon completion of ground breaking and/or construction activities, the project applicant shall allow access by the Service personnel to the project area to inspect project effects to listed species and associated habitats.

6. Consistent with the phased implementation schedule of the Proposed Action, a management plan for each acquisition site constituting a portion of the Off-Site Conservation Acquisition site to meet the compensatory conservation measures for each phase must be approved by the Service.

7. Consistent with the phased implementation schedule of the Proposed Action, an analysis of costs for the management plans and associated endowments necessary to meet the compensatory conservation measures for each phase of construction must be approved by the Service.

8. Consistent with the phased implementation schedule of the Proposed Action, a Service approved conservation easement necessary to meet the compensatory conservation measures for each phase of construction shall be placed on Off-Site Conservation Lands (which exclude any Project Area land such as the Stewardship Lands).

**Reporting Requirements**

The Action Agencies must require that Topaz Solar Farm LLC (or its successor) provide the Service with a twice yearly report to describe the progress of implementation of all the commitments in the conservation measures and terms and conditions sections of this biological opinion.

The Action Agencies must require that Topaz Solar Farm LLC (or its successor) immediately report any information to the Service about take or suspected take of federally-listed species not authorized in this biological opinion. The Sacramento Fish and Wildlife Office is to be notified within 24 hours of the finding of any dead federally-listed species or any unanticipated harm to the species addressed in this biological opinion. The Service contact person for this is the Assistant Field Supervisor of the Endangered Species Division at (916) 414-6600 and the Resident Agent-in-Charge of the Service's Law Enforcement Division at (916) 414-6660.

## CONSERVATION RECOMMENDATIONS

Conservation recommendations are suggestions from the Service regarding discretionary measures to minimize or avoid adverse effects of a Proposed Action on listed species or critical

habitat or regarding the development of new information. These measures may serve to further minimize or avoid the adverse effects of a Proposed Action on listed, proposed, or candidate species, or on designated critical habitat. They may also serve as suggestions on how action agencies can assist species conservation in furtherance of their responsibilities under Section 7(a)(1) of the Act, or recommend studies improving an understanding of a species' biology or ecology. Wherever possible, conservation recommendations should be tied to tasks identified in recovery plans. The Service is providing you with the following conservation recommendations.

*a.* Action Agencies should implement all Recovery Action as outlined in our Recovery Plan for Upland Species for the San Joaquin Valley, California.

To keep informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

**REINITIATION – CLOSING STATEMENT**

This concludes formal consultation on the proposed Topaz Solar Farm Project in San Luis Obispo County, California. As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or, (4) a new species is listed or critical habitat designated that may be affected by the action.

If you have any questions regarding this biological opinion please contact Kenneth Sanchez or Kate Symonds at (916) 414-6600.

Sincerely,

Susan K Moore

Susan K. Moore
Field Supervisor

Enclosure

cc:
Ms. J. Vance, CDFG, Fresno, CA
Mr. C. Diel, USFWS, Ventura, CA

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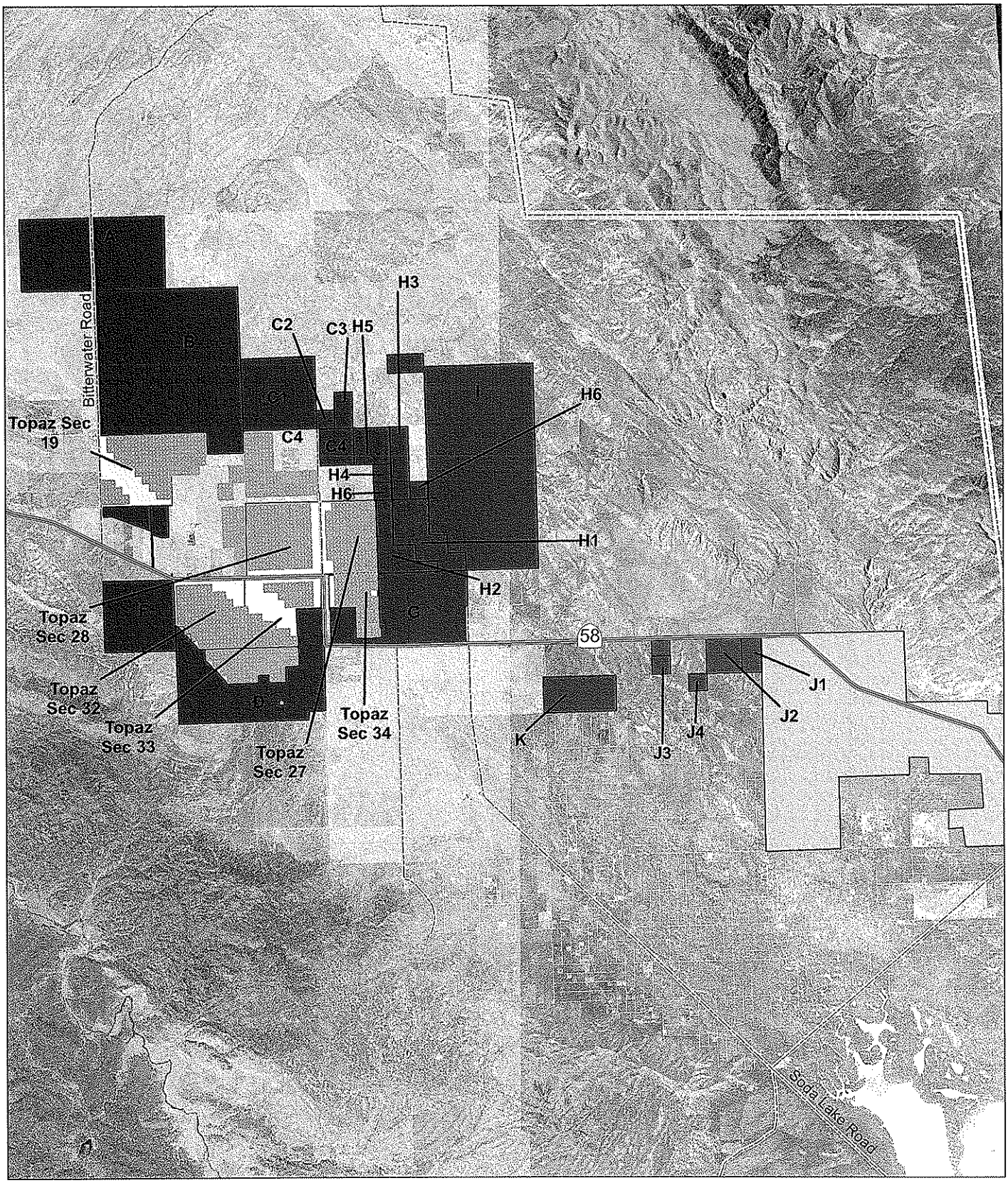
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FIGURE 1





Topaz Solar Farms, LLC
1111 Broadway, 4th Floor
Oakland, CA 94607


2009 NAIP Aerial Photography
Map Updated: May 26, 2011


Althouse and Meade, Inc.
1602 Spring Street
Paso Robles, CA 93446

# TOPAZ BEST MANAGEMENT PRACTICES

## Best Management Practices

BMPs were derived from the Draft EIR for the Topaz Solar Farm (San Luis Obispo County 2010a). BMPs will be implemented as standard operating procedures during all ground disturbance and construction-related activities to avoid or minimize project impacts on biological resources. These BMPs, which would be enforced by the County, may include but are not limited to the following:

a. Compliance with BMPs will be documented and provided to the County in a written report on an annual basis. The report shall include a summary of the construction activities completed, a review of the sensitive plants and wildlife encountered, a list of compliance actions and any remedial actions taken to correct the actions, and the status of ongoing mitigation efforts.

b. Prior to ground disturbance of any kind the project work areas shall be clearly delineated by stakes, flags, or other clearly identifiable system.

c. Vehicles and equipment shall be parked on pavement, existing roads, and previously disturbed areas to the extent practicable.

d. Speed limit signs, imposing a speed limit of 15 miles per hour, will be installed throughout the project site prior to initiation of site disturbance and/or construction. To minimize disturbance of areas outside of the construction zone, all project-related vehicle traffic shall be restricted to established roads, construction areas, and other designated areas. These areas will be included in preconstruction surveys and to the extent possible, should be established in locations disturbed by previous activities to prevent further impacts. Off-road traffic outside of designated project areas will be prohibited.

e. No vehicles or equipment shall be refueled within 100 feet of an ephemeral drainage or wetland unless a bermed and lined refueling area is constructed. Spill kits shall be maintained on site in sufficient quantity to accommodate at least three complete vehicle tank failures of 50 gallons each. Any vehicles driven and/or operated within or adjacent to drainages or wetlands shall be checked and maintained daily to prevent leaks of materials.

f. All general trash, food-related trash items (e.g., wrappers, cans, bottles, food scraps, cigarettes, etc.) and other human-generated debris will be stored in animal proof containers and/or removed from the site each day. No deliberate feeding of wildlife will be allowed.

g. Development on the main Project site will maintain existing hydrologic patterns with respect to runoff supporting seasonal wetlands, vernal pools and ephemeral drainages.

h. All pipes and culverts with a diameter of greater than 4 inches shall be capped or taped closed. Prior to capping or taping the pipe/culvert shall be inspected for the presence of wildlife. If encountered the wildlife shall be allowed to escape unimpeded.

i. No firearms will be allowed on the project site, unless otherwise approved for security personnel.

j. To prevent harassment or mortality of listed, special-status species and common wildlife, or destruction of their habitats, no domesticated animals of any kind shall be permitted within the fenced project area with the exception of sheep grazing for weed management. Dogs associated with sheep grazing shall not be authorized.

k. Use of chemicals, fuels, lubricants, or biocides will be in compliance with all local, state and federal regulations. All uses of such compounds shall observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other state and federal legislation, as well as additional project-related restrictions deemed necessary by the USFWS and CDFG. Use of rodenticides is restricted.

l. Any contractor or employee that inadvertently kills or injures a special-status animal, or finds one either dead, injured, or entrapped, will immediately report the incident to the on-site representative identified in the Worker Environmental Awareness Program. The representative will contact the USFWS, CDFG, and County by telephone by the end of the day, or at the beginning of the next working day if the agency office is closed. In addition, formal notification shall be provided in writing within three working days of the incident or finding. Notification will include the date, time, location and circumstances of the incident. Any threatened or endangered species found dead or injured will be turned over immediately to CDFG for care, analysis, or disposition.

m. During the site disturbance and/or construction phase, grading and construction activities before dawn and after dusk are prohibited.

n. Avoidance and minimization of vegetation removal within active construction areas will include flagging of sensitive vegetative communities or plants.

o. Avoid and minimize construction activities resulting in impacts to wetlands, streambeds, and banks of any ephemeral drainage.

p. All excavation, steep-walled holes or trenches in excess of 6 inches in depth shall will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth dirt fill or wooden planks. Trenches will also be inspected for entrapped wildlife each morning prior to onset of construction activities and immediately prior to covering with plywood at the end of each working day. Before such holes or trenches are filled, they will be thoroughly inspected for entrapped wildlife. Any wildlife discovered will be allowed to escape before construction activities are allowed to resume, or removed from the trench or hole by a qualified biologist holding the appropriate permits (if required).

q. Project personnel will monitor all areas within 1/4-mi around the solar arrays on a regular basis (i.e., several times per week) for any dead animals, including wild animals or grazing animals such as cattle, goats, or sheep that are being used for vegetation management on the site. Any animals found dead will be removed immediately to avoid attracting condors to the vicinity of the arrays.

r. New light sources will be minimized, and lighting will be designed (e.g., using downcast lights) to limit the lighted area to the minimum necessary.

# DRAFT VEGETATION MANAGEMENT PLAN

# Vegetation Management Plan

## (Includes Weed Control Plan and Grazing Management Plan)

# Topaz Solar Farm

San Luis Obispo County
California



Prepared for

**Topaz Solar Farms, LLC**
1111 Broadway, 4th Floor
Oakland, CA 94607

by

**ALTHOUSE AND MEADE, INC.**
**BIOLOGICAL AND ENVIRONMENTAL SERVICES**
1602 Spring Street
Paso Robles, CA 93446
(805) 237-9626

**June 17, 2011**

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# Definitions

*Project Areas*

**TSF:** **Topaz Solar Farm**; name of the proposed project.

**TSF Project, Project:** **Topaz Solar Farm Project**; used generically to describe the project layout.

**Stewardship Land:** About 1,015 acres of the Project lands, outside of the fenced areas and permanent and temporary impact areas, which will be subject to this Vegetation Management Plan. For operational and regulatory reasons, these land areas will not be the subject of a conservation easement and are not part of the 12,139 acre land mitigation package that has been proposed to the County and wildlife agencies.

*Regulatory and Organization Abbreviations*

**APN**: Assessor's Parcel Number
**BLM**: Bureau of Land Management
**Cal-IPC**: California Invasive Plant Council
**CDFA**: California Department of Food and Agriculture
**CEQA**: California Environmental Quality Act
**CFR**: Code of Federal Regulations
**COA:** Conditions of Approval
**CPNM**: Carrizo Plain National Monument
**CUP:** Conditional Use Permit
**EIR**: Environmental Impact Report
**FNWL**: Federal Noxious Weed List
**HRRP**: Habitat Restoration and Revegetation Plan
**MDBM**: Mount Diablo Base Meridian
**NRCS**: Natural Resource Conservation Service
**USDA**: United States Department of Agriculture
**USGS**: United Stated Geologic Survey
**USFWS**: U.S. Fish and Wildlife Service

*Technical Abbreviations*

**DVM**: Doctor of Veterinary Medicine
**GIS**: Geographic Information Systems
**GPS**: Global Positioning System
**kV**: Kilovolts; 1000 volts
**MW**: Megawatts
**PCA**: Pest Control Advisor
**PV**: Photovoltaic
**PV Array**: A block of photovoltaic modules
**PV Module:** An individual solar panel
**RDM:** Residual dry matter
**WMA**: Weed Management Area

*Species Abbreviations*

**SJKF**: San Joaquin Kit Fox

*Other Abbreviations*

**SLO**: San Luis Obispo
**VMP:** Vegetation Management Plan

# Executive Summary

This Vegetation Management Plan provides information regarding management of vegetation resources and invasive weeds that occur on lands used for construction and operation of the Topaz Solar Farm (TSF) photovoltaic (PV) energy generation facility (Project) in San Luis Obispo County. This plan addresses management of the TSF Project fenced areas and Stewardship Land between and adjacent to the fenced areas. The Vegetation Management Plan also identifies ongoing maintenance to maintain the Stewardship Land habitats in a condition comparable to or better than pre-project condition. Management and maintenance activities on Stewardship Lands owned by the Applicant will be limited to those necessary to restore, revegetate, enhance and maintain listed species habitat and other property infrastructure such as roads, fences, electrical lines and livestock watering facilities.

Vegetation management goals are identified, and the following strategies to support those goals over the life of the project are recommended:

- Maintain vegetative cover on the ground within the Project to promote a natural habitat capable of supporting San Joaquin kit fox prey, in addition to a variety of birds, reptiles, and amphibians.
- Enable continued agricultural use of the site concurrent with solar power generation via managed grazing, as feasible.
- Minimize use of power equipment and herbicide application for vegetation management.
- Provide adequate ground cover to prevent wind and water erosion of soils. Promote improved soil aggregate stability through increased soil organic matter, roots, and fungal associations.
- Provide adequate cover to stabilize former croplands. Promote recovery of former croplands to annual grasslands.
- Promote recruitment of native plant species, especially perennial grasses and wildflowers, to the Project fenced areas and Stewardship lands.
- Manage fuel load to minimize risk of fire.
- Manage vegetation height to maintain optimum function of solar PV arrays.

Weed management objectives are:

- Identify areas with low/no invasive weeds and prevent introduction of new weedy species
- Eradicate California Department of Food and Agriculture List A weeds from the site (skeleton weed)
- Eradicate small infestations of California Department of Food and Agriculture List B weeds from the site (tamarisk)
- Eradicate small infestations of California Department of Food and Agriculture List C weeds (tree of heaven)

- Identify areas with Moderate and Limited rated weed infestations. Control widespread California Department of Food and Agriculture List C and Cal-IPC Moderate and Limited rated species to prevent spread into uninfested areas and to prevent interference with Project operation (yellow starthistle, tocalote, bindweed, tansy mustard, perennial mustard, Russian thistle, puncture vine)
- Manage other non-native species with potential to interfere with Project operations (tumbleweed amaranth, Oriental mustard)

The Project will be grazed to accomplish the following objectives:

- Maintain annual grassland as San Joaquin Kit Fox habitat.
- Manage vegetation height to prevent shading of PV arrays.
- Reduce fuel load as a fire-prevention measure.
- Aid in conversion of croplands to annual grassland by reducing weed infestations.
- Manage weed height and control spread of existing weeds.

# 1.0 Introduction

This Vegetation Management plan provides information regarding management of vegetation resources and invasive weeds that occur on lands used for construction and operation of the Topaz Solar Farm (TSF) photovoltaic (PV) energy generation facility (Project) in San Luis Obispo County. This plan addresses management of the TSF Project fenced areas and Stewardship Land between and adjacent to the fenced areas. Land outside fenced arrays, contiguous with the project fenced areas and not proposed as mitigation land is called Stewardship Land. Figure 1, Section 7.0 illustrates the Project fenced areas and Stewardship Land. A separate plan titled Habitat Mitigation and Monitoring Plan prescribes management strategies for mitigation lands (Althouse and Meade 2011a).

Vegetation management goals are identified and strategies to support those goals over the life of the project are recommended. Vegetation within TSF must be managed to maintain cover for habitat and erosion control goals, while minimizing risk of fire and maintaining optimum function of solar PV arrays. Monitoring and adaptive management tasks are included. These tasks share many goals and together constitute Vegetation Management during construction and operation of the Project.

Development of this Vegetation Management Plan was informed by the Final Environmental Impact Report, the Draft Environmental Impact Statement, and results of the Final Biological Report for TSF (Althouse and Meade, Inc. 2010b). We provide habitat objectives for vegetation resources, and lists of target species for weed control on the Project and Stewardship Lands. The Vegetation Management Plan is an ecologically-based plant management process, incorporating revegetation and restoration, weed management and grazing management strategies[1].

The Vegetation Management Plan also identifies ongoing maintenance to maintain the Stewardship Land habitats in a condition comparable to or better than pre-project condition. Management and maintenance activities on Stewardship Lands will be limited to those necessary to restore, revegetate, enhance and maintain listed species habitat and other property infrastructure such as roads, fences, and cattle watering facilities.

## 1.1 Summary of Conditions of Approval Met by this Plan

Complete text of the relevant Conditions of Approval is provided in Appendix D. Vegetation Management Plan Action Items are listed in Appendix E.

***Condition 43. MM BR-1.2: Implementation of Best Management Practices*:**

- Use of herding dogs limited to directly supervised activity, such as movement of sheep from one project area to another, during daylight hours.

[1] Specific instruction on revegetation and restoration efforts immediately following construction of the Project is addressed in a separate document, the Habitat Restoration and Revegetation Plan (HRRP) (Althouse and Meade, Inc. 2011c). This Vegetation Management Plan provides long-term management information.

- Use of herbicides shall observe label and other restrictions mandated by state and federal legislation as well as project-specific limitations imposed by DFG and USFWS. Rodenticides shall not be used.
- Carcasses of any dead grazing animals shall be promptly removed and buried to avoid attracting condors to the site.

***Condition 46. MM BR-2.1: Prepare and Implement a Weed Control Plan:***

- Section 2.0 of this Vegetation Management Plan consists of a Weed Management Plan.
- Section 2.2 lists all weedy species that occur on or near Topaz Solar Farm and prioritizes their risk of impacting native species and potential to be eradicated or controlled.
- Sections 2.4, 2.5, and 2.6 provide information regarding weed control treatments and appropriate timing for treating weed populations for maximum control.
- Section 2.7 provides information on preventing new weed infestations, including a Vehicle Washing Plan.
- Section 2.9 provides weed monitoring and reporting guidelines
- Section 7.0 provides results of weed mapping conducted as part of Botanical Surveys in 2010.
- Section 8.0 provides photographs to help project managers in identifying weeds that are likely to occur at TSF and aid in timely treatment of new infestations.

***Condition 47. MM BR-2.2: Develop a Grazing Plan:***

- Section 3.0 of this Vegetation Management Plan consists of a Grazing Plan.
- Section 3.2 is a literature review discussing pros and cons of sheep versus other grazing animals, impacts of grazing on soil quality, and findings regarding the use of managed grazing to maintain appropriate habitat for special status species.
- Locations, timing, target intensity, water provisions, and other details of managing annual grazing are provided in Sections 3.3 through 3.7.
- Monitoring and adaptive management are discussed in Sections 3.11 and 3.12.

***Condition 54. MM BR-8.2. Avoid known listed fairy shrimp locations;***

- Grazing intensity and management will be timed to avoid adverse effects on vernal pools and associated species is discussed in Section 3.5.

***Condition 65. MM BR-16.3 (g) Monitor indirect impacts to vegetation and wildlife;***

- A strategy to monitor factors related to long-term potential changes in vegetation is addressed in Section 4.1

***Condition 88. MM HZ-1.1. Develop and implement site-specific spill response plan;***

- Herbicide spill response is addressed in Section 2.8.4.
- The project site Spill Response Plan shall include herbicides.

***Condition 89. MM HZ-1.2. Develop and implement a hazardous materials business plan.***

- Section 2.8.3 indicates that Handling and storage of pesticides shall follow the Hazardous Materials Business Plan, a separate document.

***Condition 90. MM HZ-1.3. Develop and implement a hazardous waste management plan.***

- Section 2.8 of this document includes basic information on storage, handling, and spill cleanup for herbicides.
- Reference is made to hazardous materials plans that must be prepared for the project which will include more extensive information on storage, handling, spill prevention and cleanup, and disposal of hazardous materials. Many herbicides are considered hazardous materials.

***Condition 92. MM HZ-1.5: Use licensed herbicide applicator:***

- The Weed Control Plan states that application of herbicides must be done by licensed personnel, and must follow Worker Training Program.

***Condition 102. MM HZ-7.3: Ensure proper handling of livestock:***

- The Grazing Plan identifies measures to minimize risk of exposure to naturally-occurring anthrax.
- Appropriate disposal of carcasses in the event of grazing animal deaths is addressed in the Grazing Plan.

## 1.2 Vegetation Management Plan Treatment Area: Project and Stewardship Lands

The Project and Stewardship Lands are in the northern Carrizo Plain area of San Luis Obispo County, California. The Project is within the La Panza NE and California Valley United States Geological Survey (USGS) 7.5 minute quadrangles. Elevation varies from approximately 2,010 to 2,200 feet above mean sea level. Throughout this document, a Project "Section" refers to Public Land Surveyor System section numbers. The Project includes portions of sections 19, 20, 21, 27, 28, 29, 22, 32, 33, 34 in Township 29 South, Range 18 East, and portions of sections 4 and 5 in Township 30 South, Range 18 East Mount Diablo Base and Meridian (MDBM). Section numbers can be seen on 7.5' U.S.G.S. topographic maps and are included in this plan's Section 10.1 Figures.

## 1.3 Existing Vegetation Conditions and Results of Preliminary Vegetation Tests

Vegetation tests are in process at the TSF Project site to study the effects of PV arrays on regeneration and growth of vegetation within arrays.

The tallest and densest vegetation at the Project site grow on recently farmed grain fields prepared for seeding just after the first rains. The shortest vegetation occurs in fields that

have not been plowed for over 20 years. Based on preliminary vegetation test data, unplowed fields within PV fenced arrays can produce sufficient biomass to protect the soil from erosion. Sufficient light penetrates under modules to support ample biomass that can protect soil from water and wind erosion. In addition, vegetation is likely to experience a longer growing season under modules than out in the open due to lower soil and air temperatures. Shading may benefit perennial bunchgrass species, such as nodding needlegrass (*Nassella cernua*) and one-sided bluegrass *(Poa secunda).* Nodding needlegrass is a native bunchgrass that occurs along the edge of Highway 58 between Bitterwater Road and Simmler-Soda Lake Road where roadside moisture accumulates. One-sided bluegrass is an occasional component of grassland vegetation on the the TSF site. PV arrays moderate high soil temperatures and allow more robust growth of grass due to improved moisture regime and reduced insolation under the PV arrays compared to open fields. Native bunchgrasses are desirable habitat components.

Site preparation methods for construction of the Project on actively farmed ground may include mowing or grazing, disking, harrowing, and seeding prior to surface compaction. For the majority of the Project site, where grading is not necessary, Topaz Solar Farms, LLC plans to prepare for construction with traditional farming methods plus minimal surface compaction (to 80 percent), as needed. Proposed methods will provide for worker safety while maintaining habitat for San Joaquin kit fox and their prey after construction is complete.

## 1.4 Expected Change in Vegetation Conditions Due to Project Construction

Examination of current habitat types within the Project site and associated land use history provides important insight regarding post-farming habitat recovery. The vegetative condition of land in Section 28, north of Highway 58 and west of Tracy Lane, illustrates that within approximately five years after farming is eliminated, land reverts to low-diversity annual grassland habitat. Areas of the Project site that have been untilled for 20 or more years, east of Carrisa Plains Elementary School, show a significant increase in plant species diversity, and abundance of native wildflowers. We expect that conversion of croplands within the Project to passive solar facilities would initiate land conversion to annual grassland habitat, and that by the time the solar facility is decommissioned the land would support higher diversity and abundance of native plants than the present baseline of cropland and low-quality grassland habitat over most of the Project site.

Project installation on existing croplands may result in an increase in California annual grassland habitat through elimination of seasonal tilling and subsequent long-term management for grassland species. Vegetation between and beneath PV arrays is likely to recover after installation and be dominated by annual grasses. In addition, existing cropland within the Stewardship Land will be allowed to revert to grassland. Management strategies that maintain appropriate grass height and residual dry matter could result in usable habitat for a variety of plant and animal species, including wildflowers and San Joaquin kit fox.

## 1.5 Topaz Vegetation Management Goals

- Topaz Solar Farm's vegetation management standards are to maintain percent total cover and species composition similar to or better than adjacent California annual grassland reference sites. (See CUP Condition of Approval 44, required for Habitat Restoration and Revegetation Plan, a separate document.)
- Maintain vegetative cover on the ground within the Project to promote a natural habitat capable of supporting San Joaquin kit fox prey, in addition to a variety of birds, reptiles and amphibians.
- Enable continued agricultural use of the site concurrent with solar power generation via managed grazing, as feasible.
- Minimize use of power equipment and herbicide application for vegetation management.
- Provide adequate ground cover to prevent wind and water erosion of soils in the Project. Promote improved soil aggregate stability through increased soil organic matter, roots, and fungal associations. [Improved soil stability is correlated with reduced dust and erosion.]
- Provide adequate cover to stabilize former croplands. Promote recovery of former croplands to annual grasslands.
- Promote recruitment of native plant species, especially perennial grasses and wildflowers, to Treatment Area.
- Manage fuel load to minimize risk of fire.
- Manage vegetation height to maintain optimum function of solar PV arrays.

## 1.6 Fire Risk and Fuel Management

A separate Wildfire Management Plan outlines goals specific to prevention of fire and management of potential fire hazards. Management of onsite vegetation through weed control and prescribed grazing will assist in meeting fire safety goals by reducing fuel loads.

## 1.7 Protection of San Joaquin Kit Fox and Nesting Birds and Their Habitat

Detailed information on the protection of nesting birds and SJKF is provided in the Avian and Bat Protection Plan and San Joaquin Kit Fox Conservation Plan (Althouse and Meade, Inc. 2011). Additional information on protection of natural resources, including wildlife, will be provided in a Worker Training Program. Herbicides used on the Project and Stewardship Lands shall be labeled safe for use around wildlife.

The following excerpt from the Avian and Bat Protection Plan illustrates protection measures for birds:

> Vegetation management during operation of the TSF facility will consist of grazing and mowing. Grazing will be done within the fenced array areas. Mowing will be done along roadsides, fence lines, and other limited areas where grazing is impractical. A Vegetation Management

> Plan (VMP) will be implemented at the TSF facility that will guide grazing and mowing practices. Grazing and mowing will be minimized within the nesting bird season (February 1 through August 15). If mowing is conducted during the nesting season, pre-activity nesting bird surveys will be conducted in all affected areas. Active bird nests will be flagged and avoided.

The following excerpts from the Topaz San Joaquin Kit Fox Conservation and Monitoring Plan (Sections 6.4.1 and 6.4.4) require:

> TSF Project workers will avoid kit fox dens. If kit foxes create denning sites on the TSF Project property they will not be filled or disturbed. Mowing or weed whipping within 25 feet of active dens will be prohibited. However, grazing will be allowed within 25 feet of dens. Artificial den placement will be more than 25 feet from any TSF Project components.
>
> Use of rodenticides on the TSF Project should be prohibited and herbicides should be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds should observe labels and other restrictions, mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as any additional TSF Project-specific restrictions deemed necessary by the Service. Kangaroo rats, mice, large insects, occasional gophers, and ground squirrels will provide prey for SJKF, therefore rodent and insect control measures will be avoided to the extent practicable. Use of herbicides should be consistent with the Project's weed management plan and would be utilized only for control of invasive weeds when necessary.

CUP Condition of Approval 43 protects kit fox from unmanaged dogs:

> Herding dogs associated with sheep grazing herds will not be used within fenced areas except under supervision during daylight hours. Dogs can be used to move herds from one area of the PV Arrays to another, and/or within the Stewardship Lands.

# 2.0 Weed Management Plan (also known as Weed Control Plan)

This section of the Vegetation Management Plan covers Weed Control and Weed Management, and serves as the Topaz Weed Control Plan. Some weeds will be eradicated, others reduced, and some naturalized plants such as filaree (*Erodium* ssp.) will not need to be controlled. Weed management includes identification of areas that contain invasive plants and areas not occupied by those species. Invasive exotic plants would be targeted for eradication, reduction, or maintenance, depending on the threat level each species poses to agriculture, wildlife, and solar farm operations. Areas not occupied by invasive plants would be managed to prevent weed infestation. The success of weed prevention depends upon stopping invasive plants before they have a chance to spread and become well established.

## 2.1 Definitions and Regulatory Background

In general terms, a "weed" is a plant growing where it is not wanted, often tending toward overgrowth and choking out desired plants by its presence. Because the term "weed" can mean different things to different people, we provide a summary of regulations governing noxious weeds and invasive plants in California. We then list the species addressed by this plan. Non-native species that occur at the Project and Stewardship Lands but are not listed by a regulating agency, invading the site, or causing management problems are not considered weeds for the purposes of this document.

### *2.1.1 Federal Noxious Weeds List*

The Federal Noxious Weed Act (Act) (7 CFR 360) defines a "noxious weed" as "any living stage (including seeds and reproductive parts) of a parasitic or other plant of a kind which is of foreign origin, is new to or not widely prevalent in the U.S., and can directly or indirectly injure crops, other useful plants, livestock, poultry or other interests of agriculture, including irrigation, navigation, fish and wildlife resources, or the public health." This Act also defines "undesirable plants" as "species classified as undesirable, noxious, harmful, exotic, injurious, or poisonous under state or federal law, but not including species listed as endangered by the Endangered Species Act, or species indigenous to the area where control measures are to be taken." The Federal Noxious Weed List (FNWL) designates plant species that meet the definition of a noxious weed. None of the species on the FNWL occur on the Project or Stewardship Lands, although the Carrizo Plain National Monument Plan reports *Salsola damascena* in the Monument. The FNWL considers *Salsola damascena* a part of *S. vermiculata* (sensu lato[2]), and thus incorporates this separate but closely related species into the Federal list.

[2] A botanical term (Latin, approximately, "in the broad sense"). This term is used to note when a scientific name is used to encompass a broader group of closely related organisms than other interpretations of the same scientific name would include. In this case, "*S. vermiculata*, sensu lato" includes plants that in California are thought to belong to the separate but closely related species *S. damascena*, a taxon not recognized by the USDA Plants Database.

### *2.1.2 California Department of Food and Agriculture Noxious Weeds List*

The California Department of Food and Agriculture (CDFA) focuses on plants that potentially threaten the success of agricultural operations. The California Food and Agriculture Code defines a "noxious weed" as "any species of plant that is, or is liable to become, troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species, and difficult to control or eradicate, which the director, by regulation, designates to be a noxious weed. In determining whether or not a species shall be designated a noxious weed for the purposes of protecting silviculture or important native plant species, the director shall not make that designation if the designation will be detrimental to agriculture."

The CDFA maintains a list of those species designated as noxious weeds and their pest rating, as follows:

- A rating of "A" indicates a species that is either not known in California or present in a limited distribution that allows for possible eradication. A-rated species are prohibited from entering the State, and if found, the State can require eradication, quarantine, containment or other actions to prevent establishment and/or spread of the species.
- A rating of "B" indicates a pest of limited distribution in California. State enforcement is limited to actions for containment, such as in nurseries. County agricultural commissioners can require eradication, containment, suppression or other control of the species.
- A rating of "C" indicates a pest species of widespread distribution in California. If found, these species may be subject to efforts to slow spread or suppress growth, at the discretion of the County Agricultural Commissioner (CDFA 2010).

### *2.1.3 California Invasive Plant Council (Cal-IPC) Invasive Plant Inventory*

The California Invasive Plant Council (Cal-IPC) focuses on non-native species that threaten natural areas and wildlands. Cal-IPC defines an "invasive non-native plant that threatens wildlands" as species that "1) are not native to, yet can spread into, wildland ecosystems, and that also 2) displace native species, hybridize with native species, alter biological communities, or alter ecosystem processes." Cal-IPC ranks invasive plants as follows:

- "High" risk species have "severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically."
- "Moderate" risk species have "substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread."

- "Limited" risk species are "invasive but their ecological impacts are minor on a statewide level... Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic."

### *2.1.4 San Luis Obispo County Weed Management Area*

The local San Luis Obispo County Weed Management Area (SLO WMA), through the County Department of Agriculture, identifies weed control priorities for San Luis Obispo County. The SLO WMA identifies 6 species of top priority for control on its Weed Alert list, and an additional 29 species rated as "Worst Invaders" or "Other Invasive Species" that are recognized problems in the County. These species are listed in Appendix A. Note that some species can be invasive and problematic in coastal and riparian environments, yet pose little threat in semi-arid inland locations such as Carrizo Plains.

### *2.1.5 Unlisted Project-specific Weeds*

In addition to species listed as noxious by CDFA or rated as invasive to wildlands by Cal-IPC, this plan also considers non-native species that present challenges to ongoing operations of the TSF Project and Stewardship Lands without careful management. These species require management due to their widespread presence on the site and potential to interfere with operation of the facility (PV array operation, maintenance, and vehicular access).

## 2.2 Weedy Species that Occur in the Vicinity of Topaz Solar Farm

Botanical surveys conducted on the Project and Stewardship Lands from 2008 through 2010 identified a number of weedy species that occur in the region. Table 1 lists weed species in and near the Treatment Area that are on the CDFA Noxious Weeds List, the Cal-IPC Invasive Plant Inventory, or both lists. Current extent at the site, potential to increase after module installation, and recommendations regarding the need to control each species are also provided in Table 1. Those species that require management are discussed in more detail in the subsections below. Species that are naturalized and widespread in the region that do not present habitat or management concerns are not discussed further in this document. Methods and timing for control of each species are provided in Section 2.5.

Weeds that occur in only one or a few locations are plotted on Figure 2 in Section 7.0. Weeds with widespread distribution, such as field bindweed (*Convulvulvus arvensis*) and perennial mustard (*Hirschfeldia incana***)**, are described but not mapped. As required by the Conditions of Approval (Condition 46-a), additional mapping will be conducted annually during spring and summer inspections for three species that have concentrated populations of limited distribution on the site: yellow starthistle (*Centaurea solstitialis*), Russian thistle (*Salsola tragus*), and puncture vine (*Tribulus terrestris*). Initial mapping will be conducted by the Project biologist immediately upon approval of County permits. Locations and presence of skeleton weed (*Chondrilla juncea*) and perennial pepperweed (*Lepidium latifolium*) shall be verified at that time as well. Current agricultural operations may have already treated and eradicated occurrences in sections 29 and 4. If still present,

location information on weeds to be eradicated or reduced shall be provided to the project manager who will coordinate removal prior to site disturbance.

TABLE 1. WEEDY SPECIES. Scientific name, common name, plant family, weed rating from CDFA, Cal-IPC, or project specific management concerns, and pre-project distribution of each weed in this management plan is presented in order of scientific name. Species that are naturalized and widespread in the region that do not present habitat or management concerns, are not discussed further in this document. Naturalized and widespread species are highlighted in light grey in this table.

| **Scientific Name**<br>Common Name<br>Plant Family | **Weed Rating** | **Pre-Project Distribution & Discussion** | **Level of Management** |
|---|---|---|---|
| ***Aegilops triuncialis***<br>Barbed goatgrass<br>Poaceae | CDFA B<br>Cal-IPC High<br>SLO WMA<br>"Alert" | One infestation was observed adjacent to the project in 2009. Not seen in 2010. Agricultural pest. | Eradicate if it recruits to Project site. |
| ***Ailanthus altissima***<br>Tree of heaven<br>Simaroubaceae | CDFA C<br>Cal-IPC Moderate<br>SLO WMA<br>"Worst Invader" | Within Project, limited to the vicinity of an abandoned homestead in Section 28. Plants are in moderate to poor condition and appear to be water-stressed. Unlikely to spread but could resprout and shade PVarrays. | Eradicate within PV fenced areas. |
| ***Amaranthus albus***<br>Tumbleweed<br>Amaranth<br>Amaranthaceae | *No rating. Included for management goals only.* | Common to abundant in plowed fields and croplands. Could cause fuel buildup along fencelines. | Control as needed in project site |
| ***Centaurea melitensis***<br>Tocalote<br>Asteraceae | CDFA C<br>Cal-IPC Moderate<br>SLO WMA<br>"Other" | Common along roadsides and disturbed sites. Can invade disturbed grasslands and crowd out native species. | Control |
| ***Centaurea solstitialis***<br>Yellow-star thistle<br>Asteraceae | CDFA C<br>Cal-IPC High<br>SLO WMA<br>"Worst Invader" | Occasional along roadsides and disturbed sites. Can invade disturbed grasslands and crowd out native species. | Control |
| ***Chondrilla juncea***<br>Skeleton weed<br>Asteraceae | CDFA A<br>Cal-IPC Moderate<br>SLO WMA<br>"Other" | One infestation in a barley field in Section 5 was observed in 2010. Agricultural pest. | Eradicate |

| **Scientific Name**<br>Common Name<br>Plant Family | **Weed Rating** | **Pre-Project Distribution & Discussion** | **Level of Management** |
|---|---|---|---|
| ***Convolvulus arvensis***<br>Field bindweed<br>Convolvulaceae | CDFA C<br>(Cal-IPC Evaluated and Not Listed) | Widely distributed, abundant in croplands. Has been promoted as feed for pronghorn and tule elk. | Control as needed only in solar arrays |
| ***Descurainia sophia***<br>Tansy mustard<br>Brassicaceae | Cal-IPC Limited | Widely distributed, abundant in fallow croplands. Could create shading problems for PV arrays. | Control only as needed in solar arrays |
| ***Hirschfeldia incana***<br>Perennial mustard<br>Brassicaceae | Cal-IPC Moderate | Occasional throughout site. Could create shading problems for PV arrays. | Control |
| ***Lepidium latifolium***<br>Perennial peppercress<br>Brassicaceae | CDFA B<br>Cal-IPC High<br>SLO WMA "Worst Invader" | Observed in Section 29 along old berms, and in the main drainage channel in Stewardship Lands in Section 33. | Eradicate |
| ***Salsola tragus***<br>Russian thistle<br>Chenopodiaceae | CDFA C<br>Cal-IPC Limited<br>SLO WMA "Other" | Common along roadsides and disturbed sites. Could cause fuel buildup along fencelines. | Control |
| ***Sisymbrium orientale***<br>Oriental mustard<br>Brassicaceae | *No rating. Included for management goals only.* | Widely distributed, abundant in fallow croplands. Could create shading problems for PV arrays. | Control as needed in solar arrays |
| ***Solanum eleagnifolium***<br>White horsenettle<br>Solanaceae | CDFA B<br>SLO WMA "Other" | One infestation occurs just outside the Project and Stewardship Lands along Highway 58 near the boundary of Sections 34 and 35. Agricultural pest. | Eradicate **if** it recruits to the Project Site |
| ***Tamarix parviflora***<br>Salt-cedar<br>Tamaricaceae | CDFA B<br>Cal-IPC High<br>SLO WMA "Other" | Within Project, limited to the vicinity of an abandoned homestead in Section 28. Plants are in moderate to poor condition and appear to be water-stressed. Unlikely to spread but could resprout and shade modules. | Eradicate |

| **Scientific Name**<br>Common Name<br>Plant Family | **Weed Rating** | **Pre-Project Distribution & Discussion** | **Level of Management** |
|---|---|---|---|
| ***Tribulus terrestris***<br>Puncture Vine<br>Zygophyllaceae | CDFA C<br>SLO WMA<br>"Other" | Occasional along roadsides, particularly along sections 19 through 21. Can cause punctures in equipment tires and shoes. | Control |
| **Naturalized and Widespread Weeds** | | | |
| ***Avena fatua***<br>Wild oat<br>Poaceae | Cal-IPC Moderate | Widespread naturalized species. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Brassica nigra***<br>Black mustard<br>Brassicaceae | Cal-IPC Moderate | Occurs occasionally in croplands with grain crops. Unlikely to spread when plowing has ceased. | No Control Effort |
| ***Bromus diandrus***<br>Ripgut brome<br>Poaceae | Cal-IPC Moderate | Widespread naturalized species. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Bromus hordeaceus***<br>Soft chess brome<br>Poaceae | Cal-IPC Limited | Widespread naturalized species. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Bromus madritensis* ssp. *rubens***<br>Red brome<br>Poaceae | Cal-IPC High | Widespread naturalized species. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Bromus tectorum***<br>Cheat grass<br>Poaceae | Cal-IPC High | Occasional component of annual grasslands through the site. Eradication efforts are unlikely to succeed due to widespread presence in the region. | No Control Effort |
| ***Cynodon dactylon***<br>Bermuda grass<br>Poaceae | Cal-IPC Moderate | Occasional along fencelines and roadsides. Not interfering with habitat goals. | No Control Effort |

| **Scientific Name**<br>Common Name<br>Plant Family | **Weed Rating** | **Pre-Project Distribution & Discussion** | **Level of Management** |
|---|---|---|---|
| ***Erodium cicutarium***<br>Redstem filaree<br>Geraniaceae | Cal-IPC Limited | Dominant to common in annual grasslands on site. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Hordeum marinum***<br>Mediterranean barley<br>Poaceae | Cal-IPC Moderate | Occasional naturalized species in wetlands on site. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Hordeum murinum***<br>Foxtail barley<br>Poaceae | Cal-IPC Moderate | Common in annual grasslands on site, especially fencelines and roadsides. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Hypochaeris glabra***<br>Smooth catsear<br>Asteraceae | Cal-IPC Limited | Uncommon component of annual grasslands on site. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Lolium multiflorum***<br>Italian ryegrass<br>Poaceae | Cal-IPC Moderate | Limited to one vernal pool in Section 19. Species thrives in mesic conditions and is unlikely to spread in the dry Carrizo Plain. | No Control Effort |
| ***Marrubium vulgare***<br>White horehound<br>Lamiaceae | Cal-IPC Limited | Uncommon. May occur in anthropogenic areas. Does not interfere with habitat goals. | No Control Effort |
| ***Medicago polymorpha***<br>Burclover<br>Fabaceae | Cal-IPC Limited | Occasional component of annual grasslands onsite. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |

| **Scientific Name**<br>Common Name<br>Plant Family | **Weed Rating** | **Pre-Project Distribution & Discussion** | **Level of Management** |
|---|---|---|---|
| ***Polypogon monspeliensis***<br>Rabbitsfoot grass<br>Poaceae | Cal-IPC Limited | Occasional component of wetlands onsite. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Robinia pseudoacacia***<br>Black locust<br>Fabaceae | Cal-IPC Limited | Associated with abandoned homestead. Unlikely to spread onsite without irrigation. | No Control Effort |
| ***Rumex crispus***<br>Curly dock<br>Polygonaceae | Cal-IPC Limited | Limited occurrence near roadside in Section 28. Unlikely to spread onsite without irrigation | No Control Effort |
| ***Schismus arabicus***<br>Mediterranean grass<br>Poaceae | Cal-IPC Limited | Common component of annual grasslands on site. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Trifolium hirtum***<br>Rose clover<br>Fabaceae | Cal-IPC Limited | Occasional component of annual grassland onsite. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |
| ***Vulpia myuros***<br>Rat-tail fescue<br>Poaceae | Cal-IPC Moderate | Dominant to common component of annual grasslands onsite. Eradication efforts are unlikely to succeed due to widespread presence in the region. Not interfering with habitat goals. | No Control Effort |

Species for which control or eradication efforts will be made are described in more detail below. Monitoring is recommended following treatment of weeds targeted for eradication. We recommend follow-up monitoring to check for regrowth of the weed until the species is absent from the site for at least three consecutive years. Monitoring visits must timed appropriately for the growing season of the weed in question (See Table 3) so more than one monitoring visit may be required to visit all treated areas due to differences in growth season. Populations of weeds targeted for control but not eradication should be checked annually to determine that population size is stable and is not expanding or posing a management problem. Monitoring of weeds targeted for control must be ongoing on an annual basis. Photographs are provided in Section 7.0.

### *2.2.1 Species on the Federal Noxious Weeds List*

No species on the federal noxious weeds list occur on the Project site or Stewardship Lands.

### *2.2.2 Species on the CDFA and/or Cal-IPC Lists*

Weeds that are widespread naturalized species in the Carrizo region are unlikely to be successfully eradicated because the seed bank in the region is well established. Many of these species are functional parts of annual grassland habitat that supports San Joaquin Kit Fox and other wildlife species. Eradicating widespread naturalized species could be more detrimental than beneficial. These species are noted in Table 2 above, and are not discussed further here.

Fifteen species listed in Table 2 occur at or immediately adjacent to the Project and Stewardship Lands, and pose concerns for Project operation, site management, safety, wildlife habitat, or adjacent agricultural operations. The following subsections discuss identifying features and management recommendations for each weed species that will be controlled or eradicated at the site.

**A. Barbed Goatgrass** (*Aegilops triuncialis*)

Barbed goatgrass is a CDFA B-List noxious weed, rated High by Cal-IPC, and on the priority list for eradication in the SLO WMA. This annual grass typically occurs in dry disturbed sites, particularly fields, pastures, and roadsides. Its long awns make it unpalatable for livestock. The species was observed in a single stand in Section 16 in 2009 and was not found during 2010; it may have been eradicated from the site.

Management: This species occurs adjacent to the project. If found on the Project site, we recommend eradication. For small infestations, individuals may be mechanically removed and bagged. Individuals may also be treated with herbicide, with follow-up monitoring and treatment as needed, for 5 years following first observation of occurrence (See Section 2.8).

**B. Tree of Heaven** (*Ailanthus altissima*)

Tree of heaven is a CDFA C-list species, rated Moderate by Cal-IPC, and on the SLO WMA list of invasive species. This deciduous tree occurs on the TSF Project around an abandoned homestead in Section 28. Tree of heaven has pinnate leaves that are reddish when young and have a musky odor when crushed. In ideal habitat, this species spreads rapidly from seed and root suckers.

Management: Tree of heaven regenerates from suckers when it is cut down. We recommend removing the stump completely, and monitoring to determine if tree of heaven root fragments are generating resprouts. An herbicide treatment may be required to control resprouts (see Section 2.8, Herbicide Use).

**C. Yellow Starthistle** (*Centaurea solstitialis*), **Tocalote** (*Centaurea melitensis*)

Yellow starthistle is a CDFA C-list species, rated High by Cal-IPC, that occurs in disturbed patches within the PSA. Tocalote is a CDFA C-list species, rated

Moderate by Cal-IPC. Both species are typically annual plants, occasionally persisting into a second year. Yellow starthistle is toxic to horses when consumed in large quantities. Both species have yellow flowered heads surrounded by spine-tipped bracts. Yellow starthistle and tocalote spread via seed.

Management: Methods such as properly timed mowing and grazing that reduce seed production can control spread of these weeds. Starthistles are adversely affected by shade and unlikely to increase under PV arrays, but are likely to colonize disturbed roadsides. Management for these species will consist of controlling spread. Dense stands may require herbicide application.

**D. Rush Skeletonweed** (*Chondrilla juncea*)

Rush skeletonweed is a California List-A noxious weed that grows in disturbed areas, and is unlikely to increase in undisturbed soils under PV modules. This herbaceous perennial reproduces from seeds and broken plant parts. It has a long tap-root and can grow four feet tall.

Management: The known occurrence of this species in currently cultivated croplands of Section 5 of the Project should be located to verify that agricultural operations have not already removed the species. If still present, the plant should be eradicated to prevent spread and further reduce risk of infestation on the TSF Project. Individual plants may be pulled and bagged for small infestations, with follow-up monitoring for five years following first observation of occurrence. If necessary, herbicide may be used (See Section 2.8).

**E. Field Bindweed** (*Convolvulus arvensis*)

Field bindweed is a CDFA C-List noxious weed that is abundant on the Project. Field bindweed is a deep-rooted perennial that thrives in open disturbed farmland, and is also is a common component of annual grasslands in the vicinity. It has not achieved dominance onsite except where grasslands are recently disturbed via plowing or other mechanical means of ground disturbance and left fallow. It may grow under PV arrays but is generally found in disturbed areas that are not reseeded.

Management: Field bindweed is considered a desirable species in terms of forage for pronghorn (*Antelocapra americana*) and tule elk (*Cervus elaphus nannodes*) in the vicinity of the Treatment Area, although control of bindweed within the fenced areas would not affect its availability in adjacent wildlife corridors in Stewardship Lands. Field bindweed could climb up supports and interfere with module function. To prevent this, Topaz Solar Farms LLC plans to maintain vegetation at a height less than 18 inches.

**F. Tansy Mustard** (*Descurainia sophia*)

Tansy mustard is not listed by CDFA but is rated Limited by Cal-IPC. Tansy mustard is an annual, branched herb with divided leaves that grows up to three feet tall. When consumed in large quantities, tansy mustard is toxic to cattle. Like many mustards, tansy mustard fruits are elongated pods containing abundant

seeds. Tansy mustard typically grows along roadsides, in fields, and in cropland. Tansy mustard is common on the Project site, particularly in fallow cropland.

Management: Since tansy mustard is widespread, and has relatively low threat ratings, management on the TSF Project will consist of controlling spread of the weed, preventing fuel buildup risks associated with tall mustards, and preventing shading of PV arrays. Grazing and mowing can be used to control height, reducing fuel and preventing shade impacts.

**G. Perennial Mustard** (*Hirschfeldia incana*)

Perennial mustard is not listed by CDFA but is rated Moderate by Cal-IPC. Perennial mustard is a biennial to short-lived perennial herb that reaches up to three feet in height. Like many mustards, perennial mustard fruits are elongated pods with abundant seeds. It can be distinguished from other mustards on site by looking for pods appressed to stems. Perennial mustard is common on site, particularly along roads, margins of crop lands, and occasionally in grasslands. Mustard is a desirable forage for sheep, particularly during fruit production.

Management: Because perennial mustard is widespread onsite and has relatively low threat ratings, in addition to being good forage, management efforts will focus on controlling spread, preventing fuel buildup, and preventing shading of PV arrays. Perennial mustard seedlings can be controlled by manual removal or cultivation, which are not feasible on this site. Grazing and mowing can keep this species at acceptable height and limit production of seed.

**H. Perennial Peppercress** (*Lepidium latifolium*)

Perennial peppercress is a CDFA B-List noxious weed, rated High by Cal-IPC. This perennial grows up to six feet tall. Perennial peppercress has tough gray-green leaves, white flowers, and oval, flat pods for fruit. Peppercress is suitable forage for sheep, goats, and cattle in moderate proportions. A few individuals were observed in Section 33 in the main drainage, on Stewardship Land, and on Section 29 of the Project site. The species is abundant in fields west of TSF. This species prefers moist habitats, such as drainage edges, wet meadows, irrigation ditches, levy banks, and ponds. It could invade the banks of proposed dust control ponds and these locations should be monitored for its presence.

Management: Treat existing infestations in Sections 29 and 33 via manual removal and/or treatment with an appropriate herbicide prior to ground preparation activities.

**I. Russian Thistle** (*Salsola tragus*)

Russian thistle is a CDFA C-list noxious weed, rated “Limited” by Cal-IPC, and on the SLO WMA invasive species list. Russian thistle, also known as tumbleweed, is a summer annual with prickly leaves and stiff stems reaching three feet in height that reproduces by seed. Seeds are dispersed when the dead plant tears loose and tumbles with the wind.

Management: Seedlings are most successful on loose soil. Cutting or mowing seedlings can control infestations if done when seedlings are very young. Russian thistle can be grazed when young so long as it is part of varied forage and not the only available forage. Tumbleweed can also be treated with herbicide if necessary although this species can be resistant to many herbicides (see Section 2.8).

It may be necessary to collect dry tumbleweeds that accumulate against fence structures along roadsides to reduce fire risk. Collected weed materials can be composted onsite or hauled to a landfill. Care must be taken not to disperse seeds—use closed containers that will not tear open, such as trash cans or bins, to haul to landfill.

**J. White Horsenettle** (*Solanum elaeagnifolium*)

White horsenettle is a CDFA B-list noxious weed, rated "Limited" by Cal-IPC, and on the SLO WMA list of noxious weeds. White horsenettle occurs uncommonly along Highway 58 near Section 34, outside the Project and Stewardship Lands. This perennial sub-shrub grows best on disturbed sandy well-drained soils that have summer irrigation, such as cotton fields (DiTomaso and Healy 2007). It reproduces via seed and creeping roots.

Management: If white horsenettle recruits to the site, it should be eradicated to prevent infestation in nearby agricultural fields. Herbicide treatment may be required for this species (see Section 2.8).

**K. Tamarisk** (*Tamarix parviflora*)

Tamarisk is a CDFA B-list species, rated High by Cal-IPC, and on the SLO WMA list of invasive species. This deciduous shrubby tree extracts salt from soils and excretes it from leaves, causing a salt build-up under its canopy. Tamarisk occurs on the TSF Project and Stewardship Lands around two abandoned homesteads. Tamarisk has green to grey-green twigs with tiny leaves and pink flowers. It spreads via seed and occasionally, suckers.

Management: Cut tamarisk within the project site (Section 28). Remove reproductive parts to a landfill or compost facility. An herbicide treatment may be required to control resprouts (see Section 2.8, Herbicide Use).

**L. Puncture Vine** (*Tribulus terrestris*)

Puncture vine is a CDFA C-List noxious weed. This summer annual herb grows prostrate along the ground in disturbed places, and was observed along roadsides on the TSF Project and Stewardship Lands. Puncture vine produces obnoxious spiny burs that are strong enough to puncture lightweight tires.

Management: This species is unlikely to increase under PV arrays but could be a pest along roadsides. Because of its prostrate habit, mowing is ineffective for controlling this species. Puncture vine can be manually removed before it produces seeds via hoeing or tilling, and can be sprayed with herbicide for problem areas (see Section 2.8). Apply herbicide prior to fruit production.

### *2.2.3 Species of management concern for the Project site*

The following species are not listed as noxious weeds on state or federal lists, but present concerns for operation of the solar farm if they are not managed in the spring and late summer.

**A. Tumbleweed Amaranth** (*Amaranthus albus*)

Tumbleweed amaranth is not listed by CDFA or Cal-IPC, but does present some management concerns in the first few years of Topaz operation. This bushy summer annual reaches two to three feet in height, and at maturity, the drying plant breaks off at the ground level and tumbles around the site, spreading seed. This species is common in plowed fields and could present fire fuel risks during construction if not managed.

Management: Tumbleweed amaranth can be controlled via cultivation, use of herbicide, and manual removal of plants before they produce seed. Because the species is widespread on croplands at Topaz, we recommend management directed toward control of spread and management of fuel. Grazing and mowing can keep tumbleweeds from reaching their maximum height and if repeated during the flowering and fruiting season, can reduce the number of seeds produced.

It may be necessary to collect dry tumbleweed amaranth that accumulate against fence structures along roadsides to reduce fire risk. Collected weed materials can be composted onsite or hauled to a landfill. Care must be taken not to disperse seeds—use closed containers that will not tear open, such as trash cans or bins, to haul to landfill.

**B. Oriental Mustard** (*Sisymbrium orientale*)

Oriental mustard is not listed by CDFA or Cal-IPC but does present some management concerns due to its height at maturity. Tumble mustard is an annual herb that can reach more than 18 inches height when mature. Tumble mustard is occasional on the Topaz site and could present shading problems if not maintained.

Management: To control potential fuel buildup and shading problems, this species can be managed via planned grazing and mowing. This species does not pose a high risk of invading other areas or spreading at Topaz.

## 2.3 Weedy Species that Occur in the Carrizo Plain Region but not at the Project

The Carrizo Plain National Monument Resource Management Plan lists *Salsola damascena* as synonymous with *Salsola vermiculata*, a species on the Federal Noxious Weeds list. This species does not occur at the Project site or Stewardship Lands. *Salsola damascena* has been erroneously reported as *S. vermiculata*, a closely related species, in past accounts of the Flora of California, but is now thought not to occur in California. However, the Federal noxious weeds list considers *Salsola damascena* a part of *S. vermiculata*, sensu lato, and thus incorporates this separate but closely related species into the Federal noxious weed list.

**Damascus Saltwort** (*Salsola damascena*)

Damascus saltwort does not occur on site but has been reported from the Carrizo Plain National Monument. This shrubby perennial is somewhat similar to Russian thistle (an annual plant). Damascus saltwort has stiff branches, small leaves, and small inconspicuous flowers.

The Jepson Herbarium Index of California Plant Names considers *S. vermiculata* a valid taxon that does not occur in California, with plants that occur in California actually belonging to *S. damascena*. *S. vermiculata* is a host plant for curly-top virus, which affects tomatoes, melons, and sugarbeets, thus its listing as a Federal Noxious Weed. The CDFA considers *Salsola damascena* to be essentially a synonym of *S. vermiculata* and lists it as an alternate host for curly top virus. Therefore, for purposes of this plan, we consider *S. damascena* a noxious weed that should be eradicated if it occurs on site in the future.

Management: Damascus saltwort has not been observed at Topaz. Careful monitoring is required to distinguish this species from Russian thistle, which does occur on site. If Damascus saltwort is observed, a specimen shall be collected by the Project Biologist for verification. The infestation shall be eradicated. Cutting plants to ground level can reduce survival. Resprouts can be treated with herbicide. Ongoing monitoring of an infestation site would be required to identify and treat seedlings until eradicated.

## 2.4 Weed Management Objectives

Weed management objectives are listed below, and summarized in Table 2:

- Identify areas with low/no invasive weeds and prevent introduction of new weedy species.
- Eradicate CDFA List A weeds from the site (skeleton weed).
- Eradicate small infestations of CDFA List B weeds from the site (tamarisk, perennial peppergrass).
- Eradicate small infestations of CDFA List C weeds (tree of heaven).
- Identify areas with Moderate and Limited rated weed infestations. Control widespread CDFA List C and Cal-IPC Moderate and Limited rated species to prevent spread into uninfested areas and to prevent interference with Project operation (yellow starthistle, tocalote, bindweed, tansy mustard, perennial mustard, Russian thistle, puncture vine).
- Manage other non-native species with potential to interfere with Project operations (tumbleweed amaranth, oriental mustard).

TABLE 2. MANAGEMENT GOALS FOR WEEDY SPECIES. Scientific name, common name, and management goals are presented in order of scientific name. Weeds are sorted by those proposed for eradication and those planned for control. In addition, a noxious weed within Carrizo Plain that needs to be eradicated, if observed in the treatment area, is listed under the category titled Prevent Infestation.

| Scientific Name | Common Name | Management Goals |
|---|---|---|
| | | |
| **Eradicate** | | |
| ***Ailanthus altissima*** | Tree of heaven | Eradicate from Section 28, prevent new infestations. |
| ***Chondrilla juncea*** | Skeleton weed | Eradicate from Section 5, prevent new infestations. |
| ***Lepidium latifolium*** | Perennial peppercress | Eradicate from Sections 29 and 33, prevent new infestations. |
| ***Tamarix parviflora*** | Salt-cedar | Eradicate from Section 29, prevent new infestations. |
| **Control** | | |
| ***Amaranthus albus*** | Tumbleweed amaranth | Control spread, manage fuel load. |
| ***Centaurea solstitialis*** | Yellow-star thistle | Control spread, manage fuel load. |
| ***Centaurea melitensis*** | Tocalote | Control spread, manage fuel load. |
| ***Convolvulus arvensis*** | Field bindweed | Control height. Desirable food for wildlife. |
| ***Descurainia sophia*** | Tansy mustard | Control potential fuel and shading impacts via planned grazing and mowing. |
| ***Hirschfeldia incana*** | Perennial mustard | Control potential fuel and shading impacts via planned grazing and mowing. |
| ***Salsola tragus*** | Russian thistle | Control spread, manage fuel load. |
| ***Sisymbrium orientale*** | Oriental mustard | Control potential fuel and shading impacts via planned grazing and mowing. |
| ***Tribulus terrestris*** | Puncture Vine | Control spread (seeds in tires and shoes) |
| **Prevent Infestation** | | |
| ***Aegilops triuncialis*** | Barbed goatgrass | Prevent new infestations. Species currently occurs immediately adjacent to Topaz. |
| ***Salsola damascena*** | Damascus saltwort | Monitor for infestations. This species does not currently occur at or near Topaz. |
| ***Solanum eleagnifolium*** | White horsenettle | Prevent new infestations. Species currently occurs immediately adjacent to Topaz. |

## 2.5 Management Methods by Species

Management methods to control each species known to occur at the Project site and Stewardship Lands are listed in Table 3. If new noxious weeds are found, similar descriptive information and control methods will be prepared by the Project biologist, site manager, or Project Pest Control Advisor (PCA) and appended to this plan.

Management measures that mention herbicide herein are not intended to constitute "Recommendations" pursuant to Section 11411 of California Food and Agricultural Code, but are provided as general information only. Recommendations for pesticide use to achieve control on specific properties can only be provided by a licensed Pest Control Advisor.

TABLE 3. MANAGEMENT METHODS FOR WEEDY SPECIES. Scientific name, common name, typical method of control, flowering period, and timing for optimal control are presented by species. Weeds are sorted by those proposed for eradication and those planned for control.

| Scientific Name<br>Common Name | Typical Methods for Control | Flowering Period | Timing for Optimum Control |
|---|---|---|---|
| **Eradicate** | | | |
| ***Ailanthus altissima***<br>Tree of heaven | Mechanical removal; treat stumps with herbicide. Treat resprouts with herbicide. Monitor for 3 years. | May – July | Start of project phase in this area. Most effective during active growing season. |
| ***Chondrilla juncea***<br>Skeleton weed | Pull up and bag individuals for small infestations. Monitor site for seedlings, pull and bag or treat with herbicide, as necessary. | May – first frost | April – May |
| ***Lepidium latifolium***<br>Perennial peppercress | Mechanical removal of individuals for small infestations. Bag removed seed heads if seed has set, and any root fragments[3]. Consult a PCA for large infestations. | May – September | As soon as plants are identifiable in spring. |
| ***Tamarix parviflora***<br>Salt-cedar | Mechanical removal; treat stumps with herbicide. Treat resprouts and monitor for 3 years. | March – May | Start of project phase in this area. Most effective during active growing season. |

[3] Perennial peppercress regenerates from root fragments.

| Scientific Name<br>Common Name | Typical Methods for Control | Flowering Period | Timing for Optimum Control |
|---|---|---|---|
| **Control** | | | |
| ***Amaranthus albus***<br>Tumbleweed amaranth | Graze/ mow to control height and reduce abundance; collect and compost tumbleweeds to reduce fuel load along fences. | June – October | May – September |
| ***Centaurea melitensis***<br>Tocalote | Graze/ mow to control height. Limit soil disturbance to control infestation of new areas. | June – December | April – May |
| ***Centaurea solstitialis***<br>Yellow-star thistle | Graze/ mow to control height. Limit soil disturbance to control infestation of new areas. | April – July | April – May |
| ***Convolvulus arvensis***<br>Field bindweed | Graze to prevent bindweed from climbing up supports. | April – October | April – October |
| ***Descurainia sophia***<br>Tansy mustard | Graze/mow to control height. | March – August | April – May |
| ***Hirschfeldia incana***<br>Perennial mustard | Graze/mow to control height. | May – October | May – October |
| ***Salsola tragus***<br>Russian thistle | Graze and mow to control existing populations. Early grazing that affects young leaves is most effective. Collect and compost tumbleweeds as necessary to reduce fuel load. Herbicide can be applied in areas requiring additional control. | July – October | April – May |
| ***Sisymbrium orientale***<br>Oriental mustard | Graze/mow to control height. | April – August | April – August |
| ***Tribulus terrestris***<br>Puncture vine | Mechanical removal where foot and tire traffic would disperse seeds; herbicide if necessary. | March – October | March – October |

| Scientific Name<br>Common Name | Typical Methods for Control | Flowering Period | Timing for Optimum Control |
|---|---|---|---|
| **Prevent Infestation** | | | |
| ***Aegilops triuncialis***<br>Barbed goatgrass | Cut and bag flowering heads for small infestations. Monitor and treat with herbicide if reinfestation occurs. | May – August | April – May |
| ***Salsola damascena [= S. vermiculata]***<br>Damascus saltwort | Monitor for new infestation. Consult PCA immediately if new infestations are discovered. This species can be distinguished from Russian thistle because it is perennial, not annual. | June–October | As soon as plants are observed on site; April–May |
| ***Solanum eleagnifolium***<br>White Horsenettle | Mechanical removal or herbicide treatment. Bag removed fruits and roots. | May – September | April – May |

## 2.6 Management Methods

Methods used to control weeds, other than those species targeted for eradication, will vary by location within the Project and Stewardship Lands. Not all methods are feasible in all locations. The site consists of croplands – already heavily disturbed – and annual grasslands, which are tolerant of mowing and grazing. They are adapted to periodic grazing, and mowing mimics some aspects of grazing.

### *2.6.1 Fenced areas and Stewardship Land*

The primary method of controlling weeds and preventing spread of invasive species within PV array fenced areas will be planned grazing. Properly managed grazing of annual grasslands has been shown to increase productivity, decrease abundance of noxious weeds, reduce fuel loads, and encourage recovery of native grasses (DiTomaso et al. 2008). Planned grazing would occur twice yearly to target both early and late season plants. Perimeters around PV arrays would be grazed more aggressively to allow vehicular access as needed with reduced risk of fire. For weedy species widespread on the Project and Stewardship Lands, grazing will be used to control spread, reduce competition with natives, and encourage wildflowers that could otherwise be choked out by weed overgrowth. The choice of grazing animal will depend on the area to be grazed. Sheep are planned for use within the Project's PV array fenced areas due to their smaller stature and ability to interact with PV arrays without causing damage. Cattle will be used for vegetation management outside PV arrays fenced areas where coyote predation risk is too high to use sheep.

A secondary method of vegetation management will be hand-removal of tall weeds that shade modules. Crews may remove or cut tall weeds with hand-tools and weed whackers.

When sheep are not available for general vegetation management, mowing may be used following pre-mowing site surveys by the Project Biologist. Pre-mowing surveys would be conducted for San Joaquin kit fox dens and nesting birds (between February and August). Dens and active bird nests shall be avoided during mowing operations.

If grazing is found to be unsuitable as the primary vegetation management method within the fenced areas and on Stewardship Land, a permanent alternate mowing methodology will be developed. The alternate methodology would be consistent with state and federal Endangered Species Acts and the Migratory Bird Treaty Act.

### *2.6.2 Roadsides*

Where Project access roads occur outside fenced areas, grazing may be impractical as a vegetation management option due to the difficulties containing livestock while still allowing vehicular access along unfenced roads. Control of weeds already widespread at Topaz may consist of mowing along roadsides. Mowing would be necessary along roadsides located outside fenced PV arrays, as a normal maintenance operation. Mowing would reduce vegetation height to no less than 2 inches. Pre-mowing surveys shall be used to identify canid or badger dens. If conducted during the nesting season (February 1 – August 15), pre-mowing surveys shall include identification of active bird nests. Dens and active nests shall be flagged and avoided. Roadsides that are mowed regularly are less likely to invite nesting birds to take up residence.

If new invasive species are observed along roadsides, consider immediate containment and control measures as appropriate for the species. A licensed PCA can provide guidance on controlling species not discussed in this plan. PCAs can also provide guidance on the use of herbicides for controlling persistent weeds that are increasing in extent or population size on site (See Section 2.8).

### *2.6.3 Buildings, switching station structures, and parking lots*

Weed control around buildings and switching stations will be primarily directed toward maintaining fire-safe zones as prescribed by the Topaz Wildfire Management Plan. Use of rock or wood chip mulches around structures discourages weed growth. Weeds that grow through mulch can be mowed or weed whipped. Pre-emergent herbicides and post-emergent herbicides can also be used to achieve control of weeds adjacent to structures. Vegetation within 100 feet of buildings may be mowed when sheep are not present. Tall weeds around parking lots may be mowed or cut using hand tools, mowers, and weed whackers.

## 2.7 Preventing New Infestations

### *2.7.1 Minimize soil disturbance*

Many of the weedy species known from the site and the vicinity of the Project and Stewardship Lands are opportunists that readily colonize recently disturbed soil. By minimizing the acreage of grading, plowing, and other surface disturbance, the potential for new weed infestations can be minimized with the following techniques:

- Minimize the areal extent of plowing and grading used for Project construction.

- Minimize vehicular access to roads and established access routes. Avoid off-road use of vehicles except as necessary for Project operation.

### *2.7.2 Equipment and materials sanitation during construction (Vehicle Washing Plan)*

One key element in preventing new weed infestations is to avoid transporting seeds to or from the site with equipment, vehicles, or materials. During construction, equipment may be brought to the site from outside the County or outside the Carrizo Plain and the following Best Management Practices will be implemented:

- Equipment transported from outside the Carrizo Plain shall be free of mud and vegetation before transport to the site. Equipment and vehicles shall be inspected upon arrival at the site to determine if additional cleaning is required; the results of inspections and any required cleaning shall be logged daily as delegated by the construction site manager.
- A log shall be kept on site by the construction site manager documenting inspections and cleaning efforts. Written logs will be provided to the County's Environmental Monitor and included in monitoring reports for the Construction Phase of the Project. This log must include the following information: all vehicle/equipment/tool washing on site that states the date, time, location, type of equipment washed, methods used, and staff present, and condition of vehicles entering the site, including worker transport vehicles.
- The primary emphasis for inspection and cleaning of vehicles refers to trucks and construction vehicles, not to passenger vans used to transport workers from lodgings to the staging area. However, all vehicles entering the site must be kept clean, and dates and locations of passenger vehicle washing (typically at offsite car washes) should be logged to demonstrate to the County that vehicles are not transporting soil and new weed seeds to the site. If a vehicle has excessive mud or vegetation on its exterior, it shall be washed as described below.
- If construction equipment arrives with mud or vegetation, it will be cleaned in a designated Weed Decontamination Site located in the staging area.
- During vehicle and equipment cleaning, emphasis shall be placed on tires, feet and treads; undercarriage; steps; and any buckets, blades, or scoop attachments. Equipment must be free of seeds before accessing the project site.
- The Weed Decontamination Site will be surfaced with sufficient gravel to allow water to drain and to trap weed seeds and mud washed from vehicles, preventing spread of these potential contaminants.
- The Weed Decontamination Area shall be treated with a pre-emergent herbicide to reduce risk of germinating foreign weeds.
- The Weed Decontamination Area and Wheel Washing Stations shall be monitored for weed growth and treated with herbicide as needed. The entire staging area shall be monitored twice annually (spring and later summer) for two (2) years post-construction to verify that no new weed species have been introduced to the Project site.

- Following work in areas identified as having CDFA List A or B weeds, equipment shall be cleaned prior to work in non-infested areas of the Project site.
- Materials used for erosion control, including but not limited to straw/hay, fiber rolls, and geotextiles, shall be free of weed seeds.

### *2.7.3 Revegetation*

Disturbed areas of the Project site will be revegetated as soon as possible using seed of native and naturalized species. For details on revegetation, refer to the Habitat Revegetation and Restoration Plan prepared for the Project.

## 2.8 Herbicide Use

Topaz Solar Farms, LLC intends to limit herbicide use to the minimum necessary to achieve control of weeds on the site. The following sections provide additional information on herbicide use.

### *2.8.1 Legal framework for herbicide application*

Herbicides are pesticides that treat undesired plant species or plant species growing in undesirable locations. Pesticide use is regulated by the U.S. Environmental Protection Agency as described in 40 CFR 150-189. Pesticide use in the State of California is also regulated by the California Department of Pesticide Regulation (CDPR). Use of herbicides on the Project site must comply with federal, state, and local regulations and herbicide product labels. Disposal of herbicide containers must comply with federal, state, and local law and regulation.

The CDPR regulates qualified applicator certificates and licenses as defined in California Code Title 3, Section 6000:

- **"Qualified applicator certificate holder"** means a person who has qualified by examination in one or more pest control categories to supervise pesticide applications. However, such qualification shall not entitle the holder to supervise the operations of a pest control business licensed pursuant to section 11701 of the Food and Agricultural Code, except as provided in section 11704.
- **"Qualified applicator licensee"** means a person who has qualified by examination in one or more pest control categories to supervise the pesticide applications made by a pest control business licensed pursuant to sections 11701 to 11709, inclusive, of the Food and Agricultural Code, and who is responsible for safe and legal operations under such license.

Herbicide application shall be conducted by personnel with appropriate permits, certifications, and/or licenses pursuant to state and federal law.

### *2.8.2 Pest control advisor recommendations for persistent weeds*

Agricultural Pest Control Advisors (PCAs) are licensed by the State Department of Pesticide Regulation to provide recommendations on any agricultural use of pesticides. While Topaz is not strictly an agricultural operation, PCAs are very knowledgeable in the

variety of herbicides available and the legal restrictions on their use. For difficult to control weeds and for sites that may require regular use of herbicides, the applicant could consult a PCA for site-specific and species-specific advice on controlling weeds, as well as information on registration and reporting requirements for pesticide use.

The current list of licensed PCAs in San Luis Obispo County can be found at http://www.cdpr.ca.gov/docs/license/pdf/Valid_Licenses_San_Luis_Obispo_County-Individual.pdf.

### *2.8.3 Safe handling and storage*

Handling and storage of pesticides (e.g. herbicides) shall follow guidelines set forth in the Hazardous Materials Business Plan. Proper disposal of pesticides and containers shall follow the Hazardous Waste Management Plan.

Note that pesticides must be handled and stored according to safety warning provided on the pesticide label. Safe storage of pesticides is dependent on which chemical is used and how long it will be stored. All pesticides at the Project site will be stored in their original containers. Dilutions of concentrated pesticides (e.g., sprayers and tanks) must be labeled with contents and concentration during use. Only the minimum amount of pesticide required to accomplish a specified task shall be purchased at any one time. Stockpiles of pesticides are not recommended.

Only trained personnel with the appropriate licenses or permits should handle pesticides. State Licensed Applicators are trained in appropriate storage and safe handling of pesticides.

### *2.8.4 Spill cleanup of herbicides*

Herbicides shall be considered in preparation of the project-specific Spill Response Plan. Precautions shall be taken to minimize risk of an herbicide spill. Should a spill occur, the spill site shall be cleaned up immediately, according to herbicide label instructions. Spill kits shall be on hand whenever herbicides are in use, and shall be stored with herbicides if herbicides are kept at the Project site with maintenance equipment.

Spill kits typically contain gloves, protective clothes, absorbent materials, and a large container (e.g. blue 50-gallon barrel). An MSDS sheet and spill response for each herbicide shall be kept in the Spill Response Plan and reviewed during routine safety briefings with herbicide handlers.

### *2.8.5 Herbicide application*

Herbicides shall be mixed and applied in conformance with the product manufacturer's directions. The herbicide applicator shall be equipped with splash protection clothing and gear, chemical resistant gloves, chemical spill/splash wash supplies, and material safety data sheets (MSDSs) for all hazardous materials to be used. To minimize harm to wildlife, vegetation, and waterbodies, herbicides shall not be applied directly to wildlife; products identified as non-toxic to birds and small mammals shall be used if nests or dens are observed; and herbicides shall not be applied within 50 feet of any surface waterbody when water is present. Herbicides shall not be applied if rain is falling or imminent or the target area has puddles or standing water. Herbicides shall not be applied when wind

velocity exceeds 10 miles per hour. If spray is observed to be drifting to a non-target location, spraying shall be discontinued until conditions causing the drift have abated.

Prior to any herbicide application, the herbicide applicator shall contact the County Environmental Monitor to show where work will be done and to receive information/ training about potentially sensitive biological resources that may be within the area to be sprayed and methods to apply to minimize those impacts. The Worker's Training Manual (a separate document prepared as part of the Worker Training Program) shall be given to any herbicide applicator and followed prior to spraying.

## 2.9 Weed Control Monitoring

### *2.9.1 Construction phase*

During the construction phase of the Project, eradication efforts shall begin for the target species. Eradication efforts shall be monitored twice annually (spring and late summer) throughout the construction phase. In addition, the staging area, Weed Decontamination Area, and areas graded for the project shall be monitored annually to assess weed recruitment and identify additional problem areas that need weed management. Problem areas shall be plotted on a site plan and identified by species. Treatment and monitoring shall be coordinated with the project biologist. Documentation of eradication and control efforts shall be reported to the County. Reports shall include locations of weed treatment and locations of new occurrences of target weeds. For species targeted for eradication, the status of previously treated occurrences shall be documented annually until no new plants or resprouts are observed for three consecutive years.

### *2.9.2 Operation phase- Annual monitoring*

After construction of each Project phase, during the operation phase of the TSF Project, monitoring shall consist of evaluating the Project site and Stewardship Lands annually for expansion of existing weed populations and colonization by new weed species. It is acceptable to conduct weed monitoring concurrently with other annual monitoring tasks, such as grazing monitoring or kit fox monitoring. Rapid expansion of existing weed populations targeted for control shall trigger evaluation by a PCA to determine if additional control measures are necessary. New occurrences of weed species targeted for control or eradication shall require treatment as outlined above for species known to occur in the region, or consultation with a PCA for species not previously observed in the region. Findings of new target weeds shall be reported to the County Weed Management Area Coordinator or County Agricultural Department along with proposed methods of treatment. Treatment of all identified target weed populations shall occur at a minimum of once annually. When no new seedlings or re-sprouts are observed at treated sites for three consecutive normal or above average rainfall years, the weed population can be considered eradicated and weed control efforts may cease for that impact site. Weed monitoring forms are provided in Appendix B along with a map for taking notes on distribution and location of weeds requiring treatment. A log for treatment of weed populations as recommended by annual monitoring and maintenance requirements is also provided. Weed monitoring forms and treatment logs should be retained to provide reference regarding past distribution of species and treatment efforts.

## 2.10 Adaptive Management

If monitoring events determine that weed management prescribed in this plan is not successfully meeting objectives, seek advice from the project biologist and/or a PCA. Modify vegetation management plan accordingly. Ecologically based invasive-plant management should reduce the need for herbicide application, and increase revegetation and restoration success (Sheley et al. 2010).

## 2.11 Resources for More Information

| |
|---|
| **San Luis Obispo County Weed Management Area**<br>San Luis Obispo County Department of Agriculture<br>Marc Lea, WMA Coordinator<br>(805) 781-5910 |
| **California Noxious Weed Program**<br>Southern California Regional District:<br>Daud Senzai<br>(619) 607-1458<br>http://www.cdfa.ca.gov/phpps/ipc/district_map.htm |
| **California Department of Food and Agriculture**<br>Encycloweedia<br>www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_hp.htm |
| **Cal-IPC Weed Inventory**<br>www.cal-ipc.org/ip/inventory/weedlist.php |
| **California Department of Pesticide Regulation**<br>http://www.cdpr.ca.gov/ |

# 3.0 Grazing Plan

This Grazing Plan has been prepared for management of vegetation resources within the TSF Project. The TSF Project has proposed sheep pulse grazing as a part of the fenced area vegetation management plan. Sheep and/or cattle will be used to manage vegetation on the Stewardship Lands, with a preference for cattle grazing in areas used by pronghorn.

## 3.1 Grazing Objectives

The Project will be grazed to accomplish the following objectives:

- Maintain annual grassland as San Joaquin Kit Fox habitat.
- Manage vegetation height to prevent shading of PV Arrays.
- Reduce fuel load as a fire-prevention measure.
- Aide in conversion of croplands to annual grassland by reducing weed infestations.
- Manage weed height and control spread of existing weeds.
- Manage vegetation in Stewardship Lands to optimize forbs utilized by pronghorn.

## 3.2 Literature Review: Effects of Short Duration Grazing

Sheep will graze such that the flock pulse-grazes each fenced area for less than a month until the whole Project has been grazed. This grazing pattern would occur up to four times annually, such that any specific acre of the Project experiences grazing less than one month per year.

### *3.2.1 Sheep versus cattle grazing*

Cattle and sheep diets overlap to a certain extent. Cattle prefer grass, while sheep prefer forbs (broadleaf, herbaceous plants) over grasses, but will readily consume grasses if that is what is available (Heitschmidt and Stuth, 1991). Sheep graze by pinching the forage between their incisors and dental pad so the length of plant left is subject to lip thickness. If the sheep are only on a site for a short time period, they tend not to graze too close to the ground. Cattle tend to eat by wrapping their tongues around the forage and pulling back, therefore, they will typically leave more stubble height. Cattle can most effectively eat forage that is between 4 and 8 inches tall. Regarding impact, cattle more effectively break soil crust, their manure tends to be softer and more readily decomposed, and they produce more saliva than sheep (Rutherford 2010, personal communication).

### *3.2.2 Soil properties*

Grazing animals compact soils via trampling, and redistribute nutrients (Jackson and Bartolome 2007, p. 198). Native grazers, including tule elk and pronghorn, have similar soil compaction effects as sheep and cattle via trampling the soil surface. The degree of compaction due to grazing varies with specific soil conditions and moisture content at the time of grazing. Wet soils with higher clay content are more easily compacted than soils with lower moisture content and higher sand fraction (Van Havern 1983). Compaction is partially alleviated via regrowth of plant roots and action of burrowing animals. Furthermore, grassland soils typically have notable accumulations of organic matter

relative to soils in other habitat types in the same locale. This increased organic matter content lowers bulk density of a soil and can increase vegetative cover.

The low number of grazing days at Topaz means that the total hours of trampling on the site will be low during operation of TSF. Grazing will be timed when soils are not saturated and thus are less susceptible to severe compaction during grazing events.

### *3.2.3 Plant and wildlife diversity*

Grassland species have evolved in the presence of grazing animals and have been influenced by grazing. Selective grazing of different functional groups (perennial versus annual grasses, for instance) can influence composition of a plant community. Grazing can be utilized as a tool for native grass enhancement for species such as *Nassella* spp. and forbs that can benefit from reduced competition from non-native grasses (Jackson and Bartolome 2007).

However, Jackson and Bartolome (2007) note that while management of grazing intensity can influence the productivity of California annual grasslands for livestock production, species composition is "more or less entrained by intra and interannual weather (p. 197)" rather than grazing practices. When only one functional group is abundant, annual species in the case of annual grassland, abiotic factors are thought to have greater influence on plant community structure in annual grasslands in California than biotic factors, including grazing. The variability of California climate and soils are important factors in year to year variation in California grasslands regardless of their grazing status.

Several studies cited in Jackson and Bartolome (2007) found that grazing is linked with increased cover of native forbs, a class which includes annual wildflower species, although one study cited did not observe this phenomenon. Several studies cited by Huntsinger et al. (2007, p. 245) found that complete exclusion of grazing animals reduces herbaceous species diversity of both native and introduced species. Huntsinger also notes that where grasslands have both exotic and native annual species composition, grazing can be used to promote native annual wildflowers, also known as forbs in the grazing literature.

### *3.2.4 Habitat quality*

As noted above, sheep graze differently than cattle, and prefer forbs over grasses but will eat both. Bartolome (1993) notes that grazing intensity rather than selective grazing drives changes in plant community structure. By controlling grazing intensity during periods of active growth, grazing managers can limit negative effects on plant community structure. A grazing regime in which sheep graze the beneath PV arrays for two to four days per year is unlikely to result in a shift of species composition.

Grazing can also be used as a tool for managing invasive species. Jackson and Bartolome comment that properly timed late spring to early summer grazing can be used to reduce cover and reproduction of yellow star thistle, a weed that occurs on the Project. Further, barbed goatgrass spreads more readily in plots that have not been grazed or otherwise managed to reduce residual dry matter (RDM). This species occurs adjacent to Topaz.

A study by Marty (2005) found that carefully managed grazing of annual grassland/vernal pool complexes can be beneficial for native flora and duration of pool

inundation compared to ungrazed pool/grassland complexes. Vernal pool/annual grassland complexes occur at Topaz and could benefit from occasional grazing.

### 3.3 Locations for Use of Sheep versus Cattle

Both sheep and cattle may be used on site, though not in the same locations.

Sheep are smaller in stature, and can more easily reach plants underneath and adjacent to PV arrays. Sheep are also unlikely to damage modules or wiring within PV arrays and can easily be moved via portable fencing. Grazing studies were conducted in August 2010 and May 2011 using non-functioning PV arrays similar in layout to the Project. The studies found that sheep effectively reduce vegetation height under and around PV arrays without causing damage to modules or wiring. Sheep would be used in fenced areas with PV arrays where larger animals would be likely to damage the installation or be unable to reach vegetation. See Appendix C for a complete report on the August 2010 Preliminary Grazing Study.

Cattle are larger animals and are likely to damage PV arrays and wiring. However, due to their larger size they are not likely to invite predation by coyotes. In Stewardship Lands outside fenced PV arrays areas, including drainage buffers and wildlife corridors, cattle may be used to control weeds and maintain appropriate short grass conditions used by San Joaquin kit fox.

### 3.4 Timing

Appropriate timing for grazing varies annually with weather and forage conditions. Topaz Solar Farms, LLC proposes two rounds of grazing each year timed to target early season forage and late season weeds. Typically, early season grazing could begin in April, and late season grazing could be conducted anywhere between June and September depending on weather and forage conditions. Grazing will be avoided when soils are saturated. Experienced livestock managers will be consulted in early spring each year regarding appropriate soil and forage conditions to determine timing the appropriate timing of grazing in that year. During drought years, no grazing may be appropriate. During above-average rainfall years following a period of drought, cattle may be brought in during the fall to reduce grass biomass, after wildflowers (forbs) have set seed.

### 3.5 Grazing Intensity and Management

As with timing, appropriate numbers of animals per acre and duration of grazing will vary from year to year to achieve optimum grazing intensity. Targets for vegetation removal are reduction to less than 8 inches average height and no less than 500 pounds per acre residual dry matter in the fall (unless vegetation density is naturally less than 500 pounds per acre RDM as can happen during periods of extreme drought).

Grazing would be managed by an experienced livestock manager in conjunction with the project biologist. If two separate flocks are used to graze the site, they will be separated such that one flock starts at an edge and the other flock starts in the center of the project, with flocks consistently separated by moving in the same direction across the landscape.

Temporary fencing will be used to constrain sheep into small enough areas to encourage even foraging across the target area. Sheep will be moved every few days into a new area.

Cattle grazing on Stewardship Lands will also be managed to optimize San Joaquin kit fox habitat and maintain adequate cover for erosion control. Cattle grazing will be managed within 200 feet of the main drainage to optimize opportunities for riparian vegetation to naturally recruit and grow along the banks of the channel.

Cattle grazing will be avoided within 250 feet of vernal pools (e.g. portions of sections 4, 5, and 20) during the winter and spring, when pools are filling and drying. Electric fences may be used to maintain a buffer between the pools and grazing areas, if grazing is planned during the winter and spring.

Placement of salt blocks, supplements, water troughs, or other actions that may concentrate livestock or diminish soil conditions will be more than 250 feet from vernal pools, ephemeral wetland depressions, or spadefoot breeding pools.

## 3.6 Target Weed Species for Grazing Control

At least eight weed species may be controlled by appropriately timed grazing practices. Table 3 lists weeds such as tumbleweed amaranth, tocalote, yellow starthistle, tansy mustard, perennial mustard, Russian thistle, and oriental mustard that are best grazed in mid spring for optimal control. Bindweed is a deep-rooted perennial that can be controlled by grazing during spring and summer to keep its twining stems from growing up PV array posts.

## 3.7 Fencing

Fencing will be utilized around Stewardship Lands sufficient to contain cattle used to periodically graze these areas. Fencing may include single-strand electric fence, easily negotiated by pronghorn and San Joaquin kit fox.

Permanent fencing around the PV arrays will be utilized to assist in containing flocks of sheep during grazing. Interior fencing would consist of temporary electric fence panels installed for a day or two and moved frequently. Because temporary fences would be present for only a few days and would not be static, mapping these fence locations is impractical. Temporary electric fences within PV arrays are not expected to significantly affect wildlife movement.

## 3.8 Shepherd Temporary Quarters

Shepherds may use their own self-contained trailers, and will coordinate with Operations and Maintenance for parking in proximity to their herds.

## 3.9 Water for Livestock

Water for sheep grazing within PV arrays will be provided via a portable water tank refilled from onsite wells. PV arrays are divided into approximately 7.5-acre patches, each divided by a 20-foot wide aisle running north-south and a second aisle running east-west. Water tanks may be temporarily stationed in aisles during grazing operations, and will be managed by the shepherds.

Water for cattle grazing on the Stewardship Land will be provided in stock tanks available in each pasture. Tanks will be distributed in a manner that will direct livestock away from natural drainages. Stock tanks will be filled from domestic well(s) operated by TSF.

### 3.10 Livestock Handling and Disposal of Carcasses

All livestock, especially dead animals, will be handled by animal handlers knowledgeable about anthrax. Livestock managers will bury them on Stewardship Land, more than 250 feet from identified sensitive resources. Cases of anthrax will be immediately reported to the animals' veterinarian and to the County Environmental Health office. The livestock handler will contact the Agricultural Commissioner's office (per CUP Condition of Approval 102) to determine of coordination regarding disposal is necessary. See Appendix F, email from Dr. Palmer, veterinarian involved with the most recent outbreak of anthrax in this region.

### 3.11 Grazing Monitoring Plan

Standing vegetation biomass will be measured before and after grazing at a minimum of 10 locations within the PV arrays for each grazing event. A grazed site and an ungrazed control will be compared at each site. A grazing report will be prepared for each of the first six events (first three years) to confirm that residual dry matter targets and vegetation height are met, document any problems encountered, and propose revisions to the plan as needed. Subsequent monitoring will consist of annual monitoring at three locations within a half mile of active San Joaquin kit fox dens, if present, to determine if SJKF habitat is maintained through the fall. Annual fall monitoring will document residual dry matter for erosion control and SJKF habitat conditions.

### 3.12 Adaptive Management

During the first three years, the livestock managers, Topaz Solar Farms LLC representatives, and the project biologist will communicate annually on the success of grazing to meet Grazing Plan objectives. Adjustments will be made to the plan during that time. Grazing intensity and duration will respond to seasonal climate conditions (e.g. precipitation and temperatures) that affect forage production, quality, and habitat value for kit fox. After the first three years' data analysis, the plan will be refined to incorporate input from project biologist, kit fox specialists, sheep herd managers, and solar farm managers.

# 4.0 Vegetation Response to Solar Modules

## 4.1 Strategy for Monitoring Factors Related to Long-term Potential Changes in Vegetation.

Topaz CUP Condition of Approval 65(g) addresses monitoring "indirect impacts to vegetation and wildlife from alteration to the solar and hydric regimes as a result of solar modules." The strategies to monitor indirect impacts to vegetation are to compare the effect of land use within PV sites to areas in the Stewardship Land not affected by PV arrays, and easure potential abiotic (temperature, moisture, insolation) and biotic (grazing) effects on vegetation development within the solar arrays.

Compare vegetation in the PV array areas with Stewardship Land. Document species composition and height in the spring and in the summer each year. Set up permanent exclosures to prevent grazing animals from using a site. Monitor vegetation under the panels compared with grazed areas each year, following the guidelines in Section 5, below.

- Measure potential abiotic and biotic effects on vegetation development within the solar arrays.
- Determine if there are statistically significant differences in vegetation height and species composition between sites.
- Interpret results and provide a summary of findings in the annual monitoring report that shall be provided to the County.
- Conduct the study annually for five years following construction, then every 10 years until the project is decommissioned.

# 5.0 Success Criteria and Performance Standards

Success criteria are based on the Topaz CUP Conditions of Approval numbers 44, 46c, and 65g. Vegetation management standards are to maintain the conditions established during construction, based on the Habitat Restoration and Revegetation Plan (HRRP). These performance standards will be used during construction and for 5 years following construction in each phase of the project, as part of the HRRP. These performance standards will be monitored every 10 years, thereafter, until project decommissioning.

Vegetation management success will be documented by comparing conditions within the Project to conditions on Stewardship Lands in section 33, habitat with similar soil, slope, and aspect. Five sample sites with photo points will be established in each fenced area to monitor conditions under and between PV arrays. For comparison, ten sample sites with photo points will be established in Stewardship Lands not affected by PV arrays (e.g. section 33).

Measurements will be made during mid spring (March to April) regarding total plant cover, percent non-native naturalized species and native plant cover. Measurements will be made again in August or September to compare conditions related to late-blooming and biennial plants as well as to document residual dry matter. Sample sites will be

evaluated using 1-meter square or 1-yard square quadrats to estimate percent plant cover. The quadrat will be placed in a non-random location representative of the range of conditions commonly observed that season. Areas disturbed by burrowing animals will not be sampled for evaluation of performance standards.

Forage production will be measured in the spring and residual dry matter will be measured in the fall using one foot square clip plots. Measurements will be converted to pounds per acre.

TABLE 4. PERFORMANCE CRITERIA. Performance standards will be measured twice a year to compare vegetation in the array areas with natural vegetation outside of the arrays.

| **Performance Standard** | **Measurement** | **Year 1 after construction is complete** | **Years 2 to 4** | **Year 5 and every 10 years thereafter** |
|---|---|---|---|---|
| Total Live Vegetative Cover (permanent erosion control) | Percent absolute plant cover | 40 | 50 to 75 | 60 to 100+ (depending on precipitation) |
| Percent Bare Ground (exposed soil not covered by dead or live plant material) | Percent of quadrat | 30% less than reference site | 20% less than reference sites | Equivalent to or less than reference sites |
| Percent Non-living Organic Matter (dead plant material or feces) | Percent of quadrat | Not applicable | 50 to 80% less than reference sites | Equivalent to or more than reference sites |
| Non-native, Naturalized Grass Cover | Percent absolute non-native plant cover | Higher than reference sites | Higher than reference sites | Equivalent to or higher than reference sites |
| Native Grass Cover | Percent absolute native grass cover | Lower than reference sites | Lower than reference sites | Equivalent to or higher than reference sites |
| Native Forb Cover (wildflowers) | Percent absolute wildflower and other native forb cover | Lower than reference sites | Lower than reference sites | Equivalent to or higher than reference sites |
| Non-native Forb Cover | Percent absolute non-native forb cover | Higher than reference sites | Equivalent to reference sites | Equivalent to or less than reference sites |
| Forage Production (Spring) | Pounds per acre | Lower than reference sites | Lower than reference sites | Equivalent to or higher than reference sites |
| Residual Dry Matter (Fall) | Pounds per acre | 400+ lbs per acre | 500+ lbs per acre | 600+ lbs per acre |

Details will be noted for each performance standard (e.g. dominant species in each plant category, type of organic matter). Overall vegetation height and notes about specific weeds observed (height, density, and distribution beyond the quadrat sample sites) will also be documented. A monitoring sheet is included in Appendix B of this plan.

Data shall be compiled in a spreadsheet (Microsoft Excel, or equivalent) and results for PV arrays compared with results for reference sites. A brief summary report shall be

prepared and submitted to the County and Topaz Solar Farms, LLC. The report shall summarize observations (quadrat sampling, clip plots, quarterly visits, and wildlife observed) in each fenced area, and include a punch list with remediation recommendations, as appropriate to meet the performance criteria. If the monitor finds that the performance criteria are not being met, an explanation should be provided to inform managers and County staff regarding factors contributing to the conditions observed. The annual report shall provide adaptive management actions.

# 6.0 Conclusion

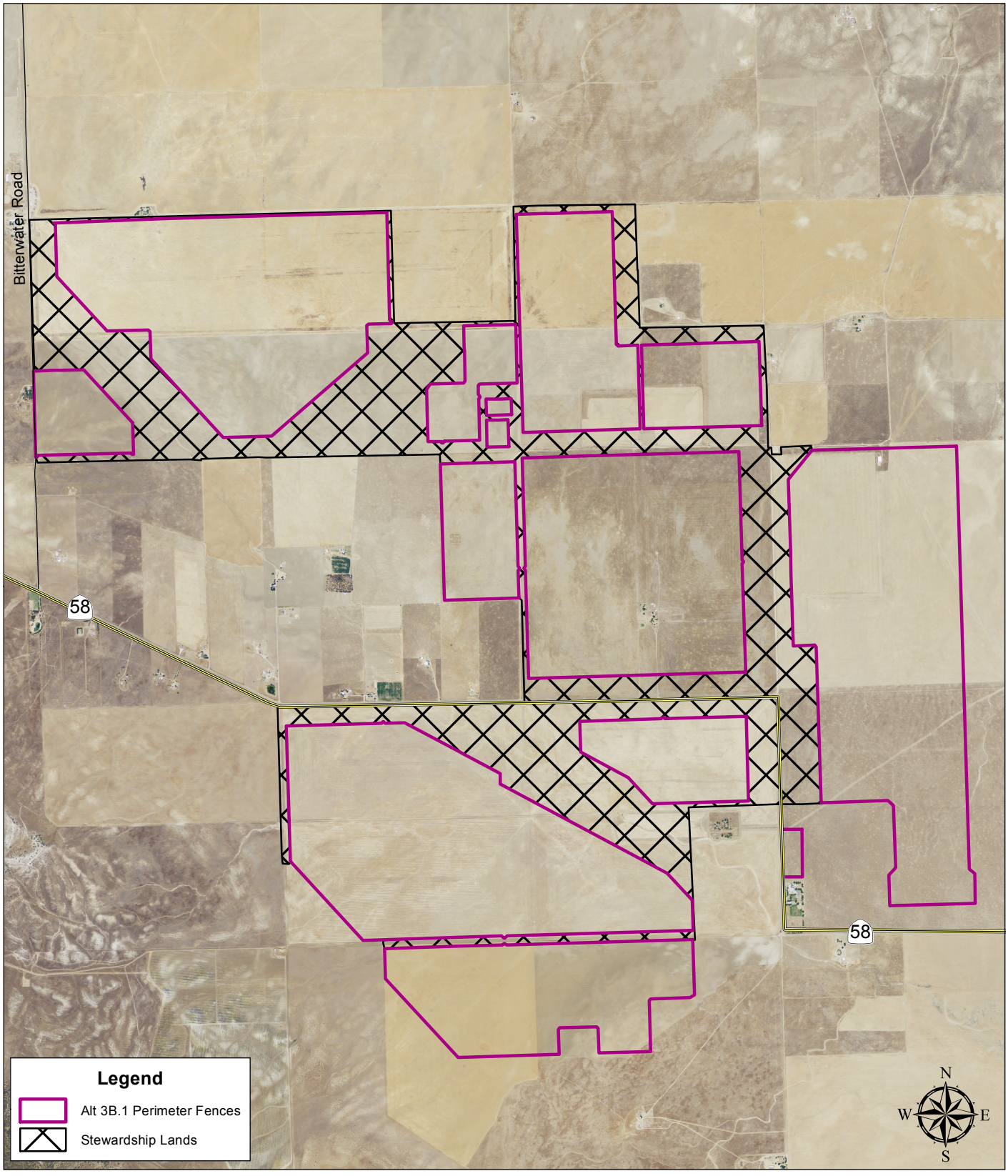
The Topaz Vegetation Management Plan will remain a dynamic document that reflects a growing understanding of weed control factors, grazing management, and San Joaquin kit fox habitat quality. The plan will continue to support the basic objectives of running a safe PV facility that also provides habitat for San Joaquin kit fox.

# 7.0 Vegetation Management Plan Figures

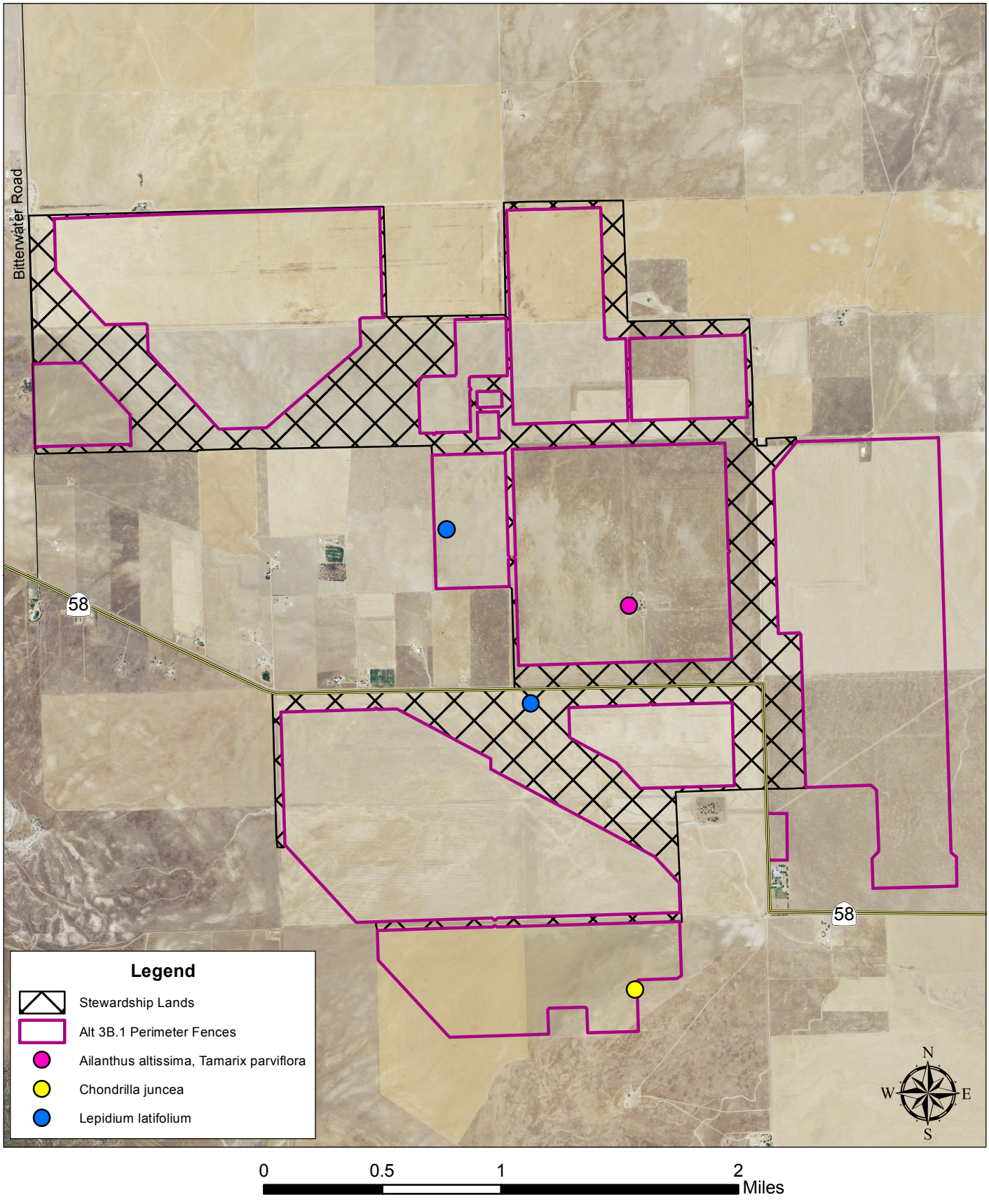
- **Figure 1: Vegetation Management Plan Treatment Area (Topaz Solar Farm Project Footprint plus Stewardship Lands)**

- **Figure 2: Locations of Weed Species Targeted for Eradication:** Weed species targeted for eradication at the Project site and Stewardship Lands occur in limited distribution such that eradication is a reasonable goal. Locations at which these species were observed during 2008 through 2010 biological surveys are noted.

# Figure 1. Treatment Area



# Figure 2. Pre Construction Weed Distributions



# 8.0 Weed Identification Photographs

## Topaz Solar Farms, LLC - Weed Identification



Barbed Goatgrass (*Aegilops triuncialis*)





Barbed Goatgrass flower



Tree of Heaven (*Ailanthus altissima*) leaves



Tree of Heaven flower



Tumbleweed amaranth (*Amaranthus albus*)



Tumbleweed amaranth

## Topaz Solar Farms, LLC - Weed Identification



Yellow-star thistle (*Centaurea solstitialis*)



Yellow-star thistle flower



Tocalote (*Centaurea melitensis*)



Tocalote flower



Skeleton weed (*Chondrilla juncea*)



Skeleton weed fruits

## Topaz Solar Farms, LLC - Weed Identification



Field Bindweed (*Convolvulus arvensis*)



Field bindweed flower



(*Descurainia sophia*) leaves



Descurainia sophia flower and fruits



Perennial mustard (*Hirschfeldia incana*)



Perennial mustard flower and fruits

## Topaz Solar Farms, LLC - Weed Identification



Broad-leaved Pepper-grass (*Lepidium latifolium*)



Broad-leaved Pepper-grass in flower



Russian thistle (*Salsola tragus*)



Russian thistle flower



Tumble mustard (*Sisymbrium orientale*)



Tumble mustard flower and fruit

## Topaz Solar Farms, LLC - Weed Identification



White Horsenettle (*Solanum eleeagnifolium*)



White Horsenettle flower



Salt-cedar (*Tamarix parviflora*)



Salt-cedar flower



Puncture Vine (*Tribulus terrestris*)



Puncture Vine flower

**Weed Identification Photo Credits. Photos used with permission from:**

| Scientific Name | Common Name | Photo 1 Credit | Photo 2 Credit/ Photo 3 Credit |
|---|---|---|---|
| ***Aegilops triuncialis*** | Barbed goatgrass | © 2001 Joe DiTomaso<br>Cal Photos 0102 0350 | © 2004 Carol W. Witham<br>Cal Photos 1104 0368 /<br>© 2009 Barry Rice<br>Cal Photos 0509 1629 |
| ***Ailanthus altissima*** | Tree of heaven | Althouse and Meade, Inc. | © 2007 Luigi Rignanese<br>Cal Photos 0507 1363 |
| ***Amaranthus albus*** | Tumbleweed amaranth | © 2004 Penn Martin II<br>Cal Photos 1104 0545 | © 2009 Luigi Rignanese<br>Cal Photos 0909 0463 |
| ***Centaurea solstitialis*** | Yellow-star thistle | 8.1.1.1.1.1.1 Althouse and Meade, Inc | © 2008 Thomas Stoughton<br>8.1.1.1.1.1.2 Cal Photos 0708 2233 |
| ***Centaurea melitensis*** | Tocalote | © 2007 Thomas Stoughton<br>Cal Photos 0807 0972 | © 2009 Thomas Stoughton<br>Cal Photos 0709 0299 |
| ***Chondrilla juncea*** | Skeleton weed | © 2006 Luigi Rignanese<br>Cal Photos 0806 1170 | © 2001 California Department of Food and Agriculture<br>Cal Photos 0175 3301 3809 0035 |
| ***Convolvulus arvensis*** | Field bindweed | © 1995 Saint Mary's College<br>Cal Photos 5207 1611 1136 0081 | © 2004 Carol W. Witham<br>Cal Photos 0404 1112 |
| ***Descurainia sophia*** | | © 2009 Thomas Stoughton<br>Cal Photos 0709 0332 | © 2007 Thomas Stoughton<br>Cal Photos 0807 0950 |
| ***Hirschfeldia incana*** | Perennial mustard | 8.1.1.1.1.1.3 Althouse and Meade, Inc. | 8.1.1.1.1.1.4 Althouse and Meade, Inc. |
| ***Lepidium latifolium*** | Perennial peppergrass | Althouse and Meade, Inc. | Althouse and Meade, Inc. |
| ***Salsola tragus*** | Russian thistle | © 2006 Heath McAllister<br>Cal Photos 0406 1609 | © 2007 Thomas Stoughton<br>Cal Photos 0807 0942 |
| ***Sisymbrium orientale*** | Tumble mustard | © 1995 Prof. R. P. Olowin Saint Mary's College<br>Cal Photos 6249 3022 3538 0046 | © 2009 Phil Pullen<br>Cal Photos 0509 2576 |
| ***Solanum elaeagnifolium*** | White Horsenettle | © 2009 Neal Kramer<br>Cal Photos 1009 1844 | © 2009 Neal Kramer<br>Cal Photos 1009 1842 |
| ***Tamarix parviflora*** | Salt-cedar | © 2010 Neal Kramer<br>Cal Photos 0110 0387 | © 2010 Neal Kramer<br>Cal Photos 0110 0388 |
| ***Tribulus terrestris*** | Puncture Vine | © 2001 Steven Thorsted<br>Cal Photos 0801 0392 | © 2010 Neal Kramer<br>Cal Photos 0110 0378 |

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# Appendix A. SLO County WMA Weeds List

San Luis Obispo County's Weed Management Area lists six species with limited distribution in the County on their Weed Alert List. Most of these species do not occur at Topaz.

| Scientific Name<br>Common Name | Reported Distribution<br>(Summarized from WMA website) |
|---|---|
| *Aegilops triuncialis*<br>Barbed Goatgrass | First found in SLO County in 2000, there are only two known infestations and both are currently under eradication. Both infestations are in the hills east of Harmony, one along Highway 46 and one on private property off of Old Creek Road.<br><br>**This species has been reported near TSF but not onsite.** |
| *Euphorbia oblongata*<br>Oblong Spurge | Currently, oblong spurge is only known to occur in a few roadside and urban areas, one near Pismo Beach, one on Camp San Luis Obispo, and one in the city of Atascadero. All of the plants in these areas are being eradicated. |
| *Ononis alopecuroides*<br>Restharrow | The only recorded observation of this plant in North America is right here in San Luis Obispo County. Restharrow is a weedy annual plant that originates from Southern Europe. The small infestation, which occurs in the Suey Creek area, is being controlled by the County Department of Agriculture. |
| *Salvinia molesta*<br>Giant Salvinia | Salvinia is an aquatic weed that reproduces rapidly, and is capable of completely covering freshwater sources. Giant salvinia has been detected in one small pond south of San Luis Obispo, where it is under eradication by the California Department of Food & Agriculture. |
| *Taeniatherum caput-medusae*<br>Medusahead | This annual grass has caused problems in southern Monterey County, near Parkfield. Recently, it has been discovered in a few areas near the city of SLO, and a couple of small infestations have turned up outside of Paso Robles. We are trying to determine the full extent of medusahead in SLO County in order to develop an appropriate control strategy. |

The SLO WMA also lists an additional 14 species they consider the "Worst Invaders of San Luis Obispo County":

| Scientific Name | Common Name | Occurs at Topaz? |
|---|---|---|
| *Ailanthus altissima* | Tree of Heaven | ✓ |
| *Arundo donax* | Arundo or Giant Reed | |
| *Cardaria spp.* | Hoary Cress | |
| *Carthamus lanatus* | Wooly Distaff Thistle | |
| *Centaurea calcitrapa* | Purple Starthistle | |
| *Centaurea solstitialis* | Yellow Starthistle | ✓ |
| *Cortaderia jubata* | Jubatagrass | |
| *Cortaderia selloana* | Pampasgrass | |
| *Cynara cardunculus* | Artichoke Thistle | |
| *Delairea odorata* | Cape Ivy | |
| *Ehrharta calycina* | Veldt Grass | |
| *Genista monspessulana* | French Broom | |
| *Lepidium latifolium* | Perennial Pepperweed | ✓ |
| *Spartium junceum* | Spanish Broom | |

Finally, the SLO WMA lists 15 species as "Other Invasive Plants of San Luis Obispo County":

| Scientific Name | Common Name | Occurs at Topaz? |
|---|---|---|
| *Acroptilon repens* | Russian Knapweed | |
| *Ammophila arenaria* | European Beachgrass | |
| *Carduus pycnocephalus* | Italian Thistle | |
| *Carpobrotus edulis* | Ice Plant | |
| *Centaurea melitensis* | Tocalote | ✓ |
| *Chondrilla juncea* | Skeleton Weed | ✓ |
| *Cirsium vulgare* | Bull Thistle | |
| *Conium maculatum* | Poison Hemlock | |
| *Foeniculum vulgare* | Wild Fennel | |
| *Ricinis communis* | Castor Bean | |
| *Salsola tragus* | Russian Thistle | ✓ |
| *Solanum elaeagnifolium* | White Horsenettle | |
| *Tamarix spp.* | Saltcedar/Tamarisk | ✓ |
| *Tribulus terrestris* | Puncture Vine | ✓ |
| *Vinca major* | Periwinkle | ✓ |

# Appendix B. Sample Vegetation Monitoring Checklist

## (During Spring and Summer Quarterly Sampling)

| Performance Standard | Measurement | Observed Quantity | Details |
|---|---|---|---|
| Percent Bare Ground (exposed soil not covered by dead or live plant material) | Percent of quadrat | % | Soil conditions |
| Percent Organic Matter (e.g. dead plant material or feces) | Percent of quadrat | % | Type |
| Non-native, Naturalized Grass Cover | Percent absolute non-native plant cover | % | Species |
| Native Grass Cover | Percent absolute native grass cover | % | Species |
| Native Forb Cover (wildflowers) | Percent absolute wildflower and other native forb cover | % | Species |
| Non-native Forb Cover (broadleaf nonnatives) | Percent absolute non-native forb cover | % | Species |
| Total Live Vegetative Cover (permanent erosion control) | Percent absolute plant cover[4] | % | Ht, Vigor |
| | | | |
| Forage Production (Spring) | Pounds per acre | lbs/acre | high average, poor |
| Residual Dry Matter (Fall) | Pounds per acre | lbs/acre | high, average, poor |

### Sampling Data Form for Each Quadrat

Site Type (PV Array Under or Alley, Stewardship, Reference) _____ Site number _____

Date _____Section, Township, Range_____ Investigator(s)_____

| Scientific Name | Common Name | Absolute % Cover | Dominant Species? | Forb or Grass | Native or Non-native |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | Total Percent Live Cover | | | | |

_____ % Bare Ground _____ %Dead Organic Matter

| Remarks |
|---|
| |

[4] Absolute plant cover may total over 100% if tall plants overlap shorter plants.

# Sample Weed Monitoring and Treatment Checklist

Monitoring Date: _____

Monitor Name(s): _____

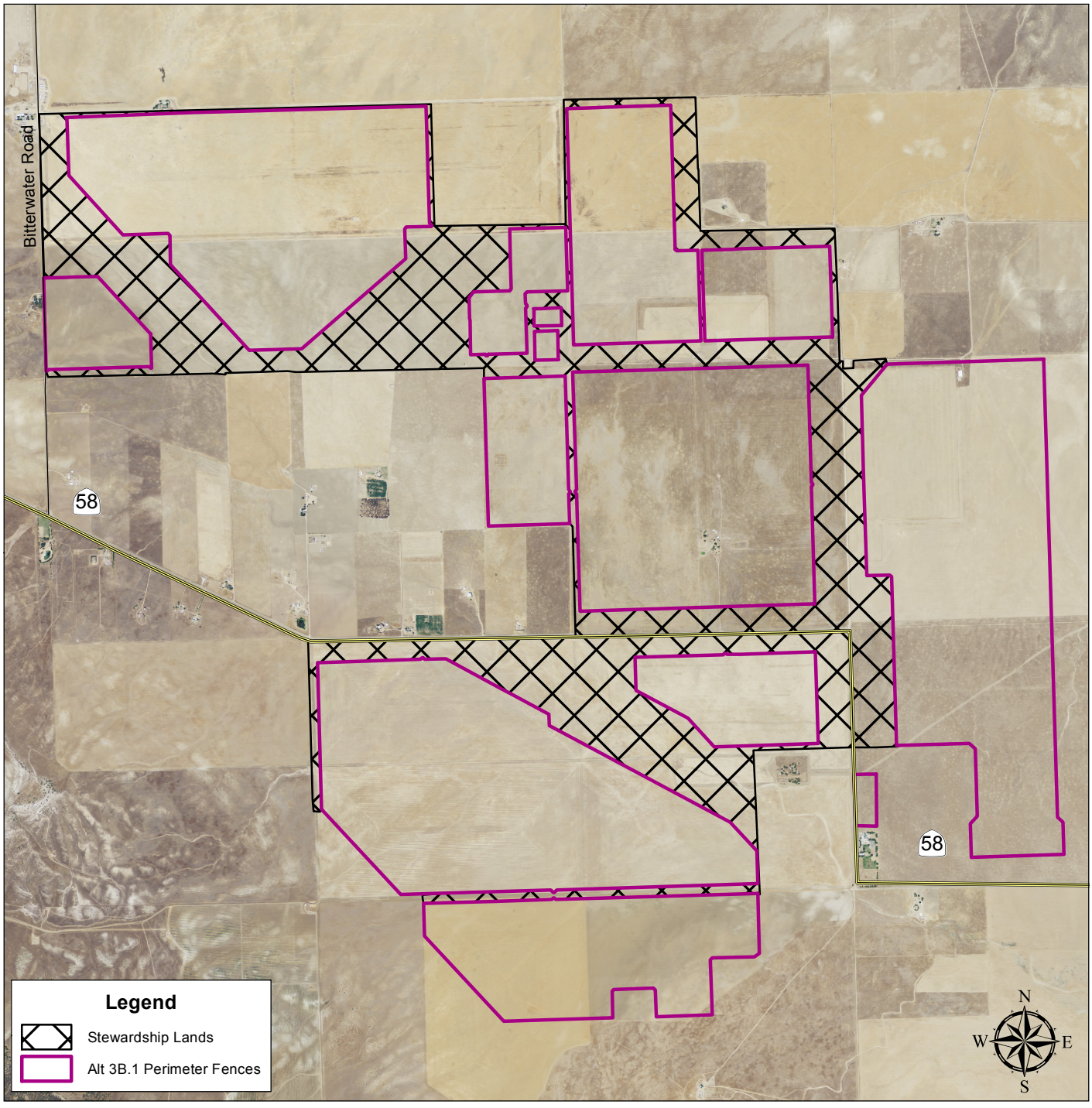
| **Scientific Name**<br>Common Name<br>Plant Family | **Pre-Project Distribution & Discussion** | **Current Distribution, Density, and Notes** | **Management Recommendation** |
|---|---|---|---|
| | | | |
| **Species Targeted for Eradication/Prevention** | | | |
| ***Aegilops triuncialis***<br>Barbed goatgrass<br>Poaceae | One infestation was observed adjacent to the project in 2009 (Section 16). | | |
| ***Ailanthus altissima***<br>Tree of heaven<br>Simaroubaceae | In 2010, limited to the vicinity of an abandoned homesteads in Section 28. Plants are in moderate to poor condition and appear to be water-stressed. | | |
| ***Chondrilla juncea***<br>Skeleton weed<br>Asteraceae | One infestation in a barley field in Section 5 was observed in 2010. | | |
| ***Lepidium latifolium***<br>Perennial peppercress<br>Brassicaceae | In 2010, observed in Section 29 along old berms, and in the main drainage channel in in Section 33. | | |
| ***Salsola damascena*** | Not observed in the vicinity of TSF in 2010 | | |
| ***Solanum eleagnifolium***<br>White horsenettle<br>Solanaceae | In 2010, one infestation occurs just outside the Project and Stewardship Lands along Highway 58 near the boundary of Sections 34 and 35. | | |
| ***Tamarix parviflora***<br>Salt-cedar<br>Tamaricaceae | In 2010, limited to the vicinity of an abandoned homestead in Section 28. Plants are in moderate to poor condition and appear to be water-stressed. | | |
| **Other Weed Observations** | | | |
| | | | |

| **Scientific Name**<br>Common Name<br>Plant Family | **Pre-Project Distribution & Discussion** | **Current Distribution, Density, and Notes** | **Management Recommendation** |
|---|---|---|---|
| **Species Targeted for Control** | | | |
| ***Amaranthus albus***<br>Tumbleweed amaranth<br>Amaranthaceae | Common to abundant in plowed fields and croplands. | | |
| ***Centaurea melitensis***<br>Tocalote<br>Asteraceae | Common along roadsides and disturbed sites. | | |
| ***Centaurea solstitialis***<br>Yellow-star thistle<br>Asteraceae | Occasional along roadsides and disturbed sites. | | |
| ***Convolvulus arvensis***<br>Field bindweed<br>Convolvulaceae | Widely distributed, abundant in croplands. | | |
| ***Descurainia sophia***<br>Tansy mustard<br>Brassicaceae | Widely distributed, abundant in fallow croplands. Could create shading problems for PV arrays. | | |
| ***Hirschfeldia incana***<br>Perennial mustard<br>Brassicaceae | Occasional throughout site. Could create shading problems for PV arrays. | | |
| ***Salsola tragus***<br>Russian thistle<br>Chenopodiaceae | Common along roadsides and disturbed sites. Could cause fuel buildup along fencelines. | | |
| ***Sisymbrium orientale***<br>Oriental mustard<br>Brassicaceae | Widely distributed, abundant in fallow croplands. Could create shading problems for PV arrays. | | |
| ***Tribulus terrestris***<br>Puncture Vine<br>Zygophyllaceae | Occasional along roadsides, particularly along sections 19 through 21. Can cause punctures in equipment tires and shoes. | | |

# Weed Monitoring Map

Use this map to note locations of weed infestations requiring treatment, and to make other notes on presence and distribution of other weeds. Please include your name and the monitoring date.

**Name** _____ **Date** _____



# Record of Weed Treatment

Record all weed treatment activities completed annually, and document compliance with management recommendations made during annual weed monitoring.

| Species | Treatment Location | Treatment Date(s) | Followup Observation | Personnel |
|---|---|---|---|---|
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# Appendix C. Preliminary Grazing Trial Report

# Topaz Solar Farm Grazing Test

Section 29 of TSF Project Study Area
California Valley, San Luis Obispo County, California



Prepared for
**Topaz Solar Farms, LLC**
1111 Broadway, 4th Floor
Oakland, CA 94607

by

**Marc Horney, Ph.D., and Rob Rutherford, M.S.**

**California Polytechnic State University, Animal Sciences Department**

and

**Royce Larsen, Ph.D.**

**University of California Cooperative Extension Service**

with

**LynneDee Althouse, M.S. and Meg Perry**

**Althouse and Meade, Inc.**

**October 2010**

*654.18*

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# 1 Introduction

As described in the Final Biological Report for Topaz Solar Farm dated July 2010, First Solar commenced two vegetation tests on Topaz during Fall 2009 and Winter 2010. One test investigated site preparation methods for construction, and the second is an on-going test of vegetation response to solar arrays and sheep grazing. The second vegetation test site was grazed in August 2010 as a preliminary trial of grazing as a site management strategy, and is documented in this report.

Goals of this second vegetation test are to identify ground treatments that will provide the appropriate vegetative ground cover within the project site, and identify strategies to manage vegetation over the life of the project. Grazing is one potential tool to manage vegetation long-term. Appropriate ground cover on the project site will provide habitat for kit fox and their small mammal prey, will protect the soil from wind and water erosion, and will encourage stormwater infiltration while not shading the PV modules or creating a fire hazard.

Researchers included the following participants: Marc Horney, Ph.D, Assistant Professor, Rangeland Resource Management, with Rob Rutherford, M.S., Sheep Specialist, and interns Gretchen Wulff and Erika Hucal, Animal Sciences Department, California Polytechnic State University; Royce Larsen, Ph.D., Natural Resources Watershed Advisor, University of California Cooperative Extension Service; LynneDee Althouse, M.S., Biologist/Range Conservation Specialist, Daniel E. Meade, Ph.D., Biologist/Statistician, and Meg Perry, B.S., Biologist/Soil Scientist from Althouse and Meade, Inc. Additional field assistance was provided by Cassie Murphy, Naomi Oyler, and Russell Stack.

# 2 Existing Conditions

A vegetation test commenced January 2010, prior to heavy winter rains, in the northeast corner of Section 29, Township 29 South, Range 18 East, Mount Diablo Base Meridian, approximately one mile north of Highway 58 in eastern San Luis Obispo County.

Vegetative cover was evaluated for height, species, and percent cover/percent bare ground (Photo 1). By May 2010 most annual species had gone to seed and dried up. Rat-tail fescue (*Vulpia myuros*), soft-chess brome (*Bromus hordeaceus*), rip-gut brome (*B. diandrus*), wild oats *(Avena fatua)*, and Mediterranean grass (*Schismus arabicus*) dominated the site along with pineapple weed (*Chamomilla suaveolens*), mustard (*Hirschfeldia incana*), and fireweed (*Amsinckia menziesii*). Patches of native annual fescue *(Vulpia microstachys)* occurred throughout the test site. Late-blooming annual plants included mustard, turkey mullein *(Eremocarpus setigerus)*, vinegar weed *(Trichostema lanceolatum)*, and tumble mustard *(Sisymbrium altissimum)*. Vegetation height was 10 to 18 inches tall with about 50 percent bare ground, and about 1500 pounds per acre above-ground biomass measured in August 2010.

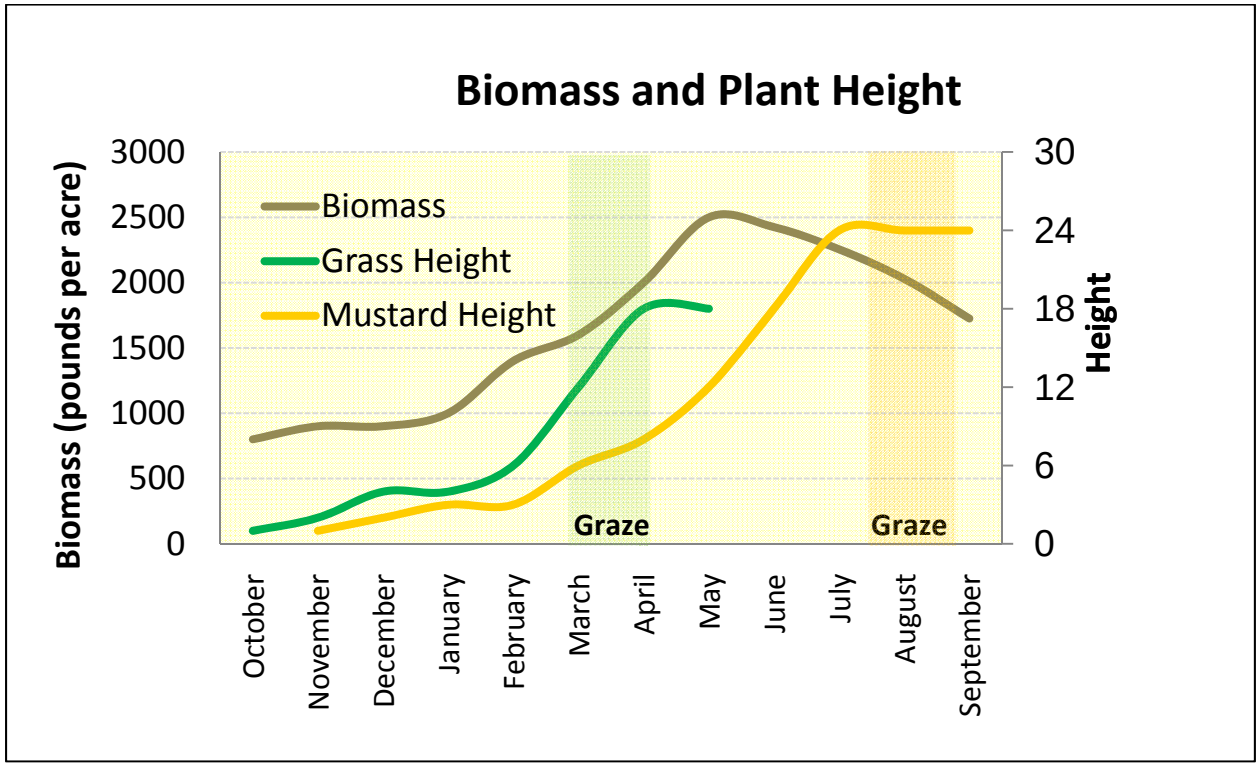
First Solar installed PV modules (not electrically connected) over two replicate vegetation test sites in June 2010. Each test site contains 6 module tables within an area 80 feet by 80 feet (Photo 2 and Figure 1). The low end of the modules averaged 25 inches above the existing ground surface (range 17 to 32 inches due to slight variation in ground surface elevation).

The module installation process was conducted with minimal ground disturbance. Equipment rolled over some of the standing dried vegetation, reducing its height and potentially reducing its

quality as forage in a few months immediately following module installation (Photo 3). This approximates the expected condition of the ground and vegetation condition at the Topaz Solar Farm immediately following panel installation. Vegetation is expected to fully recover the following growing season, because annual plants reproduce the following rainy season from seeds produced during previous spring and summer months.

Grass production at Topaz typically peaks in April, near the end of the rainy season (October to April). In the vegetation test sites, annual grass height varied from 12 to over 30 inches tall in 2010. Late-blooming herbaceous plants such as native milkweed, vinegarweed, and non-native mustards grow into August and September. Grasses dry in the late spring and begin to deteriorate, while late-blooming annual plants reach their peak biomass in mid to late summer. In 2010, annual mustards were the tallest weeds in the test sites, with some over 30 inches tall.

The grazing trial was scheduled to mimic late-season grazing to reduce vegetation height and potential fire hazards from the PV solar farm. The figure below illustrates optimal periods for sheep grazing in the spring, when grass productivity is near its peak, and again in the late summer, when late-season annuals have reached their maximum height. Annual grasslands lose approximately seven percent of their mass each month after peak maturity, due to deterioration (decomposition), seed loss, and insect herbivory (Royce Larsen, unpublished data on San Luis Obispo County forage production). Grass production peaks between March and April, depending on seasonal rainfall and temperature patterns. Late-season annuals generally peak in July or August; thus, the peak of standing biomass occurs in late spring or early summer. In the graphic below, lines depicting biomass, grass height, and mustard height represent an ungrazed scenario. The standing biomass curve would flatten out with prescribed grazing.



# 3 Grazing Trial Objectives

The grazing trial conducted in August 2010 was part of an effort by Topaz Solar Farm LLC to determine if grazing can be used to manage vegetation for habitat improvement and fire prevention. The grazing test conducted in August 2010 was a preliminary trial to determine if grazing sheep under solar modules is feasible before dedicating resources to develop a management plan for grazing. This preliminary trial investigated

(1) whether sheep are likely to damage solar modules, wiring, or support structures when confined to solar arrays for grazing; and

(2) how effectively sheep remove vegetation, especially in front of and underneath the array structures.

# 4 Characteristics Observed/Measured

Observations and measurements are directed toward the following characteristics:

## 4.1 Qualitative observations

Investigators specifically watched for instances of sheep...

- grazing beneath solar panels.
- chewing on panel wiring.
- climbing on solar panels.
- rubbing on or butting solar panels.

These observations were to determine whether interaction of sheep with solar module components would be likely to cause damage to them, and whether sheep would graze beneath the panels.

## 4.2 Measured characteristics

The following criteria were documented via measurements or tallies of the number of incidents.

- Change in vegetation height following grazing.
- Compare pounds of forage removed beneath panels with pounds of forage removed in alleys between panel rows.
- Estimate number of manure pellets per square foot post-grazing.
- Frequency of itching and rubbing against panel corners and low edges.
- Frequency of itching and rubbing against steel supports and piles.

# 5 Methods

Grazing occurred from August 16 to 19, 2010. Two PV module treatments and one control plot were grazed for 24 hours. A second control plot was grazed for only 8 hours, because of student intern availability.

## 5.1 Site layout

Grazing was conducted over a period of four days, with one enclosure grazed per day. Each enclosure was approximately 6400 square feet (0.15 acre) in size using 320 feet of electric net fencing. One Stafix x6 battery and a 40 Watt solar Panel (BP Solar) were connected to 42-inch

tall Quick Ground Netting (nine horizontal hot wires and one grounded bottom wire). Materials were purchased from Livewire Professional Fencing. Water was provided in one trough at the east edge of each enclosure, filled by the Kuhnle's water truck (from a local well). Animals were moved between enclosures using additional fence panels.

Two enclosures, PV1 and PV2, contained the photovoltaic (PV) arrays installed in June 2010. PV1 and PV2 enclosures each consisted of five rows of panel tables and five alleys, with approximately 10 feet of clear space to walk around the edge of each row of PV panels. The other two enclosures, Control 1 (C1) and Control 2 (C2), consisted of annual grassland vegetation planted for the vegetation test adjacent to but outside the panel table installations. These control enclosures are within the vegetation test site and were treated with the same seed mixes as the area beneath the panel table. A diagram of enclosure layout (Figure 1) and photos are provided in Section 9.

## 5.2 Grazing herd

Each enclosure was grazed by a herd of 30 crossbred ewes (Targhee, Finnsheep, and Dorper breeds in varying amounts). These ewes weighed an estimated 140 pounds during the grazing trial and stood approximately 28 inches tall. Each enclosure was grazed for 24 hours, except C2 which was grazed for only 8 hours due to limitations with herd availability on the final day of the trial. The ewes were last sheared in March and had five months of wool regrowth during the Preliminary Grazing Trial. Sheep with more wool are typically more prone to itching and rubbing than recently shorn sheep.

## 5.3 Measured characteristics:

Plant height and biomass were measured before and after grazing each enclosure to investigate changes caused by grazing. Measurements were also taken in control enclosures for comparison with panel sites.

### 5.3.1 Clip plots

Clip plots were taken to estimate plant biomass, also known as "dry matter" (DM), present before and after grazing, which provides an estimate of forage available and consumed. Vegetation collected from each plot is weighed, and forage biomass before and after grazing is estimated from these measurements. Clippings were taken from forage growing beneath panel tables and from forage growing in alley ways. Clip plots were used to test whether sheep grazed the open alleys more or less than they did under the panels. The difference in pounds of plant material present before grazing and after grazing was used to estimate how much the sheep ate. The estimated net loss of forage was divided by the number of sheep (30) to estimate average intake per ewe. This result was compared with documented intake values for sheep published in the National Research Council's *Nutrient Requirements of Sheep* (1985).

### 5.3.2 Vegetation height

Maximum vegetation height was measured at 10 points along the lower panel edge for each row of panels in each PV enclosure. At each point the tallest standing vegetation within six inches of the point was measured. Measurements were repeated following 24 hours of grazing. Vegetation height measurements were also made along transects in the Control enclosures (Photos 3-6).

### 5.3.3 Sheep fecal pellet count

Following grazing, technicians counted the number of fecal pellets in one-square foot quadrats from five locations under the PV modules and five locations within alleys. Placement of the quadrat frames was randomized by dropping the frame without looking where it would fall. The purpose of this measurement was to give First Solar an estimate and visual of how much manure could be generated during high intensity short duration grazing. Pellet counts also document animal use intensity.

## 5.4 Observations

### 5.4.1 Panel inspection

Panels were inspected before grazing to document any preexisting irregularities, damage, or flaws (panels installed on the site are non-functioning panels). Wires were checked for preexisting damage. Panels and wires were inspected a second time following grazing to check for changes in panel condition.

### 5.4.2 Behavior observations

Two technicians observed sheep behavior for a 15-minute period every hour from 0915 to 1630 on August 16 and 0930 to 1615 on August 17, when PV2 and PV1 were grazed. The number of sheep engaged in specific behaviors (grazing, resting, rubbing on panels or supports) were recorded. Technicians were instructed to record observations of the following behaviors if they occurred.

- Frequency of itching and rubbing against panel corners and low edges.
- Frequency of itching and rubbing against steel supports and piles.
- Number of sheep grazing beneath panels.
- Number of sheep resting/ruminating.
- Instances of sheep investigating (smelling, licking, nosing) panels.
- Instances of sheep chewing on wires.
- Instances of sheep climbing on solar panels.
- Instances of sheep butting solar panels.
- Any interactions that cause or appear to cause damage to panels.

# 6 Results

## 6.1 Clip plot data – forage consumed

Average pounds of forage per acre are presented in two ways. First, average biomass as dry matter under panels, in alleys, and in control plots is presented with percent change after grazing. In this table, alley and under-table measurements are presented separately (Table 1). Second, average biomass as dry matter is presented for each enclosure, along with average consumption per sheep and hours of grazing (Table 2); alley and under-table measurements are combined by PV enclosure.

TABLE 1. Pounds of forage per acre (mean ± SE) calculated from clip plots of residual dry matter before and after grazing combined for two replicates. Grazing enclosures were approximately 0.15 acre.

| Location | Average pounds of forage/acre ($n$ = 40) | | | | Average Forage Consumed | Percent change |
|---|---|---|---|---|---|---|
| | Pre-graze | Post-graze | *F* | *P* | | |
| Alleys | 1618±160 | 972±114 | 10.78 | 0.0022 | 645 | 40 |
| Under Panels | 1392±111 | 1089±118 | 3.51 | 0.0688 | 303 | 22 |
| Controls | 1486±97 | 874±132 | 14.03 | 0.0006 | 612 | 41 |

Analysis of Variation[1] (ANOVA) found significant differences between pre- and post-grazing values for the Control enclosures ($P$ = 0.0006, $F$ = 14.026, $n$ = 40) and the alley portions of the PV enclosures ($P$ = 0.0022, $F$ = 10.780, $n$ = 40). However, pre- and post-grazing values for beneath the panels within the PV enclosures were not significantly different ($P$ = 0.0688, $F$ = 3.507, $n$ = 40).

Sheep consumed between 2.1 and 3.8 pounds of feed over a 24 hour period when grazing in the panel treatment and control (Table 2). The second control was only grazed 8 hours, because sheep were moved back to Cal Poly the fourth day of the test. Twenty clip plots were sampled before and after grazing. Before grazing, available biomass ranged from 1340 to 1632 pounds per acre. After grazing, biomass ranged from 864 to 1046 pounds per acre.

[1] ANOVA means Analysis of Variance, a statistical test to make simultaneous comparisons between two or more means. *P* is the probability of two groups being the same (the lower the p-value, the more significant the result); *F* statistic is a test of variance; *n* is the number of samples.

TABLE 2. Pounds of biomass per acre, per plot, and per sheep (mean) for PV arrays and control plots. Clip plots were used to estimate biomass as dry matter before and after grazing. Total forage removed was divided by the number of sheep grazing (30) to estimate feed per sheep.

| Plot | Pre-grazing Biomass lb/ac (*n* = 20) | Post-grazing Biomass lb/ac (*n* = 20) | Amount Feed Consumed Total | | | Time Grazed |
|---|---|---|---|---|---|---|
| | | | lb/ac | lbs/plot | lbs/sheep | (hours) |
| **PV- 1** | 1555 | 1046 | 509 | 75 | 2.5 | 24 |
| **PV-2** | 1454 | 1016 | 439 | 64 | 2.1 | 24 |
| **C1** | 1632 | 864 | 768 | 113 | 3.8 | 24 |
| **C2** | 1340 | 883 | 457 | 67 | 2.2 | 8 |

## 6.2 Vegetation height and fuel reduction

Maximum vegetation height along the low panel edge of each panel row in both PV enclosures and along two transects in one control enclosure were measured before and after grazing (Photos 3-6). Vegetation height varied from 7 to 15 inches before grazing (Table 3). Vegetation in the panel treatment area was affected by equipment on the ground during the June installation of the panels and was therefore shorter than vegetation in the control area. Grazing resulted in a significant difference in vegetation height within treatment and control areas (ANOVA, $P < 0.0001$, F-value 69.3 for PV, $P = 0.005$, F-value 13.00 for Control).

TABLE 3. Maximum height of vegetation at panel edge (PV enclosures) or along designated transects (Control) before and after grazing. Values reported as means ± SE.

| Location | Pre-graze Height (Inches) | Post-graze height (Inches) | *F* | *P* | Average change (Inches) |
|---|---|---|---|---|---|
| PV | 7.3±0.6 (*n*=100) | 1.8±0.4 (*n*=100) | 69.3 | <0.0001 | -5.4 |
| Control | 14.2±1.0 (*n*=68) | 9.7±0.6 (*n*=20) | 13.00 | 0.0005 | -4.5 |

## 6.3 Sheep fecal pellet count

The number of sheep fecal pellets on the ground provide a measure of the amount of time sheep are at a location. By counting sheep pellets we can approximate their use of different locations. Table 4 presents a summary of pellet counts. No difference was noted in number of pellets under PV panels versus in alleys on the same day, suggesting movement of sheep is evenly distributed over the PV enclosures. In PV2, which was grazed first, on August 16, 2010, pellets per square foot averaged 15. In PV1, which was grazed second, on August 17, 2010, technicians found 6 pellets per square foot. The combined overall average is 10 pellets per square foot (See Photo 10).

TABLE 4. Pellet count average, range, and number of samples.

| Location | Average Pellets per Square Foot | Range | *n* |
|---|---|---|---|
| PV1 – Alley | 6 | 0-14 | 5 |
| PV1 – Under Panels | 6 | 0-17 | 5 |
| **PV1 Combined Average** | **6** | **0-17** | **10** |
| PV2 – Alley | 15 | 1-51 | 5 |
| PV2 Under Panels | 15 | 4-29 | 5 |
| **PV2 Combined Average** | **15** | **1-51** | **10** |

## 6.4 Panel inspection

Technicians did not note any changes in panel condition or wiring after PV enclosures were grazed for 24 hours. The only indication of sheep investigating panels were marks in dust on the panels where ears, noses, lips, and tails had brushed against the panel surface (Photo 11). Brush marks from investigating panels do not damage the PV modules or impair their function.

## 6.5 Behavior observations

Behavior observations include both tallies of certain behaviors, particularly rubbing/itching against panels and supports, and grazing beneath panels, as well as yes/no observations (behavior was observed or not). Table 5 presents yes/no observations; Table 6 and Table 7 present tallies.

TABLE 5. Results of behavior observations (Yes/no or Presence/absence of behavior).

| Parameter | Observed? |
|---|---|
| Sheep grazing beneath panels | Yes |
| Sheep resting/ruminating under panels | Yes |
| Sheep itching and rubbing against panel corners and low edges. | Yes |
| Sheep itching and rubbing against steel supports and piles | Yes |
| Sheep investigating panels (licking, smelling, nosing, brushing against panels) | Yes |
| Sheep chewing on wires | No |
| Sheep entangled in wires | No |
| Sheep climbing on solar panels | No |
| Sheep butting solar panels | No |
| Interactions that damage or appear to damage panels | No |

TABLE 6. The average number of sheep grazing under panels per hour is estimated from observations during 15-minute observation periods.

| Date | Average Number of Sheep Grazing under Modules (Sheep per hour) | Range | Hours of Observation |
|---|---|---|---|
| 8/16/2010 | 17.0 | 0-29 | 3.75 |
| 8/17/2010 | 22.8 | 1-28 | 4 |

TABLE 7. Each incident of sheep rubbing or itching on steel support piles and low edges or corners of PV modules was documented. Total incidents are reported, along with total hours of observation.

| Date | Incidents of rubbing/itching on steel piles | Incidents of rubbing/itching on corners and low edges of modules | Hours of Observation |
|---|---|---|---|
| 8/16/2010 | 25 | 19 | 3.75 |
| 8/17/2010 | 20 | 6 | 4.00 |
| Total | 45 | 25 | 7.75 |

# 7 Discussion

## 7.1 Forage consumed

Intake estimates from the forage clip plots agree with National Research Council nutrition guidelines for sheep. These estimate a dry matter intake of 1.7% of body weight for 150-pound ewes, or 2.6 pounds dry matter, at maintenance/early gestation. At the Grazing Trial Site, sheep consumed an average 2.6 pounds dry matter per day (compare to "Amount Feed Consumed - Total" columns in Table 2). According to the National Research Council nutrition guidelines (NRC 1985), sheep that are in late gestation or lactating (nursing lambs) require additional feed, typically needing dry matter equaling 2.6 to 3.7 percent of body weight (4.0 to 5.5 pounds for a 150-pound ewe). Clip plot data shows that additional forage was available, even in the unusually disturbed condition of the PV grazing trial enclosures.

This preliminary grazing trial was conducted very late in the season. Grazing at this time could be feasible for management of late-season weeds, such as annual mustard species which can grow very tall and present a fire risk. However the preliminary grazing trial did not provide data on potential spring grazing. Spring grazing would be a key component of grazing for fuel and habitat management. Forage was also crushed/disturbed by panel installation in June, a condition that could be replicated in the installation year of the Project but would not be repeated in subsequent years.

The sheep used to graze the trial site were crossbreeds including Targhee, Finnsheep, and Dorper breeding of varying amounts. These ewes weighed an estimated 140 pounds during the grazing trial and stood approximately 28 inches tall. Note that weight of ewes can vary by 80 pounds

during a year-long production cycle. Herds of sufficient size to graze a site the acreage of the proposed Topaz Solar Farm are likely to be Rambouillet/Merino ewes and lambs of those ewes bred to blackface rams of Suffolk and Hampshire blood. These sheep would be slightly larger than those used to graze the Trial site.

Subsequent grazing trials aimed at developing management standards should consider forage requirements of lactating ewes. Future study should be timed to reflect forage conditions in all season(s) proposed for vegetation management via grazing, most likely late spring in addition to midsummer.

## 7.2 Vegetation height and fuel reduction

Installation of PV panels in June 2010 disturbed vegetation and reduced vegetation height prior to the grazing trial in August 2010. This is expected to mimic conditions in the installation year of the solar farm. In subsequent years vegetation is expected to recover, and would likely be taller than the average height of disturbed vegetation along panel rows in the 2010 Trial. The difference in pregrazed vegetation height in the Control versus PV enclosures reflects the disturbance due to panel installation. Depending on the preferred vegetation density for onsite habitat, grazing may not be required in the first year after panel installation.

Despite the disturbed condition of vegetation in PV enclosures, the grazing trial still demonstrated that grazing sheep will reduce average height of vegetation and remove vegetation along low edges of panels. Low edge of the panels in the trial enclosures averaged 25.24 inches above the existing ground surface (range 17 to 31.5 inches). Average maximum height of vegetation along the low edge of panels prior to grazing was 7.3 inches ($n$=100). Post-grazing average maximum height measured at the same sites was approximately 1.8 inches.

Sheep reduced vegetation height in the control enclosures, which approximate the expected condition of vegetation under panels subsequent to the panel installation year. Average maximum height of vegetation along transects in C2 enclosure was 13.3 inches ($n$=20). Post-grazing average maximum height measured at the same sites was approximately 9.7 inches ($n$=20). Vegetation average height can be managed by sheep grazing.

During the grazing trial, observers noted sheep moving easily under the low edge of the panels, and reaching for forage beneath the low edge. Sheep were willing to reach for vegetation from their knees in locations where panels were lower than average.

Additional study should consider appropriate timing to balance sheep nutrition requirements with controlling vegetation height for fuel and habitat management. Forage is more palatable and nutritious in early spring when soils are still moist and plants are able to regenerate quickly. However, when sites are grazed in late spring or early summer when soils are drying, plants are less likely to regrow until the following spring, and fire risk is reduced for a longer period.

## 7.3 Panel inspection

Grazing 30 sheep for 24 hours in just 6400 square feet of pasture qualifies as a high intensity short duration grazing operation. Even at high grazing intensity, technicians did not note any damage to PV panels or wiring.

## 7.4 Sheep fecal pellet count

No difference was noted in number of pellets under PV panels versus in alleys on the same day, suggesting movement of sheep is evenly distributed over the PV enclosures. The reduction in

pellets on the second day is likely the result of change in diet from their previous pasture at Cal Poly to the drier, lower quality forage at Topaz.

### 7.5 Behavior observations

Sheep were actively observed for a total of 8 hours, in 15 minute increments spread over two days (Photos 7-12).

In the grazing trial enclosures, the low edge of panels ranged from 17 to 31.5 inches above the ground, with an average height of 25.24 inches. This is similar to expected condition of panels proposed for Topaz Solar Farm, which are proposed to be a minimum of 18 inches above the ground. At this height, the sheep had no trouble reaching under low edges of panels to graze, and were able to move underneath the panels easily.

Itching and rubbing on the panel edges, corners, and low edge and on steel supports occurred during the grazing periods. Incidents of rubbing and itching on panel corners and low edges were much more frequent on the first day than the second. Incidents of rubbing and itching on steel piles were similar the first and second days. Itching and rubbing did not result in damage to panels or supports. Rob Rutherford noted that on the first day, sheep were transported for an hour in a trailer prior to release in the PV2 enclosure, and sheep that have been in a trailer are often restless and itchy when they are released into pasture. Some of the rubbing observed the first day may reflect this.

The ewes were last sheared in March and had five months of wool regrowth during the Preliminary Grazing Trial. Sheep with more wool are typically more prone to itching and rubbing than recently shorn sheep. Sheep can be expected to rub against panels and supports more frequently during late summer grazing than in spring when they are recently sheared. Future study should investigate if grazing earlier in the year results in fewer incidents of rubbing and itching against panel edges and supports.

Technicians did not observe any instances of sheep chewing wires or becoming entangled in wires. No damage to wiring was observed. To maintain a safe grazing environment for sheep, wiring should be kept secured to supports. Arrays should be checked for loose wiring before grazing events to prevent accidental tangling.

The grazing trial was conducted in late summer with a flock of ewes. Spring grazing would likely require use of a flock that includes lambs, and possibly rams. Behavior of ewes may change when lambs and rams are present, and behavior of rams was not investigated in this preliminary trial. Future study should consider use of a mixed flock to determine if rams will interact differently with the panels.

## 8 Conclusion

The preliminary grazing trial was conducted late in the year in conditions disturbed by panel installation. Typical site conditions in which grazing would be prescribed for habitat and fuel management would have a greater abundance of standing grasses and forbs. Therefore, many of the findings of this study are qualitative rather than quantitative measures necessary to develop a final grazing management plan. Nonetheless, this trial answered many important questions, and demonstrated that sheep will graze under solar panels. Because grazing appears to be a feasible method of managing vegetation on the Solar Farm, additional study is warranted. We recommend spring and summer grazing trials to inform decisions regarding fire risk reduction,

and wildlife habitat management. A grazing management plan should include a flexible response to annual climate variations that affect timing of forage production, total biomass produced, as well as vegetation height.

The preliminary grazing trial demonstrated that sheep will graze beneath solar panel modules similar to those proposed for Topaz Solar Farm when they are set approximately 18 inches to two feet above the ground. Occasional itching and rubbing behaviors did not appear to cause any damage to the panels. Sheep did not climb on or otherwise substantially disturb the panels, and were successful at moving beneath panels to graze and rest. Grazing reduced average maximum vegetation height along the low panel edge, and reduced biomass (fuel). Due to the small size of test plots and logistic constraints during the trial grazing period vegetation experienced more intense grazing than is anticipated in the actual solar farm. Even so, residual dry matter sufficient to provide erosion protection was retained on the site. We recommend maintaining residual dry matter over 750 pounds per acre to maintain adequate kit fox habitat[2] and for permanent erosion control.

Some questions could not be answered during this preliminary trial and additional study is needed to develop a grazing management plan. Future study should examine grazing behaviors during spring months when flock composition varies from solely ewes to include rams, who may occasionally engage in sparring contests with each other in proximity of the tables. Grazing during earlier spring months would investigate if sheep engage in less rubbing and itching behaviors when wool length is shorter. Additionally, future grazing trials should consider ideal enclosure area and duration for grazing, and how many pulses of grazing are required per year for optimal vegetation height. Forage quality should be evaluated for protein content, and the effect of grazing on vegetation height should be re-evaluated on the site when vegetation has had a chance to regrow, since the initial study was conducted on vegetation recently disturbed by panel installation. Future study may also consider dust generated by the grazing herd and its significance, if any, to PV panel function.

[2] This number was recently negotiated with the California Department of Fish and Game for a kit fox conservation bank in Bitterwater Valley.

# 9 Photographs and Figures

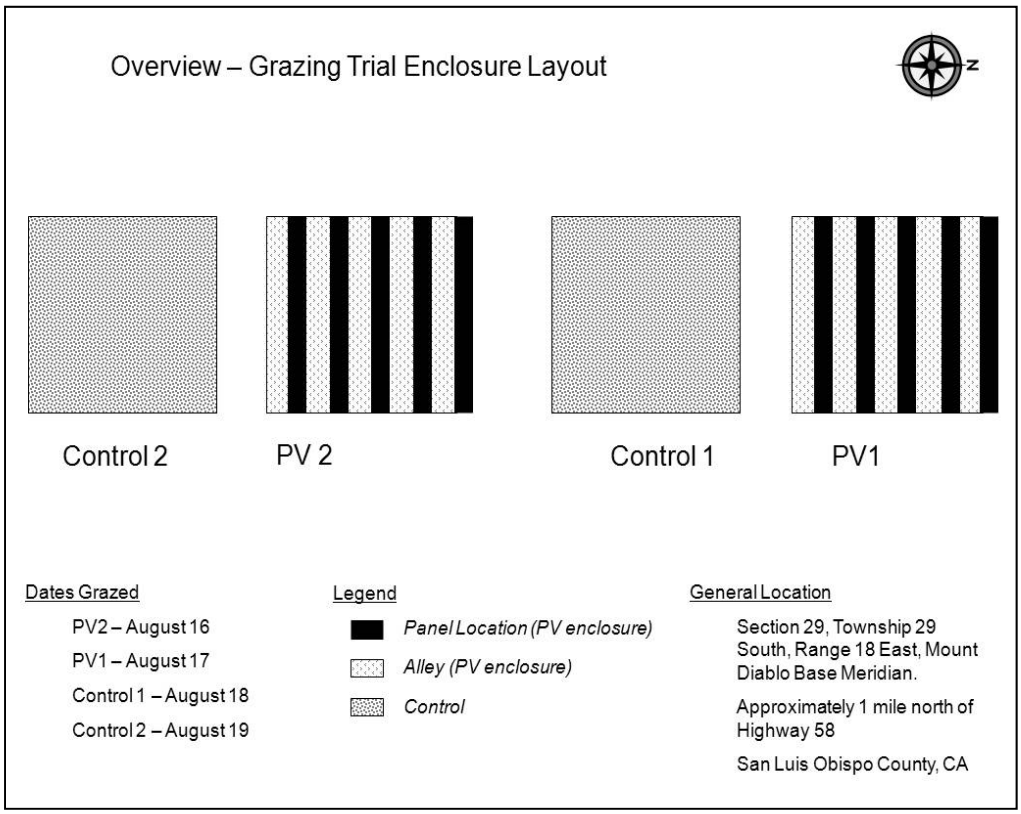



Figure 1. Experimental Layout. In each treatment, an electric fence enclosure circumscribed approximately 6400 square feet: two treatments contained photovoltaic panels, 80-feet long, spaced approximately 12 feet apart, and two controls contained no panels.

# Photo Collection: Grazing Trial August 16-19, 2010



1. Vegetation before panel installation and grazing.



2. Panel installation required small, rubbertrack pile driver and construction crew.



3. Vegetation before grazing (PV2 treatment).




4. Vegetation after grazing (PV 2 treatment).



5. Electric netting surrounded panel treatments.



6. Vegetation after grazing. (PV 1 treatment.)



7. Sheep grazing inside PV enclosure.



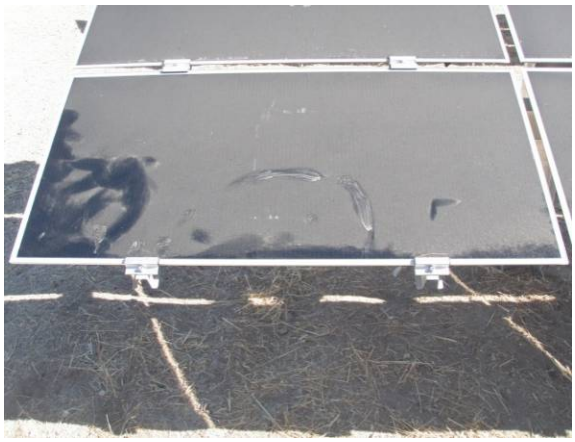
8. Sheep grazing under the panels and in alley-ways.



9. Ewe reaching under the front edge of the panel to graze.




10. Dry matter and manure pellets in a one square-foot quadrat in PV1 enclosure, post graze.



11. Marks in the dust where ewes investigated panels.



12. Wool snagged on the low edge of a panel.

## 10 References


Althouse and Meade, Inc. 2010. Final Biological Report for Topaz Solar Farm. Carrizo Plain, San Luis Obispo County, California. 29 July.

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# Appendix D. County of San Luis Obispo Conditions of Approval for Conditional Use Permit DRC2008-00009

- **Condition 43: MM BR-1.2. Implementation of Best Management Practices (BMPs).**
- **Condition 46: MM BR-2.1. Prepare and implement a Weed Control Plan.**
- **Condition 46: MM BR-2.1(e). Prepare a Vehicle Washing Plan.**
- **Condition 47: MM BR-2.2. Develop a Grazing Plan.**
- **Condition 54. MM BR-8.2. Avoid known listed fairy shrimp locations.**
- **Condition 65: MM BR-16.3 (g) Monitor indirect impacts to vegetation and wildlife.**
- **Condition 88. MM HZ-1.1. Develop and implement site-specific spill response plan.**
- **Condition 89. MM HZ-1.2. Develop and implement a hazardous materials business plan.**
- **Condition 90. MM HZ-1.3. Develop and implement a hazardous waste management plan.**
- **Condition 92. MM HZ-1.5: Use licensed herbicide applicator.**
- **Condition 102. MM HZ-7.3: Ensure proper handling of livestock.**

## CUP Condition 43

**MM BR-1.2 - Implementation of Best Management Practices (BMPs).** BMPs will be implemented as standard operating procedures during all ground disturbance and construction-related activities to avoid or minimize project impacts on biological resources. These BMPs will include but are not limited to the following:

a. Compliance with BMPs will be documented and provided to the County in a written report on an annual basis. The report shall include a summary of the construction activities completed, a review of the sensitive plants and wildlife encountered, a list of compliance actions and any remedial actions taken to correct the actions, and the status of ongoing mitigation efforts.

b. **Prior to ground disturbance of any kind for each phase** the project work areas shall be clearly delineated by stakes, flags, or other clearly identifiable system.

c. Vehicles and equipment shall be parked on designated staging or parking areas, pavement, existing roads, and previously disturbed areas to the extent practicable.

d. Speed limit signs, imposing a speed limit of 15 miles per hour, will be installed throughout the project site **prior to initiation of site disturbance and/or construction**. To minimize disturbance of areas outside of the construction zone, all project-related vehicle traffic shall be restricted to established roads, construction areas, and other designated areas. These areas will be included in preconstruction surveys and to the extent possible, should be established in locations disturbed by previous activities to prevent further impacts. Off-road traffic outside of designated project areas will be prohibited.

e. No vehicles or equipment shall be refueled within 100 feet of an ephemeral drainage or wetland unless a bermed and lined refueling area is constructed. Spill kits shall be maintained onsite in sufficient quantity to accommodate at least three complete vehicle tank failures of 50 gallons each. Any vehicles driven and/or operated within or adjacent to drainages or wetlands shall be checked and maintained daily to prevent leaks of materials.

f. All general trash, food-related trash items (e.g., wrappers, cans, bottles, food scraps, cigarettes, etc.) and other human-generated debris scheduled to be removed weekly will be stored in animal-proof containers and/or removed from the site each day. No deliberate feeding of wildlife will be allowed.

g. Development on the Project site will maintain existing hydrologic patterns with respect to runoff supporting seasonal wetlands, vernal pools and ephemeral drainages.

h. All pipes and culverts with a diameter of greater than 4 inches shall be capped or taped closed. Prior to capping or taping the pipe/culvert shall be inspected for the presence of wildlife. If encountered the wildlife shall be allowed to escape unimpeded.

i. No firearms will be allowed on the project site, unless otherwise approved for security personnel.

j. To prevent harassment or mortality of listed, special-status species and common wildlife, or destruction of their habitats no domesticated animals of any kind shall be permitted in any project area with the exception of those described in the approved grazing plan and dogs used for annual scat detection surveys for kit fox. The approved grazing plan may allow for sheep herding dogs to be onsite only when they are controlling and moving sheep from one project area to another. Dogs shall not be allowed within any project area outside of daylight hours or when they are not working under direct supervision of their handlers.

k. Use of chemicals, fuels, lubricants, or biocides will be in compliance with all local, state and federal regulations. All uses of such compounds shall observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other state and federal legislation, as well as additional project-related restrictions deemed necessary by the USFWS and CDFG. Use of rodenticides is prohibited.

l. Any contractor or employee that inadvertently kills or injures a special-status animal, or finds one either dead, injured, or entrapped, will immediately report the incident to the onsite representative identified in the WTP. The representative will contact the appropriate agency(ies) (e.g. USFWS, CDFG, and/or County) by telephone by the end of the day, or at the beginning of the next working day if the agency office is closed. In addition, formal notification shall be provided in writing within three working days of the incident or finding. Notification will include the date, time, location and circumstances of the incident. Any threatened or endangered species found dead or injured will be turned over immediately to CDFG or USFWS, as appropriate, for care, analysis, or disposition.

m. During the site disturbance and/or construction phase, grading, construction, and decommissioning activities (unless as noted in "n" below) shall be restricted to the following hours:

    i. October 1 through May 31 - Monday through Friday 7:00 a.m. to 6:00 p.m.

    ii. June 1 through September 30 – Monday through Friday 5:00 a.m. to 9:00 p.m. All construction activities between 5 am and 7 am shall not result in noise exceeding 45 dBA at the perimeter property boundaries.

    iii. Saturday and Sunday 8:00 a.m. to 5:00 p.m. throughout the year.

n. Final electrical connections, some emergency repairs, energization of each PCS and PVCS, and final energization of the switching station and substation may need to occur at night when PV modules are not producing electrical current. Any needed task lighting for construction or emergency repairs will be confined to the specific, active work location. Any shutdowns of the plant at array or PCS level may be done at night for worker safety. In addition, workers may need emergency night access to the site during construction and operations.

o. Avoidance and minimization of vegetation removal within active construction areas. This will include flagging of sensitive vegetative communities or plants.

p. Avoidance and minimization of construction activities resulting in impacts to jurisdictional wetlands, streambeds, and banks of any jurisdictional ephemeral drainage, except as authorized by regulatory agencies.

q. All excavation, steep-walled holes or trenches in excess of 6 inches in depth shall be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth dirt fill or wooden planks. Trenches will also be inspected for entrapped wildlife each morning prior to onset of construction activities and immediately prior to covering with plywood at the end of each working day. Before such holes or trenches are filled, they will be thoroughly inspected for entrapped wildlife. Any wildlife discovered will be allowed to escape before construction activities are allowed to resume, or removed from the trench or hole by a County-approved biologist holding the appropriate permits (if required).

r. Project personnel will monitor all areas within 1/4 mile around the solar arrays on a regular basis (i.e., two times per week) for any dead animals, including wild animals or grazing animals such as cattle, goats, or sheep that are being used for vegetation management on the site. Any animals found dead will be removed immediately by appropriate personnel to avoid attracting condors to the vicinity of the arrays and as described in Mitigation Measure HZ-7.3.

s. All light sources will be minimized, and lighting will be designed (e.g., using downcast lights) to limit the lighted area to the minimum necessary.

**During construction**, compliance will be verified by the County Environmental Monitor. The Applicant shall submit a written report to the County on an annual basis for review.

## CUP Condition 46

**MM BR-2.1 - Prepare and implement a Weed Control Plan. Prior to the issuance of a construction permit or any ground disturbance** the Applicant shall retain a County-approved restoration ecologist or biologist to prepare a comprehensive adaptive Weed Control Plan (WCP) to be administered during the construction and operation of the project for the purpose of invasive weed abatement. The WCP shall be submitted to the County of San Luis Obispo for review and approval and shall be updated and utilized for eradication and **monitoring after construction**. The WCP shall include, but not be limited to, the following:

a. Conduct a pre-construction survey for weeds in all areas proposed for ground-disturbing activity, including, but not limited to, solar module mounting, post installation and construction areas, assembly yards, access roads, and areas subject to grading for new or improved access roads. Weed populations that are rated high or moderate for negative ecological impact in the California Invasive Plant Inventory Database (Cal-IPC, 2006) and those determined by the County

qualified restoration ecologist or biologist (i.e., silver horsenettle [*Solanum eleagnifolium*] and Russian thistle [*Salsola tragus*]) shall be mapped and described according to density and area covered. The County qualified restoration ecologist or biologist shall then rank the species to be targeted for removal as high-threat or low-threat, taking into consideration that some species identified may be a dominant component of the annual grassland present within the Project site and should not be targeted for removal. Weeding shall first target those identified as high-threat for eradication. The County qualified restoration ecologist or biologist shall review the list of low-threat species and determine whether eradication or management of the species is required. Areas identified to have weed infestations shall be treated prior to ground disturbance according to control methods detailed below and best management practices for invasive weed populations.

b. Weed control treatments shall include, as appropriate, all legally permitted herbicide approved for application, and manual and mechanical methods of weed removal. The application of herbicides shall be in compliance with all state and federal laws and regulations under the prescription of a Pest Control Advisor (PCA), where concurrence has been provided by the County of San Luis Obispo, and implemented by a Licensed Qualified Applicator. Herbicides shall not be applied during or within 72 hours of a scheduled rain event. Where manual and/or mechanical methods of weed removal are used, disposal of the plant debris will take place at an appropriate offsite location. The timing of the weed control treatment shall be determined for each plant species with the goal of controlling populations before they start producing seeds. Consultation with a County-approved wildlife biologist or botanist shall be required prior to weed control treatments with the intent of avoiding any adverse impacts to plants and wildlife in the area.

c. From the time ground disturbance through operation of the project surveying for new invasive weed populations and the monitoring of identified and treated populations shall be required at all sites impacted by construction (array structures, staging areas, etc.), including access roads disturbed during the project. Surveying and monitoring for weed infestations shall occur annually. Treatment of all identified weed populations shall occur at a minimum of once annually. When no new seedlings or re-sprouts are observed at treated sites for three consecutive, normal rainfall years, the weed population can be considered eradicated and weed control efforts may cease for that impact site.

   Weed control efforts shall be timed annually to reduce noxious weed seed production, by conducting activities when flowering has just started, but before seeds have been produced. All plant debris shall be disposed of at an approved location. Weed control efforts shall commence in early spring (February), as indicated annually by a County-approved restoration ecologist or biologist.

d. During project preconstruction and construction, all seeds, straw, gravel, and fill materials shall obtained from vendors able to certify that these materials are weed free. Any deviation from this will be approved by the County of San Luis

Obispo. All plant materials used during restoration shall be native, certified weed-free, and approved by the County of San Luis Obispo.

e. As an element of the Weed Control Plan, the Applicant shall retain a County-approved restoration ecologist or biologist to prepare a Vehicle Washing Plan. The Vehicle Washing Plan, as a part of the Weed Control Plan, shall be submitted to the County of San Luis Obispo for review and approval. The Vehicle Washing Plan shall include measures to ensure that all vehicles or equipment are clean and free of dirt and noxious weeds prior to entering the project area. The Vehicle Washing Plan may include, but is not limited to, the following elements:

   i. As necessary, during project preconstruction and construction, vehicles and all equipment shall be washed (including wheels, undercarriages, and bumpers) before entering the project area. Vehicles shall be cleaned at existing construction yards or legally operating car washes.

   ii. In addition, tools, such as chainsaws, hand clippers, pruners, etc., shall be washed before and after entering all Project work areas.

   iii. All washing shall take place where rinse water is collected and appropriately disposed (such as a sanitary sewer or landfill) unless otherwise, as approved by the County of San Luis Obispo.

   iv. The Applicant shall ensure that trucks and equipment leaving the site are clean and shall not spread dirt on public roads;

   v. A written daily log shall be kept to ensure only clean vehicles enter the project area. The log shall include information about all vehicle/equipment/tool washing that states the date, time, location, type of equipment washed, methods used, and staff present. The log shall include the signature of a responsible staff member. Logs shall be available to the County of San Luis Obispo for inspection at any time and shall be submitted to the County of San Luis Obispo on a monthly basis.

f. During project operation and maintenance activities, clear and dispose of weeds in assembly yards, array footprints, access roads, staging areas, and any other disturbance areas in an approved method.

The above measures shall be implemented by the Applicant as specified in the WCP. The County environmental monitor shall ensure compliance with construction measures.

## CUP Condition 47

**MM BR-2.2 - Develop a Grazing Plan.** If managed livestock grazing is proposed for the Solar generation facility site then p**rior to the issuance of a construction permit** the Applicant shall retain a County-approved restoration ecologist or biologist to prepare a Grazing Plan to be administered during the construction and operation of the project. The Grazing Plan shall be submitted to the County of San

Luis Obispo for review and approval. The Grazing Plan shall include, but not be limited to, the following:

a. Timing and duration of grazing depending on seasonal conditions (i.e., rainfall, temperature).

b. Discussion on the pros and cons of grazing sheep and/or goats vs. cattle.

c. Detailed measures to ensure the persistence of annual grassland habitat suitable for listed, rare or special-status plant species.

d. Detailed maps of any additional interior fencing required for onsite grazing and a detailed plan for ensuring that any interior fencing does not have additional impacts on wildlife movement.

e. Analysis of the effects of sheep or goat grazing on soil compaction or trampling on vegetation or the spread of invasive weed seed through hooves, scat or fur of livestock.

f. Development of a monitoring plan that will facilitate the examination of the effects of grazing on surrounding wildlife and plant and wildlife biodiversity.

g. Development of a plan for adaptive strategies to ensure that grazing is managed to benefit native wildlife and vegetation.

h. Submittal of an annual report to the County on effectiveness of the Plan for the first five years of operation and afterwards as required by the County.

The Grazing Plan will be an adaptive management tool. Grazing management strategies will be evaluated over time. Modifications to the strategies used or to the techniques used to accomplish each strategy will be implemented based on results, experience, and the latest research. Alterations to the plan must be reviewed and approved by the County in consultation with CDFG before being implemented.

**Prior to acquisition or implementation**, should the land be proposed for limited grazing to complement reestablishment of sensitive biological resources, the County shall evaluate to determine to what extent, if any, the two can jointly qualify for protection of agricultural and sensitive biological lands.

## CUP Condition 54, MM BR-8.2. (in part)

MM BR-8.2 (in part) – Avoid known listed fairy shrimp locations.

## CUP Condition 65 (in part)

MM BR-16.3 (g) - Development of a strategy for the monitoring of indirect impacts to vegetation and wildlife from alteration to the solar and hydric regimes as a result of solar modules.

## CUP Condition 88

**MM HZ-1.1 - Develop and implement site-specific spill response plan. Prior to construction permit issuance**, the Applicant shall submit to the County for review and approval a site-specific spill response plan that shall include the following elements:

a. **General information:**

i. Name and location of facility

ii. Description of facility operations

iii. General manager and emergency coordinator names and phone numbers (home, work, pager, and mobile contact information)

iv. Description of what is stored at the facility (contents and volume)

v. Site diagram showing:

- ❖ Hazardous materials storage areas
- ❖ Drains (storm and sanitary)
- ❖ Surface waters
- ❖ Buildings
- ❖ Surrounding neighborhood

b. **Prevention:** A description of prevention measures to be taken at the project site, such as secondary containment, employee training, and proper storage. Products shall be kept in their original containers with the original manufacturer's label and resealed when possible, and the manufacturer's recommendation for proper disposal shall be followed. The site superintendent shall perform routine inspections to ensure that all materials onsite are being stored and disposed of in an appropriate fashion.

c. **Preparedness:** A description of the planned onsite equipment for spill response and its location. Spill clean-up materials and equipment appropriate to the type and quantity of hazardous materials shall be located onsite and personnel made aware of their location. Key employees shall be trained in spill response procedures in accordance with local, State, and federal regulations. Material safety data sheets (MSDSs) shall be kept onsite during construction and operation of the solar farm. Spill response materials including brooms, dust pans, mops, rags, gloves, absorbent pads/, sand/absorbent litter, sawdust, and plastic and metal containers will be kept onsite. The spill response plan shall also specify:

i. The Applicant's health and safety training plan, Department of Transportation–required training, and spill response training

ii. Local, State, and federal regulatory agency reporting procedures and phone numbers, as well as emergency response contractor contact information and local hospital contact information

d. **Response Procedures:** An outline of emergency response procedures, including physical spill clean-up procedures, reporting requirements, and stabilization techniques. Spill guidelines shall include the following:

i. All spills shall be immediately cleaned up upon discovery

ii. The spill area shall be kept well ventilated and personnel shall wear the appropriate protective clothing to prevent injury when cleaning up a spill

iii. Reportable quantities of spills of hazardous materials shall be reported to the appropriate local, State, and federal authorities

iv. All vehicles leaking oil or fluids shall be scheduled for maintenance, and drip plans shall be placed under the leak when parked prior to the maintenance event

e. **Transformer Oil:** A description of spill prevention and response measures for transportation of substation transformer oil to and from the project site. Spill guidelines shall include the following:

i. The transformer oil transportation route shall be mapped with all navigable or potentially navigable waters adjacent to or perpendicular to the route

ii. A list of contact information for the appropriate local, State, and federal authorities shall be located in the transportation vehicle(s) at all times

iii. Transformer oil spills during transportation shall be immediately reported to the appropriate local, State, and federal authorities

The spill response plan shall be implemented during both construction and operation. In addition, during the life of project operation, the project shall not use any hazardous materials not specified in the plan or in greater quantities than specified, unless approved in advance by the County Environmental Health Services Division and the County Department of Planning and Building.

**During construction**, the County Environmental Monitor shall work with the Environmental Health Division to verify that the approved Spill Response Plan is followed or incorporated. Environmental Health Division to verify compliance post-construction.

## CUP Condition 89

**MM HZ-1.2 - Develop and implement a hazardous materials business plan. Prior to issuance of the construction permit**, in accordance with the California Health and Safety Code, the Applicant shall prepare a hazardous materials business plan and submit it to the County Environmental Health Services Division for review and approval. The hazardous materials business plan shall delineate hazardous material and hazardous waste storage areas; describe proper handling, storage, and disposal techniques; describe methods to be used to avoid spills and minimize impacts in the event of a spill; describe procedures for handling and disposing of unanticipated hazardous materials encountered during construction; and establish public and agency notification procedures for spills and other emergencies, including fires. The Applicant shall provide the hazardous materials business plan to all contractors working on the project and shall ensure that one copy is available at the project site at all times.

**During construction**, the County Environmental Monitor shall work with the Environmental Health Division to verify that the approved Plan is followed or incorporated. Environmental Health Division to verify compliance post-construction.

## CUP Condition 90

**MM HZ-1.3 - Develop and implement a hazardous waste management plan. Prior to issuance of the construction permit**, the Applicant shall prepare a hazardous waste management plan to ensure proper storage, transport, and disposal of hazardous waste generated at the project site during construction and operation. The Applicant shall submit the plan to the County Environmental Health Services Division for review and approval. At a minimum, the hazardous waste management plan shall address:

a. Waste determination (22 CCR §66262.11);

b. On-site container/tank management (22 CCR §66265.171 - .191);

c. Proper disposal (22 CCR §66266.3, HSC §25250.4);

d. Accumulation times (22 CCR §66262.34);

e. Contingency plans (22 CCR §66265.50); and

The plan shall comply with all future revisions and updates to the regulations cited in this condition.

**During construction**, the County Environmental Monitor shall work with the Environmental Health Division to verify that the approved Plan is followed or incorporated. Environmental Health Division to verify compliance post-construction.

## CUP Condition 92

**MM HZ-1.5 - Use licensed herbicide applicator.** During the construction and operational phases of the project, the contractor or personnel applying herbicides shall have all the appropriate State and local herbicide applicator licenses and comply with all State and local regulations regarding herbicide use. Herbicides shall be mixed and applied in conformance with the product manufacturer's directions. The herbicide applicator shall be equipped with splash protection clothing and gear, chemical resistant gloves, chemical spill/splash wash supplies, and material safety data sheets (MSDSs) for all hazardous materials to be used. To minimize harm to wildlife, vegetation, and waterbodies, herbicides shall not be applied directly to wildlife, products identified as non-toxic to birds and small mammals shall be used if nests or dens are observed, and herbicides shall not be applied within 50 feet of any surface waterbody when water is present. Herbicides shall not be applied if it is raining at the site, rain is imminent, or the target area has puddles or standing water. Herbicides shall not be applied when wind velocity exceeds 10 miles per hour. If

spray is observed to be drifting to a non-target location, spraying shall be discontinued until conditions causing the drift have abated.

Prior to any herbicide application, the herbicide applicator shall contact the County Environmental Monitor to show where work will be done and to receive information/ training about potentially sensitive biological resources that may be within the area to be sprayed and methods to apply to minimize those impacts. **Prior to construction permit issuance,** a Worker's Training Manual shall be prepared for the County Environmental Monitor's review that includes a provision on herbicide application. Once facility operation commences, this Manual shall be given to any herbicide applicator and followed prior to spraying.

## CUP Condition 102

**MM HZ-7.3 - Ensure proper handling of livestock. Prior to livestock grazing on the project site**, to substantially reduce the risk of livestock transmitting anthrax to personnel, the Applicant shall ensure that all personnel are trained to be aware of the risk of naturally occurring anthrax being transmitted to humans from a diseased animal carcass. In addition, the following practices shall be followed:

a. Only trained livestock handlers shall handle livestock at the project site.

b. Animal carcass disposal shall follow accepted practice if the death is potentially related to anthrax.

c. All suspected cases of anthrax shall be immediately reported to the animal's veterinarian, the San Luis Obispo County Agricultural Commissioner, County Planning and the California Department of Food and Agriculture's Animal Health and Food Safety Services – Animal Health Branch.

d. Livestock carcasses shall be handled only by properly trained livestock handlers, veterinarians, or health officials.

e. If livestock carcasses must be temporarily stored at the project site overnight, all carcasses shall be covered with thick plastic and secured from being accessed by scavenging wildlife.

f. Livestock carcasses shall not be temporarily stored on the project site during a rain storm.

g. Livestock carcasses shall not be allowed to remain unsecured on the project site overnight in order to avoid scavengers and pets opening a potentially diseased carcass.

h. Livestock carcasses shall be burned or removed and properly disposed as soon as possible after the death of the animal. Disposal shall be coordinated with the San Luis Obispo County Agricultural Commissioner.

# Appendix E. Vegetation Management Plan Action Items

| Permit | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section |
|---|---|---|---|---|---|---|
| **Prior to Issuance of Construction Permits** | | | | | | |
| CUP | 46.MM BR-2.1.1 | Weed Control Plan (WCP) | Prepare & submit to County | Prior to Issuance of Permits | Project Biologist | 1.1; 2.0; Appendix D |
| CUP | 46.MM BR-2.1.3 | Weed Control Plan (WCP) | Prepare Vehicle Washing Plan as part of Weed Control Plan | Prior to Issuance of Permits | Project Biologist | 1.1; 2.7.2; Appendix D |
| CUP | 47.MM BR-2.2.1 | Develop A Grazing Plan | Develop a Managed Grazing Plan<br>- Timing & duration<br>- Sheep vs. goats vs. cattle<br>- Biotic protection measures<br>- Interior fencing maps<br>- Monitoring & Reporting Plan | Prior to Issuance of Permits | Project Biologist | 1.1; 3.0; Appendix D |
| CUP | 92.MM HZ-1.5.1 | Use licensed herbicide applicator | Prepare Herbicide Application Manual describing handling procedures – VMP refers readers to the other documents prepared for handling and storage of herbicides and hazardous materials. | Prior to Issuance of Permits | Licensed Pest Control Advisor (PCA) | 1.1; 2.8; Appendix D |
| **Prior to Start of Work** | | | | | | |
| CUP | 46.MM BR-2.1.2 | Weed Control Plan (WCP) | Conduct pre-construction survey, map weed control and protection areas | Prior to new site disturbance, immediately upon approval of permits | Project Biologist | 1.1; 2.2; Appendix D |
| CUP | 46.MM BR-2.1.4 | Weed Control Plan (WCP) | Initial treatment of weed populations targeted for eradication | Prior to ground disturbance in the affected phases (see weed maps produced by the previous step) | Project Biologist, PCA, EPC | 2.2; 2.5; 2.6 |

| Permit | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section |
|---|---|---|---|---|---|---|
| **During Construction** | | | | | | |
| CUP | 46.MM BR-2.1.4 | Weed Control Plan (WCP) | Monitor treated areas (species targeted for eradication) | Spring or Summer (varies by Species) annually During Construction | Project Biologist; First Solar EPC | 2.2; 2.5; 2.9 |
| CUP | 46.MM BR-2.1.4 | Weed Control Plan (WCP) | Monitor Weed Decontamination Area, Staging Area, and Wheel Cleaning areas (rumble strips) | Monthly during Construction | Project Biologist; First Solar EPC; PCA as needed | 2.7; 2.9 |
| CUP | 46.MM BR-2.1.4<br>92.MM HZ-1.5.x | Weed Control Plan (WCP);<br>Use licensed herbicide applicator | Treat Weed Decontamination Area and wheel cleaning areas as needed. | During Construction, monthly as needed dependent on monitoring results. | Project Biologist; First Solar EPC; Licensed applicator | 2.7 |
| CUP | 46.MM BR-2.1.4 | Weed Control Plan (WCP) | Perform monitoring of the entire project site to monitor status of weeds targeted for control and eradication. | During Construction, annually as needed | Project Biologist; First Solar EPC | 2.9 |
| CUP | 46.MM BR-2.1.4 | Weed Control Plan (WCP) | Treat weeds as needed based on annual monitoring results (see previous action item). | During Construction, as needed | Project Biologist; First Solar EPC; Licensed Applicator | 2.5, 2.6 |
| CUP | 92.MM HZ-1.5.4 | Use licensed herbicide applicator | Notification to County Environmental Monitor of areas to be sprayed | During Construction, Monthly as Needed | Licensed Applicator; Environmental Monitor | 2.8 |
| CUP | 92. MM HZ-1.5.x | Worker Training Manual – herbicide application provision | A Worker's Training Manual shall be prepared for the County Environmental Monitor's review that includes a provision on herbicide application. Once facility operation commences, this Manual shall be given to any herbicide applicator and followed prior to spraying. | Prior to construction permit issuance | First Solar | 1.1; 2.8.3; Appendix D |

| Permit | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section |
|---|---|---|---|---|---|---|
| CUP | 43.MM BR1.2.4 | Implement Biological Resource BMP's as Standard Procedure | Implement BMP Program on site | During Construction; Prior to New site disturbance or mobilizations. | A&M to provide list of BMP's for all construction related work. | 1.1 |
| **During Operations and Maintenance** | | | | | | |
| CUP | 46.MM BR-2.1.5 | Weed Control Plan (WCP) Implementation | Conduct weed monitoring for species treated for eradication | Ongoing Spring or Summer (varies by species) until species had not been observed for three consecutive rainfall years. | Project Biologist; First Solar O&M | 2.9 |
| CUP | 46.MM BR-2.1.5 | Weed Control Plan (WCP) Implementation | Re-treat resprouts and new plants of species targeted for eradication, as needed based on results of annual monitoring. | Ongoing until species had not been observed for three consecutive rainfall years. | Project Biologist; First Solar O&M; Licensed applicator | 2.5, 2.6, 2.9 |
| CUP | 46.MM BR-2.1.5 | Weed Control Plan (WCP) Implementation | Perform monitoring of the entire project site to monitor status of weeds targeted for control and eradication. | Annually as needed | Project Biologist | 2.9 |
| CUP | 46.MM BR-2.1.5 | Weed Control Plan (WCP) Implementation | Treat species targeted for control that are expanding in range, density, or are posing management problems | As needed based on results of annual monitoring | Project Biologist; First Solar O&M; Licensed applicator | 2.5, 2.6 |
| CUP | 47.MM BR-2.2.2 | Develop A Grazing Plan | Contract with shepherds | Winter | Project Biologist; First Solar O&M | 1.1, 3.0, Appendix D |
| CUP | 47.MM BR-2.2.x | Implement grazing plan | Contact grazing specialist/livestock manager and project biologist in February to determine when and where grazing will occur for the year. | Annually in late February | First Solar O&M | 3.4; 3.5 |
| CUP | 47.MM BR-2.2.x | Implement grazing plan | Contact biologist/grazing specialist to perform required forage production measurements | Annually in spring | First Solar O&M; project biologist | 3.10, 4.0, 5.0 |

| Permit | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section |
|---|---|---|---|---|---|---|
| CUP | 47.MM BR-2.2.x | Implement grazing plan | Graze site | Up to twice annually as determined by livestock manager and/or project biologist | First Solar O&M, Project Biologist | 3.0 |
| CUP | 47.MM BR-2.2.x | Implement grazing plan | Contact biologist/grazing specialist to perform required RDM measurements | Annually in the fall. | O&M; Project Biologist | 4.0 |
| CUP | 54.MM BR-8.2 | Avoid known listed fairy shrimp locations | Time grazing to avoid adverse effects on fairy shrimp | Ongoing | Project Biologist; First Solar O&M | 3.4 |
| CUP | 65. MM BR-16.3(g) | Monitor indirect impacts to vegetation and wildlife from alteration to the solar and hydric regimes as a result of solar modules | Study and analyze specific abiotic and biotic factors that may affect vegetation and wildlife. | After construction of Phase 1 and 6 | Project Biologist (and outside specialists, as available) | 4.0; 5.0 |
| CUP | 102.MM HZ-7.3.1 | Procedures for proper handling of livestock to prevent anthrax | Prepare livestock handling procedures | Ongoing, as needed | Project Biologist; First Solar O&M | 3.9 |
| CUP | 102.MM HZ-7.3.2 | Procedures for proper handling of livestock to prevent anthrax | Include note about dead livestock requirements on construction plans | Ongoing, as needed | Project Biologist; First Solar O&M | 3.9 |
| CUP | 102.MM HZ-7.3.3 | Procedures for proper handling of livestock to prevent anthrax | Include livestock handling procedures and anthrax training in the WTP | Ongoing, as needed | Project Biologist; First Solar O&M | 3.9 |
| CUP | 102.MM HZ-7.3.4 | Procedures for proper handling of livestock to prevent anthrax | Notify San Luis Obispo County Ag Commissioner, and CA Dept. of Food and Agriculture -Animal Health Branch | Immediately, if anthrax is suspected. | Project Biologist; First Solar O&M | 3.9 |

# TOPAZ FINAL BIOLOGICAL REPORT

# Final Biological Report

**for the**

# Topaz Solar Farm

California Valley
San Luis Obispo County
California



Prepared for

**Topaz Solar Farms LLC**
1111 Broadway, 4th Floor
Oakland, CA 94607

by

**ALTHOUSE AND MEADE, INC.**
**BIOLOGICAL AND ENVIRONMENTAL SERVICES**
1875 Wellsona Road
Paso Robles, CA 93446
(805) 467-1041

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# Synopsis

- This biological report examines a Biological Resource Project Study Area (PSA) consisting of 42 parcels in the northern end of California Valley in eastern San Luis Obispo County, California. The parcels consist of all or portions of 20 USGS land Sections, comprising approximately 9,700 acres of land.
- The applicant, Topaz Solar Farms LLC, proposes to construct a solar photovoltaic (PV) energy plant on approximately 4,100 acres of land in one of two alternative locations within the PSA. When fully developed, the project would be capable of generating 550 megawatts (MW) of power. The project name is Topaz Solar Farm (TSF).
- Biological resources within the PSA are addressed within this document as they pertain to the Option A study area (7,727 acres) and the Option B study area (6,290 acres).
- Most land within the PSA is or recently was utilized for agricultural production. We characterized habitat types within the PSA to identify potential habitat for special status species, and to assess potential impacts from the proposed project.
- We identified and mapped eight habitat types within the PSA: cropland, California annual grassland, vernal pool, ephemeral wetland depression, natural non-wetland pool, anthropogenic non-wetland pool, agricultural reservoir, and anthropogenic. Ephemeral drainages within the PSA are not described in this report as an independent habitat type. No riparian habitat is present.
- Floristic surveys conducted from March 2008 through July 2010 identified 248 species, subspecies, and varieties of vascular plants within the PSA. Nine special status plant species occur within the PSA; one additional special status plant species was identified and mapped just outside the PSA boundary.
- Documentation of wildlife included numerous highly specialized survey methods that enabled our team to locate, identify, and map rare and endangered species within and near the PSA. In addition, the use of stringent survey protocols provided robust data to support negative findings for certain species.
- We documented 18 special status wildlife species within the PSA in a manner consistent with their listing status (e.g. nesting), including three species listed under the Federal Endangered Species Act: the San Joaquin kit fox, longhorn fairy shrimp, and venal pool fairy shrimp.
- Development of the TSF Project would affect biological resources. We identify potential impacts to biological resources and provide recommendations for avoidance, minimization, and mitigation

# Definitions

*Project Areas*

**TSF:** **Topaz Solar Farm**; name of the proposed project.

**TSF Project:** **Topaz Solar Farm Project**; used generically to describe the proposed project, without distinction between the proposed project options.

**Option A:** The southernmost of two proposed TSF Project options; includes an approximately 7,727-acre study area, with a final fenced project area of approximately 4,104 acres.

**Option B:** The northernmost of two proposed TSF Project options; includes an approximately 6,290-acre study area, with a final fenced project area of approximately 4,007 acres.

**PSA:** **Biological Report Project Study Area**; used specifically when discussing the entire 9,700-acre area included in biological resource studies. The PSA is the combined area of the Option A study area and the Option B study area.

*Regulatory Abbreviations*

**CUP**: Conditional Use Permit
**APN**: Assessor's Parcel Number
**EIR**: Environmental Impact Report
**CEQA**: California Environmental Quality Act
**FESA**: Federal Endangered Species Act
**CESA**: California Endangered Species Act
**BGEPA**: Bald and Golden Eagle Protection Act
**CWA**: Clean Water Act
**MBTA**: Migratory Bird Treaty Act
**USFWS**: United States Fish and Wildlife Service
**CDFG**: California Department of Fish and Game
**CNDDB**: California Natural Diversity Database
**CNPS**: California Native Plant Society
**USACE**: United States Army Corps of Engineers
**RWQCB**: Regional Water Quality Control Board
**USGS**: United Stated Geologic Survey
**MDBM**: Mount Diablo Base Meridian
**NRCS**: Natural Resrouce Conservation Service
**CRP**: Conservation Reserve Program
**USDA**: United States Department of Agriculture
**CPNM**: Carrizo Plain National Monument
**BLM**: Bureau of Land Management

*Technical Abbreviations*

**PV**: Photovoltaic
**MW**: Megawatts
**kV**: Kilovolts; 1000 volts
**AC**: Alternative Current
**PCS**: Power Conversion Stations
**PVCS**: Photovoltaic Combining Switchgear houses
**M&M**: Maintenance and Monitoring Facility
**PV Array**: A block of photovoltaic panels
**PV Module:** An individual solar panel
**GIS**: Geographic Information Systems
**GPS**: Global Positioning System

*Species Abbreviations*

**BNLL**: Blunt-nosed Leopard Lizard
**NEAS**: Nelson's Antelope Squirrel
**GIKR**: Giant Kangaroo Rat

# 1.0 Introduction

This report provides information regarding biological resources that occur on lands associated with the proposed Topaz Solar Farm (TSF) photovoltaic power facility in San Luis Obispo County. The applicant, Topaz Solar Farms LLC, conducted research and feasibility studies on various potential project lands since early 2008. All biological surveys are complete except the 2010 blunt-nosed leopard lizard (BNLL) protocol survey, which will be completed in September[1].

The Biological Report Project Study Area (PSA), includes approximately 9,700 acres of land. Potential project layouts are currently focused on two proposed project options within the PSA, Option A and Option B. Each TSF Project Option includes a study area that is significantly larger than the ultimate fenced area of the Project. The Option A study area is approximately 7,727 acres in size, with a proposed fenced area of 4,104 acres. The Option B study area is approximately 6,290 acres in size, with a proposed fenced area of 4,007.

Baseline biological studies reported herein provide data on the entire 9,700 acre PSA. To support the preparation of the Environmental Impact Report (EIR) by the County of San Luis Obispo and Aspen Environmental Group, we present the data, maps, and our impact analyses according to the Option A Study Area and the Option B Study Area.

Numerous specialized wildlife studies were conducted in support of this Biological Report. All supporting research and survey reports completed by June 2010 were bound and distributed to the County, Aspen Environmental Group, and other regulatory agencies in a three volume 2010 Biological Report Technical Appendix (Althouse and Meade, Inc. 2010b). The 2010 blunt-nosed leopard lizard report and the San Joaquin kit fox genetic analysis report will be distributed as Volume 4 of the Biological Report Technical Appendix immediately upon completion.

Results reported in the final biological report are for floristic and wildlife surveys conducted from March 2008 through July 2010. We provide lists of plant and animal species found within the entire PSA. We summarize protocol and specialized wildlife studies conducted for the project in this document. In addition, we provide lists, maps, and discussions of special status species that could occur on or near the PSA or that could be affected by the proposed TSF Project.

We evaluate the effect of the proposed project on biological resources and propose avoidance, minimization and mitigation measures based on potential impacts. In some cases, recommendations are included for resource protection measures that could avoid or lessen potential adverse effects of the TSF Project.

[1] As of July 15, 2010 twelve full transect passes were completed for the 2010 adult BNLL survey period. The survey results for the adult period were negative for BNLL. This suggests greater than 95% certainty that BNLL do not occur within the survey area (Germano 2009).

## 1.1 Biological Resource Project Study Area Location

The PSA is located in the northern Carrizo Plain area of San Luis Obispo County, California (Section 12.0, Figure 1). The PSA is located northwest of California Valley, east of Bitterwater Road, and on either side of State Highway 58. The PSA is located within the La Panza NE and California Valley United States Geological Survey (USGS) 7.5 minute quadrangles. Elevation varies from approximately 2,010 to 2,200 feet above mean sea level.

The PSA includes all or portions of Sections 7, 8, 15, 16, 17, 18, 19, 20, 21, 22, 26, 27, 28, 29, 32, 33, 34, and 35 of Township 29 South, Range 18 East, and Sections 4 and 5 of Township 30 South, Range 18 East, of the Mount Diablo Base and Meridian (MDBM) (Section 12.0, Figure 2). Table 2 in Section 1.4 provides an overview of the PSA parcel data.

## 1.2 Project Description

The TSF Project would consist of the installation of approximately 437 photovoltaic (PV) arrays for solar power generation, each of which is capable of generating approximately 1.3 megawatts (MW) of Alternating Current (AC) power during peak sunlight conditions. Each PV array encompasses approximately 7.6 acres. The total area of PV arrays within the TSF Project would be 3,339 acres. Each PV array would consist of groups of PV modules mounted on an angle to steel racking supported by vertical steel columns driven into the ground. The total area of PV modules within the TSF Project would be 1,353 acres. The tallest part of the PV array and mounting structure is typically 5.5 feet above grade. The TSF project would ultimately generate approximately 550 megawatts of power for transmission along the existing Morro Bay/Midway 230 kV power line that passes through the PSA. Vehicular access to the facility would be from Bitterwater Road and Highway 58.

The TSF Project would be installed over an approximate 6.4 square mile site that would be located within one of two study areas. The study areas are larger than needed to accommodate the proposed project and allow flexibility in the final project design. Both study area options are considered as project variants in the EIR.

- **Option A** is comprised of approximately 7,727 acres. If the TSF Project is located within Option A, the fenced area would be approximately 4,104 acres.
- **Option B** is comprised of approximately 6,290 acres. If the TSF Project is located within Option B, the fenced area would be approximately 4,007 acres.

The applicant has applied to the County of San Luis Obispo (County) for a Conditional Use Permit (CUP) to allow a solar power plant as a permitted use on the site. Because of its responsibility for issuing this permit, the County is the lead agency under the California Environmental Quality Act (CEQA) and is responsible for preparation of the EIR. Key components of the TSF Project include:

- Installation of over seven million PV solar modules within approximately 437 arrays, and associated electrical equipment (e.g. Power Conversion Stations [PCS], PV Combining Switchgear [PVCS] houses);

- Direct conversion of sunlight to electricity without the use of water for power generation;
- PV arrays that are approximately five and a half feet in height (the distance from the ground to the top of the PV module table may vary depending on the topography);
- Each array would be approximately 1.3 $MW_{AC,}$ would occupy approximately seven acres, and would be equipped with a PCS, which includes two inverters and one transformer;
- Restoration of portions of the main on-site drainage to Soda Lake to help control off-site sediment flow;
- Electrical substation and switching station;
- Monitoring and Maintenance (M&M) facility (11,250 square feet);
- Solar Energy Learning Center (900 square feet);
- Placement of most medium-voltage feeder lines underground;
- Approximately 8 to 12 miles (depending on the option selected) of above-ground medium-voltage (34.5 kV) collector lines;
- Construction of approximately 14 to 22 miles (depending on the Option selected) of on-site access roads utilizing existing agricultural roads to the extent feasible;
- Minimal demand for water usage during plant operation, with no water necessary for module washing and water use only for sanitary purposes;
- A leach field and septic system located adjacent to the M&M facility to support the domestic sanitary needs of employees and visitors during operation;
- Four temporary construction staging areas of approximately 10 acres each that would accommodate temporary construction offices, parking, material laydown, and storage area; and
- Perimeter fencing consisting of six-foot-high chain link with three strands of barbed wire on top and small openings approximately every 100 yards to allow for kit fox passage.

The solar arrays have no moving parts for sunlight tracking and utilize no water during project operation. The proposed project is near existing electrical transmission lines.

## 1.3 Responsible Parties

TABLE 1. RESPONSIBLE PARTIES. Applicant, biological consultant, EIR consultant, and lead agency are provided.

| Applicant | Biological Consultant |
|---|---|
| **Topaz Solar Farms LLC**<br>1111 Broadway<br>4th Floor<br>Oakland, CA 94607<br>(510) 625-7408<br>Contact: Ashley Frush | Althouse and Meade, Inc.<br>1875 Wellsona Road<br>Paso Robles, CA 93446<br>(805) 467-1041<br>Contact: Daniel E. Meade, Ph.D. |
| **EIR Consultant** | **Lead Agency** |
| Aspen Environmental Group<br>30423 Canwood Street, Suite 215<br>Agoura Hills, CA 91301<br>562-947-5259<br>Contact: Sandra Alarcon-Lopez | County of San Luis Obispo<br>Department of Planning and Building<br>976 Osos Street, Room 300<br>San Luis Obispo, CA 93408<br>(805) 781-1431<br>Contacts: Steve McMasters<br>Trevor Keith |

## 1.4 Project Study Area Overview

Land included in the PSA includes 42 parcels in private ownership (Table 2). None of the land is public. All of the parcels included in the PSA are within the Agriculture Land Use category, as designated by the County of San Luis Obispo. The total size of the PSA is approximately 9,700 acres.

TABLE 2. PARCEL DATA. For each parcel the Section, Township, and Range, Assessor's Parcel Number (APN), size (acres), and general land use are provided. All acreage calculations are approximate.

| Section Township Range | Project Option | APN | Approx. PSA Size (acres) | Land Use |
|---|---|---|---|---|
| **Section 4**<br>T. 30 S., R. 18 E. | A | 072-131-001 | 621 | Rangeland<br>Dry-farmed grain |
| **Section 5**<br>T. 30 S., R. 18 E. | A | 072-131-002 | 360 | Rangeland<br>Dry-farmed grain |
| **Section 7**<br>T. 29 S., R. 18 E. | B | 072-011-005 | 178 | Dry-farmed grain |

| Section Township Range | Project Option | APN | Approx. PSA Size (acres) | Land Use |
|---|---|---|---|---|
| **Section 8** T. 29 S., R. 18 E. | B | 072-011-006 | 323 | Dry-farmed grain<br>Rangeland |
| **Section 15** T. 29 S., R. 18 E. | A/B | 072-061-027, -039, -041, -037, -040, -038, -036 | 162 | Rangeland<br>Residential |
| **Section 16** T. 29 S., R. 18 E. | A/B | 072-051-003 | 652 | Rangeland<br>Residential |
| **Section 17** T. 29 S., R. 18 E. | B | 072-051-007, -027, -028 | 654 | Dry-farmed grain |
| **Section 18** T. 29 S., R. 18 E. | B | 072-051-027, -028 | 640 | Residential<br>Dry-farmed grain |
| **Section 19** T. 29 S., R. 18 E. | A/B | 072-051-004 | 639 | Dry-farmed grain |
| **Section 20** T. 29 S., R. 18 E. | A/B | 072-051-005 | 659 | Dry-farmed grain |
| **Section 21** T. 29 S., R. 18 E. | A/B | 072-051-008, -013, -017, -018, -019, -020, -021, -023, -024, -025, -029 | 618 | Dry-farmed grain |
| **Section 22** T. 29 S., R. 18 E. | A/B | 072-061-031, -033, -054, | 246 | Dry-farmed grain<br>Residential |
| **Section 26** T. 29 S., R. 18 E. | A | 072-101-030 | 176 | Rangeland |
| **Section 27** T. 29 S., R. 18 E. | A/B | 072-101-010, -023 | 655 | Dry-farmed grain |
| **Section 28** T. 29 S., R. 18 E. | A/B | 072-091-001 | 660 | Dry-farmed grain<br>Residential |
| **Section 29** T. 29 S., R. 18 E. | A/B | 072-301-005 | 134 | Dry-farmed grain<br>Access easement |
| **Section 32** T. 29 S., R. 18 E. | A | 072-091-005, -007, -009 | 650 | Rangeland |
| **Section 33** T. 29 S., R. 18 E. | A/B | 072-091-010 | 567 | Rangeland<br>Residential |
| **Section 34** T. 29 S., R. 18 E. | A | 072-101-031 | 518 | Rangeland |
| **Section 35** T. 29 S., R. 18 E. | A | 072-101-031 | 651 | Rangeland |
| **Totals** | | **42 Parcels** | **~9,700** | |

# 2.0 Methods

Althouse and Meade, Inc. (A&M) conducted biological resource surveys from March 2008 through July 2010 (Table 3). Daniel E. Meade, Ph.D. and LynneDee Althouse, M.S. are the Principal Scientists for biological resource surveys within the PSA. Staff biologists Jason Dart, Meg Perry, Audrey Weichert and Cassie Murphy conducted wildlife and botanical surveys. Independent biologist Peter Gaede assisted with burrowing owl surveys. Russ Stack and Kerri Johnson conducted mapping field work and produced GIS based maps. Survey dates listed in Table 3 do not include protocol and other specialized surveys conducted for San Joaquin kit fox, blunt-nosed leopard lizard (BNLL), Nelson's antelope squirrel (NEAS), giant kangaroo rat (GIKR), small mammal trapping, golden eagle, Kern primrose sphinx moth, and fairy shrimp.

Protocol surveys for blunt-nosed leopard lizard, Nelson's antelope squirrel, and small mammal trapping surveys were conducted by William Vanherweg in 2008. In 2009, Paul Collins and Tom Olson conducted small mammal trapping surveys, and Alex Brown was the lead for BNLL and NEAS surveys. In 2010, Paul Collins, Tom Olson, and Larry Hunt conducted small mammal trapping surveys, and Alex Brown was the lead for the BNLL surveys. Also in 2010, Collins and Olson conducted a kangaroo rat burrow and scat measurement study to determine species identification at known precincts within the PSA. Assisting biologists for protocol surveys are listed in the original protocol reports, and specific protocol survey methods are discussed in detail (refer to Biological Report Technical Appendix, volumes 1 through 3). Survey methods for botanical and non-protocol wildlife surveys, as well as an overview of protocol survey methods, are included in Sections 6.1 and 7.2.

Biological surveys were conducted on foot, by 4-wheel drive vehicle, and by ATV in order to compile species lists, to search for special status plants and animals, to map habitats and drainages, and to photograph the PSA. The PSA is composed of one-mile square legal land Sections, and portions thereof, which were used to grid the site and guide surveying to ensure adequate coverage. All areas of the PSA were surveyed. All plant and animal species detected within the PSA were identified and recorded (Sections 6.0 and 7.0).

Mapping efforts utilized a Trimble GeoXT global positioning system (GPS) with ArcPad 6.0.3. The embedded firmware of the GPS unit includes the Satellite-based Augmentation System (SBAS) that utilizes a system of satellites and ground stations to provide GPS signal corrections, allowing sub-meter accuracy. Maps were created using GPS data imported to ArcGIS 9.3.1, a Geographic Information System (GIS) software program. GPS data was overlaid on 2005, 2006 and 2009 aerial photographs (USDA 2006a, 2006b, 2009) of the PSA. Some map layers, such as parcel boundaries, are from the County of San Luis Obispo.

Biological resource constraints were mapped using the Trimble GPS, with point and polygon layers overlaid on high resolution aerial photographs. Sensitive wildlife constraints were mapped where found, but due to their transient nature sensitive wildlife are expected to occur in other areas. Survey efforts were not designed to document all locations of mammal den sites or nests of sensitive species that are expected to be in different locations from year to year, rather we identified presence or absence on the site

and preferred habitat type(s). Locations of sensitive wildlife species observations, as well as den and nest sites that were detected, are provided on the Biological Resource Maps in Section 13.0. Discussions of special status species are provided throughout the document (refer to Sections 4.0, 6.0, 7.0, 10.0, and 11.0).

We conducted a search of the California Natural Diversity Database (CNDDB July 3, 2010 data) and the California Native Plant Society (CNPS) On-line Inventory of Rare and Endangered Plants of California for special status species reported to occur in the twelve USGS quadrangles that include and surround the PSA: La Panza NE, California Valley, La Panza, La Panza Ranch, Holland Canyon, Packwood Creek, Shale Point, Las Yeguas Ranch, Simmler, Chimineas Ranch, Branch Mountain, and Los Machos Hills.

Additional special status species research consisted of reviewing previous biological reports for the area and searching on-line museum and herbarium specimen records for locality data within San Luis Obispo County. We reviewed online databases of specimen records maintained by the Museum of Vertebrate Zoology (MVZ) at the University of California, Berkeley, and the Consortium of California Herbaria. Additional special status species with potential to occur on or near the PSA were added to our special status species list (refer to Table 4 and Table 5). We also contacted the U.S. Fish and Wildlife Service regarding rare species known in the area. They referred us to the Bureau of Land Management, who provided us with lists of plants and animals of the Carrizo Plain National Monument.

Special status species lists produced by database and literature searches were cross-referenced with the described habitat types within the PSA to identify all potential special status species that could occur on or near the project site. Each special status species with a potential for occurrence on or near the PSA is individually discussed (refer to Sections 4.1.4 and 4.1.6).

TABLE 3. BIOLOGICAL SURVEYS. Biological survey dates, times, weather observations, and biologist(s) are provided. Not included here are the 4,846 field hours conducted for the 2008 and 2009 BNLL protocol surveys, the on-going 2010 BNLL protocol survey, or hundreds of additional field hours conducted during other specialized wildlife studies.

| Survey Date | Survey Type | Start Time Stop Time | Temp. | Wind | Weather Observations | Biologist(s) |
|---|---|---|---|---|---|---|
| 3/6/08 | Wildlife | 0925 -1530 | 60-66 °F | 0- 3 mph | Partly cloudy, cool | D. Meade<br>J. Dart |
| 3/17/08 | Botanical<br>Wildlife | 1142 – 1550 | 59-63 °F | 4 -12 mph | Sunny, cool, breezy | J. Dart |
| 3/31/08 | Botanical | 0900 – 1700 | 55-65 °F | 4 - 8 mph | Sunny, breezy, and cool | D. Meade<br>L. Althouse<br>D. Keil<br>J. Dart<br>M. Perry |
| 4/4/08 | Small Mammal | 0900 – 1600 | 65 °F | 0-5 mph | Clear | D. Meade<br>W. Vanherweg |
| 4/15/08 | Botanical<br>Nesting Bird | 0930 – 1645 | 60-65 °F | 5 -15 mph | Sunny, cool, windy | J. Dart<br>M. Perry<br>A. Woodruff<br>K. Johnson |
| 4/23/08 | Botanical<br>Habitat Mapping | 0908 – 1350 | 60-64 °F | 0-5 mph | Sunny but cool | J. Dart<br>K. Johnson |
| 4/24/08 | Wildlife | 0900 – 1200 | 70-77 °F | 0-5 mph | Clear | D. Meade |
| 5/7/08 | Botanical<br>Wildlife | 1000 – 1830 | 65-70 °F | 3-5 mph | Clear, warm, with breeze | L. Althouse<br>M. Perry<br>C. Murphy<br>K. Johnson |
| 5/16/08 | Wildlife | 0900 – 2000 | 80-100 °F | 5 -10 mph | Scattered clouds | D. Meade |
| 5/19/08 | Wildlife | 0900 – 1700 | 85-105 °F | calm | Clear | D. Meade |
| 5/20/08 | Botanical | 0900 – 1630 | 77-95 °F | 3-5 mph | Hot, breezy in p.m. | L. Althouse<br>M. Perry |
| 5/27/08 | Wildlife<br>Botanical | 1400 – 1800 | 80-86 °F | 5-10 mph | Cumulus clouds with 80% cover | D. Meade |
| 5/28/08 | Wildlife<br>Botanical | 1100 – 1800 | 74 °F | 10 mph | Scattered clouds | D. Meade |

| Survey Date | Survey Type | Start Time Stop Time | Temp. | Wind | Weather Observations | Biologist(s) |
|---|---|---|---|---|---|---|
| 5/29/08 | Wildlife | 1000 – 1830 | 77-80 °F | 5-15 mph | Scattered clouds | D. Meade |
| 6/4/08 | Botanical | 1000 – 1900 | 75-85 °F | 5 -10 mph | Clear | D. Meade<br>M. Perry |
| 6/6/08 | Remote Camera | 0900 – 1400 | 75-85 °F | 0-5 mph | Clear, warm | A. Woodruff |
| 6/10/08 | Wildlife | 1300 – 1600 | 80-90 °F | 0 -5 mph | Clear | D. Meade |
| 6/13/08 | Wildlife<br>Botanical | 1000 – 1545 | 85-98 °F | 0-5 mph | Hot and hazy. Breezy in p.m. | D. Meade<br>M. Perry |
| 6/25/08 | Remote Camera | 0830 – 1440 | 80 °F | 0-3 mph | Sunny with smoke haze | A. Woodruff |
| 10/20/08 | Winter Bird | 0830 – 1245 | 75 °F | 0-3 mph | Sunny and warm | A. Woodruff |
| 12/2/08 | Winter Bird | 0930 – 1115 | 65 °F | 0-3 mph | Sunny | A. Woodruff |
| 2/11/09 | Winter Bird | 0800 – 1230 | 34-55 °F | 0-7 mph | Light rain, very cold | J. Dart |
| 2/20/09 | Winter Bird | 1125 – 1530 | 62 °F | 0-3 mph | Sunny, calm, cool | J. Dart |
| 3/1/09 | Winter Bird | 0820 – 1100 | 60-64 °F | 0-3 mph | High clouds, calm | J. Dart |
| 3/10/09 | Botanical | 1030 – 1630 | 55-70 °F | 10-15 mph | Sunny, cold, windy | D. Meade<br>J. Dart |
| 3/19/09 | Botanical | 0955 – 1145 | 60-66 °F | 0-3 mph | Overcast, warm, calm | J. Dart<br>A. Woodruff |
| 3/27/09 | Botanical<br>Wildlife | 1020 – 1615 | 65-75 °F | 3-5 mph | Sunny, clear, warm | J. Dart<br>A. Woodruff |
| 4/2/09 | Botanical | 0940 – 1600 | 70-72 °F | 5-15 mph | Sunny and warm | J. Dart<br>A. Woodruff |
| 4/16/09 | Botanical | 0825 – 1630 | 59 °F | 0-5 mph | Overcast and cool | D. Meade<br>L. Althouse<br>J. Dart |
| 4/23/09 | Botanical | 1100 – 1515 | 70-73 °F | 7-15 mph | Sunny, warm, and windy | J. Dart<br>A. Woodruff |
| 4/28/09 | Wildlife | 0830 – 1430 | 62-68 °F | 0- 3 mph | Cloudy, cool early; sunny, warm in afternoon | M. Perry<br>A. Woodruff |

| Survey Date | Survey Type | Start Time Stop Time | Temp. | Wind | Weather Observations | Biologist(s) |
|---|---|---|---|---|---|---|
| 4/29/09 | Wildlife Botanical | 0900 – 1600 | 70-75 °F | 0-3 mph | Clear, calm | D. Meade |
| 5/14/09 | Wildlife Botanical | 0840 – 1330 | 68-86 °F | 0-7 mph | Sunny and hot | J. Dart R. Stack |
| 5/20/09 | Remote Camera | 0810 – 1530 | 64-85 °F | 5-15 mph | Clear, sunny, warm | A. Woodruff |
| 6/10/09 | Botanical | 0758 – 1510 | 58-75 °F | 3-5 mph | Cool, cloudy AM, warming in PM | J. Dart A. Woodruff |
| 7/2/09 | Remote Camera | 0845 – 1300 | 75-90 °F | 0-5 mph | Sunny, warm | A. Woodruff R. Stack |
| 7/17/09 | Remote Camera | 0800 – 1120 | 76-83 °F | 0-3 mph | Sunny, warm | A. Woodruff R. Stack |
| 7/31/09 | Remote Camera | 0820 – 1055 | 90 °F | 0-3 mph | Sunny, warm to hot, on clouds | A. Woodruff |
| 11/9/09 | Wildlife Winter Bird | 1156 – 1539 | 74-72 °F | 0-3 mph | High clouds, warm, calm winds | J. Dart |
| 11/10/09 | Wildlife Winter Bird | 1008 – 1247 | 70 °F | 0-3 mph | High clouds | J. Dart |
| 12/3/09 | Wildlife Winter Bird | 0902 – 1500 | 52-70 °F | 0-3 mph | Cool, sunny | D. Meade C. Murphy |
| 1/8/10 | Wildlife Winter Bird | 1015 – 1530 | 66 °F | 0-5 mph | Few high clouds | J. Dart A. Weichert |
| 1/15/10 | Wildlife Winter Bird | 1830 – 1408 | 38-64 °F | 0-5 mph | High clouds, cool, warm in P.M. | J. Dart A. Weichert |
| 2/2/10 | Wildlife Winter Bird | 0848 – 1449 | 48-54 °F | 0-3 mph | Overcast, calm, cool | J. Dart R. Stack |
| 2/4/10 | Wildlife Winter Bird | 0701 – 1500 | 38-50 °F | 0-3 mph | Low morning fog, cold, high clouds | J. Dart A. Weichert |
| 2/11/10 | Winter Bird | 0905 – 1645 | 46-54 °F | 3-8 mph | High clouds | D. Meade J. Dart A. Weichert |
| 2/16/10 | Winter Bird | 0830 – 1600 | 58-65 °F | 0-3 mph | Very foggy morning, cleared at 9am, sunny, warm | J. Dart C. Murphy M. Perry A. Weichert |

| Survey Date | Survey Type | Start Time Stop Time | Temp. | Wind | Weather Observations | Biologist(s) |
|---|---|---|---|---|---|---|
| 2/18/10 | Winter Bird | 0815 – 1600 | 50-60 °F | 0-10 mph | Sunny a.m., high clouds p.m. | D. Meade<br>J. Dart<br>C. Murphy<br>M. Perry<br>A. Weichert |
| 2/22/10 | Winter Bird | 0835 – 1515 | 45-55 °F | 7-10 mph | Overcast and cold in a.m. | D. Meade<br>J. Dart<br>C. Murphy<br>M. Perry<br>A. Weichert |
| 2/25/10 | Wildlife<br>Winter Bird | 0800 – 1600 | 50-69 °F | 4-12 mph | Overcast in a.m., clearing for afternoon | J. Dart |
| 3/1/10 | Remote Camera | 1045 – 1650 | 66-48 °F | 5-10 mph | Partly cloudy | J. Dart<br>A. Woodruff |
| 3/4/10 | Wildlife<br>Botanical | 0845 – 1600 | 50 – 55 °F | 5-10 mph | clouds | D. Meade |
| 3/5/10 | Wildlife | 0915 – 1500 | 60-65 °F | 0-3 mph | Mostly cloudy | D. Meade<br>P. Collins |
| 3/11/10 | Botanical | 1128 – 1624 | 55-63 °F | 3-7 mph | Sunny, clear, breezy | L. Althouse<br>J. Dart<br>M. Perry |
| 3/12/10 | Botanical | 0833 – 1645 | 50-60 °F | 0-3 mph | Sunny, clear, cool | L. Althouse<br>J. Dart |
| 3/15/10 | Botanical | 0940 - 1745 | 58-70 °F | 0-5 mph | Sunny, clear, warm | D. Keil<br>L. Althouse<br>D. Meade<br>J. Dart<br>M. Perry<br>A. Weichert |
| 3/18/10 | Botanical | 0829 – 1532 | 54-70 °F | 0-5 mph | Sunny, warm | J. Dart<br>M. Perry<br>A. Weichert |
| 3/19/10 | Botanical | 0909 – 1440 | 54-60 °F | 3-5 mph | Sunny, clear, warm | J. Dart<br>M. Perry |

| Survey Date | Survey Type | Start Time Stop Time | Temp. | Wind | Weather Observations | Biologist(s) |
|---|---|---|---|---|---|---|
| 3/22/10 | Botanical | 0845 – 1700 | 76 °F | 0-5 mph | Sunny, clear, few clouds | D. Keil<br>L. Althouse<br>J. Dart<br>A. Weichert |
| 3/25/10 | Botanical | 0915 – 1745 | 49 °F | 3-7 mph | Low a.m. fog, cold, calm | D. Meade<br>J. Dart<br>M. Perry<br>A. Weichert |
| 3/26/10 | Botanical | 1000 – 1630 | 50-60 °F | 6-12 mph | Few clouds | D. Meade |
| 3/29/10 | Wildlife<br>Sphinx Moth<br>Botanical | 0900 - 1700 | 55-65 °F | 0-10 mph | Sunny | D. Meade |
| 4/2/10 | Botanical | 0928 – 1650 | 54-60 °F | 0-5 mph | Sunny, cool | J. Dart |
| 4/6/10 | Botanical | 1144 – 1530 | 40 °F | 10-15 mph | Partly cloudy, cold, windy | J. Dart |
| 4/8/2010 | Botanical | 0915 – 1630 | 60-75 °F | 0-5 mph | Breezy, clear | D. Keil<br>L. Althouse<br>M. Perry |
| 4/15/10 | Botanical | 0900 – 1630 | 55-67 °F | 3-7 mph | Sunny | J. Dart<br>M. Perry<br>A. Weichert |
| 4/16/10 | Botanical | 0840 – 1630 | 55-70 °F | 0-7 mph | Few high clouds, breezy | J. Dart<br>M. Perry |
| 4/23/10 | Botanical | 0830 – 1710 | 49-62 °F | 0-7 mph | Overcast and cold in a.m.; sunny and breezy in p.m. | J. Dart<br>M. Perry<br>A. Weichert |
| 4/26/10 | Botanical | 0830 – 1700 | 59-67 °F | 0-5 mph | Sunny and clear | J. Dart<br>M. Perry<br>A. Weichert |
| 4/27/10 | Botanical | 0820 – 1620 | 58 °F | 0-5 mph | Overcast morning | D. Keil<br>J. Dart<br>M. Perry |
| 5/4/10 | Wildlife<br>Botanical | 0800 – 1111 | 58-70 °F | 0-3 mph | Sunny, hot, and calm | J. Dart |

| Survey Date | Survey Type | Start Time Stop Time | Temp. | Wind | Weather Observations | Biologist(s) |
|---|---|---|---|---|---|---|
| 5/5/10 | Remote Camera | 0815 – 1345 | 64-80 °F | 0-3 mph | Sunny and warm | A. Weichert |
| 5/11/10 | Pronghorn/Elk | 1045 – 1810 | 60-62 °F | 3-9 mph | Sunny | D. Meade |
| 5/14/10 | GIKR Training | 0900 – 1200 | 75 °F | 0-5 mph | Sunny | J. Dart<br>P. Collins |
| 5/24/10 | Botanical | Botanical | 0900-1700 | 70-85 °F | 0-5 mph | M. Perry<br>A. Weichert |
| 5/25/10 | Botanical<br>Wildlife | 0840 – 1545 | 58-74°F | 4-7 mph | Sunny, cool, breezy | J. Dart<br>M. Perry<br>A. Weichert |
| 5/28/10 | Botanical<br>Wildlife | 0906 – 1540 | 57-65 °F | 3-7 mph | Partly cloudy, cool, breezy | J. Dart<br>A. Weichert |
| 6/2/10 | Burrowing Owl | 0920 – 1600 | 60-79 °F | 0-3 mph | Sunny | J. Dart<br>P. Gaede |
| 6/2/10 | Remote Camera | 0815 – 1238 | 67-78 °F | 0-3 mph | Sunny | A. Weichert |
| 6/3/10 | Burrowing Owl | 0715 – 1430 | 85 °F | 0-3 mph | Sunny and hot | J. Dart<br>P. Gaede |
| 6/11/10 | Botanical<br>Wildlife | 0658 – 1430 | 58-78°F | 0-3 mph | Sunny, calm, clear | D. Meade<br>J. Dart<br>M. Perry<br>A. Weichert |
| 6/15/10 | Botanical<br>Wildlife | 0718 – 1156 | 62-80 °F | 0-3 mph | Sunny and warm | J. Dart<br>M. Perry<br>A. Weichert |
| 6/18/10 | Kangaroo Rat Burrow and Scat Measurements | 0830 – 1530 | 64-78 °F | 4-7 mph | Sunny and warm | P. Collins<br>T. Olson<br>J. Dart |
| 6/21/10 | Botanical | 0930-1400 | 65-80 °F | 0-5 mph | Sunny and warm | M. Perry |
| 6/28/10 | Botanical<br>Pronghorn/Elk | 1115-1435 | 90 °F | 0-3 mph | Sunny and hot | J. Dart |
| 6/28/10 | Botanical | 1200-1700 | 90 °F | 0-5 mph | Sunny and hot | M. Perry |
| 6/29/10 | Botanical | 0900-1615 | 65-90 °F | 0-5 mph | Sunny and hot | M. Perry |

| Survey Date | Survey Type | Start Time Stop Time | Temp. | Wind | Weather Observations | Biologist(s) |
|---|---|---|---|---|---|---|
| 6/30/10 | Botanical | 0700 -1030 | 65-85 °F | 0-3 mph | Sunny and warm | J. Dart<br>M. Perry |
| 7/5/10 | Botanical | 0800-1330 | 65-90 °F | 0-5 mph | Sunny and hot | J. Dart<br>M. Perry<br>D. Keil |
| 7/8/10 | Remote Camera Pronghorn/Elk | 0835 - 0420 | 68-80 °F | 0-3 mph | Sunny, clear, warm | A. Weichert |
| 7/26/10 | Botanical | 0800-1200 | 65-80 °F | 0-5 mph | Sunny, warm, with mild breezes | M. Perry |

# 3.0 Topaz Solar Farm Project Study Area

## 3.1 Existing Conditions

The PSA is generally characterized by tree-less level terrain and low rolling hills and plain with ephemeral swales. Some steeper slopes occur in the north and northeast portions of the site. The PSA is primarily used for agricultural production of grain, and as rangeland for cattle. The entire site has been disturbed by dry-land farming and by ranching activities.

Farming practices consist of a summer fallow rotational program where fields are farmed for one year then plowed bare the next year to conserve soil moisture. Farming operations are conducted on a large scale utilizing 400 to 500 horsepower all-wheel drive tractors pulling 50 foot wide implements. Plowing is usually accomplished using a chisel plow that runs from 24 to 12 inches in depth depending upon soil moisture and condition. The typical two year cycle farming regime consists of plowing ground in the fall or winter after first rains. The fields are plowed again just prior to sowing, sometimes in the same operation. Crops are often sprayed (as they were in 2010) with selective herbicides that can include dicoticides and oaticides. A harvesting machine (combine) cuts the fields and harvests the grain in late spring or summer depending on the year, and cattle are turned into the field to graze into the fall. The cut field is plowed again in fall after rains. This cropland is then plowed again during the spring to remove vegetation that grows during the winter, and is left fallow over the summer. In some years two plowing passes, one in winter and one in late spring are necessary to remove vegetation. The purpose of this every-other year summer fallow method is to preserve two years of soil moisture for every one year of crop produced. In the fall, the fallow land is plowed after the first rains, starting the cycle again.

At any one time approximately half of the land is plowed bare and half is planted to grain. Areas that are left fallow for several years or more support naturally recruited annual grasslands. The primary crops grown on the PSA are wheat and barley. These grains are dry-farmed crops sown in the fall or winter and harvested for grain or used as cattle feed. Broad-leaf herbicides are sprayed on the crops by crop duster or ground spray rigs to control non-crop plants. Agricultural fields are described as cropland habitat in this report (refer to Section 5.0).

Fields that are plowed in the spring or fall and left unplanted through the following spring and summer tend to grow agrestal weeds. Some of these plants are native to the area, but most are naturalized (non-native, naturally recruiting) annual herbs and grasses. Early in the spring, vegetation is short, which allows establishment of ground squirrel den complexes and easy foraging by predators and grazing ungulates. If rainfall totals are average or above, as was the case in 2007-2008 and 2009-2010, fields left fallow more than one season become densely vegetated with annual grasses and forbs that can reach three feet in height. Tall dense vegetation limits use of these areas by some wildlife. With less than average rainfall, as in the winter of 2008-2009, vegetation in fallow fields and annual grasslands is typically less than two feet in height.

From mid spring into summer the plowed ground typically hosts an abundant growth of bindweed, an introduced perennial herb with a deep persistent taproot that sprouts green

leafy growth year after year. Bindweed provides summer forage for pronghorn antelope and tule elk, and the cropland fields in Sections 7, 8, 17 and 18 are considered by the California Department of Fish and Game (CDFG) to be important summer habitat areas for these species. Pronghorn antelope and tule elk commonly feed and rest in these fields (refer to BR Maps 3 and 4 in Section 13.0). Common reptiles, small mammals, and birds may forage in plowed fields, but the lack of cover increases the likelihood of predation and reduces food supply.

Several areas of the PSA were removed from farming rotation in the 1980's when the landowners voluntarily entered portions of their land into the Conservation Reserve Program (CRP). The CRP is a federal program administered by the U.S. Department of Agriculture Farm Service Agency, which provides landowners with annual rental payments, cost-sharing assistance, and technical assistance to remove land from annual tilling practices in order to minimize water run-off and sedimentation, and increase wildlife habitat value. CRP contracts are signed for periods of 10 to 15 years. The Natural Resources Conservation Service (NRCS) provides landowners with technical assistance regarding conservation planning and practice implementation.

Lands within the PSA that are in the CRP are managed as rangeland for watershed protection. Rangelands are described in this report as annual grasslands since species composition is similar to typical annual grassland habitats in the region. Annual grassland habitats within the PSA are variable with respect to dominant species due to different topography, soils, grazing regimes, and farming history.

Anthropogenic areas of the PSA are associated with residential compounds and other facilities. All roads are dirt ranch roads, with the exception of gravel-based access roads from Highway 58 to Sections 4, 27, 29, and 35.

## 3.2 Land Use Descriptions

Lands within the PSA are divided on USGS maps (refer to Figure 1 in Section 12.0), and often on the ground, into one mile square Sections (640 acres). The Public Land Survey System used by the United States to survey and identify land parcels utilizes one-mile square Sections as the base unit of measure, with 36 Sections equaling a Township. Sections are typically halved and quartered to identify further a parcel, with a quarter quarter Section equaling 40 acres as the smallest unit of measure.

The PSA is fenced and cross-fenced for cattle. Fence lines are not always on parcel boundaries, but are usually close. Land use descriptions provided below are based on Althouse and Meade, Inc. field observations in 2008, 2009 and 2010. In addition, we obtained information on farming history from landowners and ranch managers (refer to Figure 5, Section 12.0). Descriptions of these features are organized by the USGS land Section(s) within which they occur, and the proposed TSF Project Option that encompasses the Section is also designated. Each full Section is legally 640 acres. Actual acreage on the ground within fenced areas may vary. Where portions of Sections are included in the PSA, acreages were estimated using GIS software and high resolution aerial images. All acreages are approximate.

All of the Sections are in Township 29 South, Range 18 East, except Sections 4 and 5, which are in Township 30 South, Range 18 East. Representative photographs of each land Section are provided in Photo Collection #1, Section 14.0.

Wetland areas described as "potential wetlands" are subject to verification of the jurisdictional determination by the U.S. Army Corps of Engineers (USACE).

*Section 7 - 178 acres, Option B*

Approximately 178 acres of the southern portion of Section 7 are included in the PSA. All of the land is plowed seasonally, and planted with grain every other year. In spring 2010 this area of the PSA was planted with barley, and reached a height of nearly three feet in April. At that time the cropland had few other plant associates. Within the cropland *Polygonum arenastrum* was the most prevalent non-crop species, but was generally uncommon. Along fences and roads was a more diverse palate of species, some native to the region and some introduced, such as *Amsinckia* ssp., *Lepidium nitidum, Lepidium dictyotum, Erodium cicutarium, Plagiobothrys canescens, Chenopodium album, Monolepis nuttalliana,* and others.

Section 7 is poor wildlife habitat in general, but is frequented by elk and pronghorn in the spring and summer when preferred forage species are present, and occasionally in the fall months (refer to BR Maps 3 and 4, Section 13.0). In winter, when the ground is plowed bare, golden eagles and ferruginous hawks occasionally hunt ground squirrels in the fields.

*Section 8 - 323 acres, Option B*

Annual grassland and cropland habitat types on rolling terrain characterize the majority of Section 8. The dry-farmed grain fields in Section 7 continue into the west and southern portions of Section 8. A barbed-wire fence separates the cropland (213 acres) and annual grassland (110 acres) habitats. In 1986, portions of Section 8 croplands were put into the Conservation Reserve Program. The 110 acres of annual grassland habitat that is presently within the PSA has not been farmed since 1986. The grassland is variable in composition, generally dominated by *Avena fatua* and *Bromus madritensis* ssp. *rubens* to two feet in height, with large patches of fiddleneck, scattered wildflowers and other herbs. Notably abundant in 2008 were *Dichelostemma capitatum* bulbs, a native lily that is very uncommon in tilled lands.

Cropland areas of Section 8 were similar to those in Section 7 (see description above). Fence lines bordering the annual grassland habitat were generally more diverse than fences bordered only by cropland. Documented along the cropland-grassland fence in spring 2010 were *Amsinckia* ssp., *Calandrinia ciliata, Lasthenia gracilis, Lasthenia minor, Hordeum murinum, Phacelia ciliata, Erodium cicutarium, Lupinus bicolor,* and others.

Pronghorn and tule elk frequent Section 8 during the spring and summer. These large ungulates forage in croplands and grasslands. A badger den complex was observed to be occupied in 2009 and 2010 in a grassland area where California ground squirrels were common. Kit fox scat was detected in two locations at the southeast corner of the Section (Smith 2010). Hills at the northeast corner of the PSA support a sparse cover of short

grasses, which is a preferred habitat condition for reptiles such as the side-blotched lizard.

*Section 15 - 162 acres, Option A and B*

The southwest quarter of Section 15 is included in the PSA. It is mapped as annual grassland habitat. One ephemeral wetland depression is also present. The southwest quarter of Section 15 was periodically grazed by cattle during our surveys from 2008-2010, but has been grazed hard for many years, as evidenced by the short vegetation condition and depauperate flora. Bare ground was estimated to be less than ten percent in March 2010, with dominant cover of *Vulpia* ssp., *Bromus madritensis* ssp. *rubens*, and *Erodium cicutarium*. *Amsinckia* ssp., were present in large patches, to 24 inches in height. Native wildflower diversity was very low.

The short grass condition of Section 15 and lack of recent tilling makes this area good wildlife habitat for certain species. Rattlesnakes, which were observed infrequently across the majority of the PSA, were observed on several occasions in Section 15. Fresh and non-fresh kit fox scats were detected along the west fence (Smith 2010).

*Section 16 - 652 acres, Options A and B*

Most of Section 16 is mapped as annual grassland habitat (648.5 acres). Four shallow ephemeral depressions (0.41 acre total) and an anthropogenic area are also distinguished in mapping. The three acres of anthropogenic habitat includes areas associated with the existing residence.

Section 16 was last tilled in 2005, and as of spring 2010 has largely reverted back to annual grassland habitat. In some areas plow lines are still evident. Bare ground was estimated in 2010 to be five to ten percent by area. Dominant vegetation throughout the section consists of *Avena fatua*, *Bromus madritensis* ssp. *rubens*, *Hordeum murinum*, *Erodium cicutarium*, and *Amsinckia* ssp. Grass in the north half of Section 16 is generally taller, with large swaths of oats reaching three feet in height in 2008. In 2009, a drier year, the maximum grass height was about 18 inches. In 2010, grass height again reached three feet at the north end where it was dominated by *Avena fatua*, and averaged about one foot in height in the south half where it was dominated by *Bromus madritensis* ssp. *rubens*. At the northeast corner of the section are sparsely vegetated hills. Soils on these hills are thin, light-colored clay loams, possibly of gypseous origin, over weathered bedrock. These soils are susceptible to significant compaction when wet, as evidenced by dried, deep hoof-prints left from cattle grazing the site while soils were still wet.

Drainage swales in Section 16 dissipate in farm fields to the south. The swales do not contain wetland vegetation. Ephemeral depressions occur near the southern boundary fence. These depressions consist of small, mostly barren areas surrounded by annual grassland. The depressions are potential wetlands, as they contain hydrophytic plants including *Psilocarphus oregonus*, *Epilobium pygmaeum*, and *Veronica peregrina*. Two of the pools were determined to contain *Branchinecta lindahli*, a common fairy shrimp

species. In wet years, the pools are suitable for breeding spadefoot toads, although no tadpoles were detected in these pools during our surveys from 2008-2010.

Side-blotched lizards are present on and near the hills in the north, but are uncommon. Grasslands in portions of Section 16 are suitable for San Joaquin kit fox. One kit fox was photographed by remote camera traversing the grassland by cattle trail in spring 2009. Fresh and non-fresh kit fox scats were detected in the northwest corner and along the east fence (Smith 2010). An active badger den was present in the northwest corner in March 2010. A nesting pair of burrowing owls was detected in the northwest corner of the section in 2008. Ferruginous hawk, prairie falcon, tri-colored blackbird, and merlin are special status wintering birds that were observed occasionally foraging in Section 16 during late winter months.

*Section 17 - 654 acres, Option B*

Section 17 is an agricultural parcel that is bisected by an east-west oriented dirt road and parallel barbed-wire fence. The south half of the section was plowed to bare ground in the late winter of 2008 and was not sown. The north half was planted with grain in the winter, and was densely covered by a two to three foot high grain crop in the spring of 2008. The rotational farming practice leaves a farmed parcel fallow (usually plowed bare to promote moisture retention in the soil), for one season after being farmed. Other vegetation within the planted barley fields is typically minimal, consisting of occasional agrestal weeds like *Polygonum arenastrum* and *Descurainia sophia*. Fence lines and roads contain a variety of native and introduced species. Commonly present are *Plagiobothrys canescens, Lepidium dictyotum, Lepidium nitidum,* several *Amsinckia* species, *Capsella bursa-pastoris, Hirschfeldia incana, Calandrinia ciliata, Phacelia ciliata, Vulpia microstachys, Vulpia myuros, Hordeum murinum, Bromus diandrus, Bromus madritensis* ssp. *rubens*, and others.

Ephemeral drainages in Section 17 dissipate and the water infiltrates into farmed fields. An ephemeral depression occurs in the north half of the section. The depression has been farmed consistently for many decades, does not contain hydrophytic vegetation, and does not hold water long enough to support fairy shrimp or breeding amphibians.

Croplands are used seasonally by elk and pronghorn, particularly when the fallow lands are plowed and bindweed is prevalent as forage. Rodent populations are low in the croplands, except for California ground squirrels, which quickly colonize plowed fields. No kit fox scat was detected in Section 17 (Smith 2010). A badger was observed at a den site within a squirrel colony in Section 17 in February 2010.

*Section 18 - 640 acres, Option B*

Section 18 is cropland kept on a rotational farming system where barley is planted one year and the following year the land is fallow and plowed bare to maintain soil moisture. When bare, the fields become sparsely vegetated with *Salsola tragus* and *Convolvulus arvensis*, with a few other agrestal weeds. Cattle are grazed on the stubble of harvested grain. Roads and fence lines contain a variety of native and non-native grass and forb species, similar to Section 17 (see discussion above). This Section is located along the west edge of the PSA at Bitterwater Road, and is relatively flat terrain.

The largest ephemeral drainage within the PSA passes from north to south near the western boundary of the Section. The channel carries water from three tributary channels that begin in hills northeast of the PSA. This drainage ultimately connects to Soda Lake. Alignment of the drainage feature varies somewhat from the alignment shown on the USGS topographic map, probably due to years of farming. The main channel briefly splits into two shallow channels, which then converge into one channel near grain silos at the southwest corner of Section 18.

At the center of the southern boundary of Section 18 is a single residence, accessed from Bitterwater Road by a gravel driveway. Old grain silos and farm equipment are located in the southwest corner of the Section at Bitterwater Road.

As with other cropland parcels, elk and pronghorn frequent Section 18 seasonally. These ungulates are attracted by the summer forage, and probably by the cattle water troughs. We have observed badgers on occasion, but kit fox has not been detected in Section 18. Ferruginous hawks and other raptors hunt in the croplands when the ground is bare. Western spadefoot toads laid eggs in pools on the east side of the residence in 2010, and aestivate in the vicinity through the dry season (refer to spadefoot toad discussion in Section 7.3).

*Section 19 - 639 acres, Options A and B*

Section 19 is an agricultural parcel divided into north and south halves by a dirt ranch road lined with a barbed wire fence. Bitterwater Road forms the western parcel boundary. In 2009, the north half of Section 19 was planted with grain and the south half was plowed and left bare. In 2010, the south half was planted with barley and the north half was plowed bare. An ephemeral drainage (described above in Section 18) passes through Section 19 and connects to Soda Lake. Non-crop vegetation consists of a low diversity and abundance of agrestal weeds. Like other cropland parcels, roads and fence lines support a variety of annual species, including *Hordeum murinum*, *Eschscholzia californica*, *Lepidium* ssp., *Amsinckia* ssp., *Plagiobothrys canescens*, *Schismus arabicus*, *Vulpia myuros*, and others.

Along the west boundary fence at Bitterwater Road is a vernal pool, situated just south of the east-west dirt road bisecting the Section. The pool held water in 2010 sufficient to support hydrophytic plant species. Dominant vegetation described in the pool in April 2010 consisted of *Psilocarphus oregonus, Psilocarphus brevissimus, Veronica peregrina*, *Plagiobothrys leptocladus, Plagiobothrys acanthocarpus, Crassula aquatica*, and *Lolium multiflorum*.

Section 19 is generally characterized as poor wildlife habitat due to the intensive and long-term farming operation. However, the east-west dividing fence line was found to be occupied by Heermann's kangaroo rats (*Dipodomys heermannii swarthi*), a common species, and other small mammals (Collins 2009). A badger den was also detected along the fence line in 2009. A few kit fox scats were detected along the south and west fence lines (Smith 2010). Pronghorn and elk were not observed in Section 19.

*Section 20 - 659 acres, Options A and B*

Section 20 is bisected by an east to west road that divides approximately equal north and south halves. All of Section 20 is cropland habitat farmed on a rotational system. In the

spring of 2008 and 2010 the south half was actively dry-farmed and the north half was plowed and left bare to rest for a season. In 2009 the south half was plowed bare and the north half was planted. This Section is located on mostly level terrain. Two shallow ephemeral drainages enter from the north and northeast and dissipate into plowed ground. During very large storm events water may sheet flow across the lower half of Section 20 to connect with the ephemeral drainage on Section 29. A large vernal pool and several non-wetland ephemeral depressions were mapped in the southern half of the Section in 2010. These features were not visible during the below average rainfall seasons of 2008 and 2009 due to seasonal plowing and lack of inundation. The vernal pool, although plowed earlier in the season, contained constituent vernal pool plants such as *Myosurus minimus, Plagiobothrys leptocladus*, *Psilocarphus oregonus*, and *Juncus bufonius*. *Branchinecta longiantenna*, a federally listed endangered species of fairy shrimp, was positively detected in two ephemeral pools in Section 20, and two additional pools were mapped as potential habitat (BR Map 10 in Section 13.0).

An old abandoned reservoir created by above-ground earthen berms is located in the north half of the Section. The reservoir filled in 2010, and was a breeding site for Western spadefoot toads, a California Species of Special Concern.

*Section 21 - 618 acres, Options A and B*

The PSA includes 618 acres of Section 21, approximately 578 of which are in various stages of agricultural production. Most of the croplands were fallow for 2010 and were not plowed. Fallow lands were dominated by *Hirschfeldia incana* and *Descurainia sophia*, with very few native wildflowers. Dried barley stalks were visible, which indicates the land was not grazed after the last crop was harvested the previous year. One 40 acre parcel has not been plowed or planted in several years and is described as annual grassland habitat instead of cropland. The grassland had a very low diversity of plant species, and was dominated by *Bromus madritensis* ssp. *rubens*, an introduced annual grass. *Amsinckia* ssp. and and *Descurainia sophia* were noted to be abundant in spring 2010. Freshly dug badger dens were located in the grassland area in early 2010. Pronghorn may occasionally forage in this Section, but elk have not been found foraging in the middle areas of the PSA.

A privately owned residence on 40 acres that is not part of the PSA lies within the middle of Section 21. The southern border of the Section is separated from Section 28 by a dirt ranch road and barbed wire fence. Two PG&E power lines pass along this border in an east-west orientation. A dispersive ephemeral drainage with two primary tributary stems originating in hills to the northeast bisects the Section from north to south.

*Section 22 - 246 acres, Options A and B*

The PSA includes approximately 240 acres of Section 22, including approximately 40 acres of annual grasslands and 206 acres of croplands. Much of the croplands were left as bare plowed ground in 2008, planted to grain in 2009, and were again left bare in 2010. Ephemeral drainages pass through the west and east sides of the Section in a southwesterly direction. Drainages that pass through Section 22 are dispersed in fields immediately to the south, north of Highway 58.

*Section 26 - 176 acres, Option A*

The 176-acre portion of Section 26 within the PSA is mapped entirely as annual grassland habitat. It is an irregularly shaped area not consistent with existing fence lines. This parcel was added to the PSA in late 2009. In spring 2010, it was characterized as sparsely vegetated annual grassland four to six inches in height with shale gravels and cobbles on the surface. Plow lines were visible, despite last farming estimated to be in the mid to early 1980's. Bare ground was estimated at 15 to 30 percent by area in 2010, with dominant vegetation consisting of *Erodium cicutarium*, *Bromus madritensis* ssp. *rubens*, *Vulpia microstachys*, and *Vulpia myuros*. Native wildflowers were common, including large patches of *Lupinus bicolor* and *Amsinckia* ssp., as well as scattered *Stebbinsoseris heterocarpa*, *Lupinus microcarpus*, and *Castilleja exserta*. One dispersive ephemeral drainage passes through the area.

Wildlife was observed uncommonly in Section 26 during the spring 2010 season. An adult male pronghorn was seen occasionally on and near the Section in March. A San Joaquin kit fox latrine was active in April 2010 at the southeast fence corner, and fresh kit fox tracks were occasionally observed along the road between Sections 26 and 35 in March and April. Raptors and badgers likely hunt ground squirrels on occasion in this area.

*Section 27 - 655 acres, Options A and B*

All 655 acres of Section 27 are included in the PSA. Portions of this Section were previously developed as a solar project, however no facility remains except for a chain link fence and an abandoned building. Section 27 is dry farmed except for a small area around the existing building, based roads and in a substation easement area at the northern property boundary. The existing building is abandoned, and is currently occupied by barn owls and pigeons. Cattle were regularly kept in this Section during 2009, with watering stations located in the southwest corner. In April 2010 the entire cropland area was plowed for summer fallow.

Ground squirrels are abundant in the croplands, and several older coyote dens were identified during our surveys. One wintering burrowing owl was observed in a ground squirrel den complex in February 2008. Abundant San Joaquin kit fox scat was detected in Section 27, primarily on the diagonal dirt road accessing Section 34 from Section 21, but also along the south and west fence lines. A dead kit fox was found at the southeast corner of the chain link fence within this Section in March 2010.

*Section 28 - 660 acres, Options A and B*

Section 28 is a historically agricultural parcel that has been fallow since at least 2006. The fallow agricultural lands have reverted to annual grassland habitat with a generally poor diversity of native herbs and a predominance of introduced annual grasses. Vegetation varies across the site likely due to a history of farming certain plots at different times. The southwest quarter of the Section was dominated in April 2010 by a 24 to 36 inch tall crop of *Vicia villosa* ssp. *varia*, *Amsinckia* ssp., and *Descurainia sophia*, while the northwest and northeast quarters were dominated by *Bromus madritensis* ssp. *rubens*, *Hordeum murinum*, and *Vulpia myuros* with patches of

*Plagiobothrys canescens and Erodium cicutarium*. The southeast quarter was dominated by *Vulpia myuros, Hordeum murinum*, and *Amsinckia* ssp.

An abandoned ranch compound is situated in the center of the Section. One residence, several outbuildings, grain silos, old farm equipment, and two above-ground reservoirs are present.

Section 28 is moderate quality habitat for wildlife. We detected signs of recent badger activity in 2010, and numerous fresh kit fox scats were collected in 2009 (Smith 2010). Two pairs of burrowing owls nested in Section 28 in 2010. Two adult female pronghorn were observed in April 2010; elk do not forage on or pass through Section 28. Pacific chorus frogs (*Pseudacris regilla*) breed in the western reservoir when water is supplemented by a newer water tank.

*Section 29 - 134 acres, Options A and B*

The 134-acre portion of Section 29 included in the PSA is primarily cropland habitat planted to dry-farmed grain during the spring of 2008, left fallow for 2009, and was plowed but not planted to grain in 2010. An old abandoned above-ground reservoir is situated near the western edge of the parcel. The reservoir was once used for the farming operation, but the plumbing is dilapidated and no longer usable. It does not hold water due to the dilapidation and rodent burrowing. An access easement to Highway 58 runs along the southeast boundary of the Section that is mapped as annual grassland habitat. This area is not farmed and is mapped as annual grassland habitat.

Two special status small mammals, McKittrick pocket mouse and Tulare grasshopper mouse, were trapped and released within the easement during small mammal trapping efforts in 2008 (Vanherweg 2008). Pronghorn may forage in the cropland occasionally, but elk do not utilize this portion of the PSA. Badger and kit fox sign was observed occasionally.

*Section 32 - 650 acres, Option A*

Section 32 is entirely an agricultural parcel on level terrain. The main ephemeral drainage within the PSA that connects to Soda Lake passes through the northeast corner of Section 32. Four vernal pools were mapped in the northwest corner of the Section which contained *Branchinecta lindahli*, a common fairy shrimp species, and constituent vernal pool plants despite being plowed seasonally. Hydrophytic vegetation identified within the pools in March 2010 consisted of *Deschampsia danthonioides, Juncus bufonius, Crassula aquatica* and *Psilocarphus oregonus*. Other vernal pool plant species could potentially occupy the site; however the pools were plowed in preparation for planting shortly after drying in April 2010, before mid-spring botanical surveys were conducted.

Ground squirrels are generally uncommon in this Section. We observed evidence of temporary occupation by kit fox and badger in 2009 and 2010, but have not identified natal dens in this area for either badger or kit fox. We expect that these species move through the area on occasion while foraging or dispersing. Wintering birds such as ferruginous hawk and long-billed curlew regularly forage in Section 32.

*Section 33 - 567 acres, Options A and B*

This agricultural parcel contains an abandoned residential ranch compound at the east end accessed by a driveway from Highway 58. This area is described as anthropogenic habitat. Several abandoned homes, sheds and farm equipment are within a fenced area. The fenced area, which apparently has not been farmed in many years, extends west of the homes to a water tank. We mapped the fenced area as annual grassland habitat based on the vegetation present in spring 2010. Dominant species in the small grassland area included *Bromus madritensis* ssp. *rubens, Vulpia* ssp., and *Erodium cicutarium* with a variety of native wildflowers such as *Lupinus* ssp., *Heterodraba unilateralis, Lasthenia gracilis, Plagiobothrys canescens, Lepidium nitidum, Layia platyglossa, Castilleja exserta* and others.

The cropland habitat in this Section was last farmed in 2008, and with nearly two years of rest a variety of wildflowers and agrestal weeds are now established. In the absence of farming we expect this Section would return to low quality annual grassland habitat by 2012. In April 2010, the vegetation was six to eight inches tall and dominated by *Avena fatua, Erodium cicutarium, Bromus madritensis* ssp. *rubens, Lotus humistratus, Trifolium gracilentum*, and *Vulpia* ssp. Wildflowers were uncommon and scattered in the south half, but were prevalent in the north half. Common native wildflowers observed were *Layia platyglossa, Eschscholzia californica, Lupinus bicolor, Amsinckia* ssp., and *Achyrachaena mollis*. A population of *California macrophylla*, a rare plant known from the region, was mapped in the south half of Section 33, and a second rare species *Layia munzii* was identified in scattered localities within the fallow cropland habitat (refer to Section 6.0 for further discussion of rare plants).

The ranch compound is planted with a variety of landscape trees and shrubs that create a vegetated refuge for migrating and nesting birds. Pronghorn commonly forage in the cropland areas of the Section, however elk do not occupy this portion of the PSA. Sign of ground squirrels, badgers, and kit foxes were uncommon.

*Section 34 - 518 acres, Option A*

Section 34 is an annual grassland habitat with approximately 20 years of recovery since last farmed. It is presently in contract with the Conservation Reserve Program, and is periodically grazed from late winter through early summer, until almost no vegetation remains. The parcel is characterized by nearly level terrain and short vegetation. Two dispersive ephemeral drainages enter the parcel from the north, draining toward Highway 58. The Carissa Plains Elementary School is located in the southwest corner of the Section, and a setback of one-third mile is proposed between the school and project components. In March 2010, vegetation was estimated at two inches in height or less, dominated by *Erodium cicutarium*. By late April the vegetation was six to ten inches in height and dominated by *Vulpia microstachys, Vulpia myuros, Bromus madritensis* ssp. *rubens,* and *Lupinus bicolor*. The 2010 above-average rainfall season produced notable wildflower patches in the southern third of Section 34, along the Highway 58 corridor, including areas up to several acres in size. The wildflower patches consisted of *Layia platyglossa, Lasthenia gracilis* and *Castilleja exserta.* Bare ground was estimated to be zero to ten percent of the surface area. Several small non-wetland ephemeral depressions were mapped in the northeast quadrant, one of which contained *Branchinecta lindahli,* a common fairy shrimp species, in 2010.

Wintering burrowing owls were observed occasionally, and signs of kit fox and badger were commonly observed. One kit fox was observed at a den in February 2010. Pronghorn are occasionally observed in Section 34, but elk do not occupy this portion of the PSA.

*Section 35 - 651 acres, Option A*

Section 35 has been under the same ownership and management as Section 34, and is therefore similar to the description above. One ephemeral drainage enters the Section from the north, but disperses into the fields before reaching Highway 58. As with Section 34, large areas of wildflowers were present along the highway corridor in spring 2010. One ephemeral depression was mapped near the eastern boundary road, which contained *Psilocarphus oregonus* and *Plagiobothrys acanthocarpus*.

*Section 4 -621 acres, Option A*

Section 4 is an agricultural parcel located at the southern end of the PSA. Two residences are located in the Section, both on approximately 40-acre parcels that are excluded from the PSA. Active croplands, in an irregularly shaped configuration, are located in the north end of the Section. The croplands are planted to barley on a rotational system. Annual grasslands were entered into the CRP program in 1984-1985, and have not been farmed since.

The annual grassland habitat, with over 25 years of recovery from agricultural use, is a high diversity grassland system with five to twenty percent bare ground, and vegetation consisting almost entirely of annual herbs and small areas of low sparse shrub development. The dominant herbs are *Vulpia microstachys, Erodium cicutarium, Plagiobothrys canescens, Lasthenia gracilis*, *Layia munzii* (CNPS List 1B.2), *Castilleja* ssp., *Clarkia affinis*, and *Lupinus bicolor*.

Two areas of stabilized sand deposition from north-draining ephemeral drainages are located near the southern fence line. Patches of *Heterotheca sessiliflora* are common on these sands, and comprise the only shrub development in the Section. Also common in this area are *Camissonia strigulosa, Vulpia* ssp., *Microseris douglasii*, and others.

Because the soil type in the eastern portion of Section 4 is underlain by a shallow hard pan, numerous vernal pools and ephemeral wetlands have developed (refer to Section 5.0 for detailed descriptions of these habitats). This shallow hard pan also resulted in inundation of small mammal burrows in 2010. This explains the low abundance of small mammal burrows in the east end of Section 4.

Section 4 contains a variety of habitat types, and because much of the land has not been farmed in 25 years, numerous wildlife species utilize these habitats. A concentration of kit fox sign, including tracks, dens, and scats, were detected in the south and east ends of the Section. Badger diggings were also common. Pronghorn, although occasionally present, tend to forage to the west in Section 5. Burrowing owls were observed in several locations, and a variety of other birds forage in the upland and wetland habitats.

*Section 5 - 360 acres, Option A*

The 360 acres of Section 5 that is within the PSA is comprised of active croplands and untilled annual grasslands. In 1981-1982 approximately 250 acres in the southwest corner of the Section were placed in the Conservation Reserve Program (CRP) and have not been farmed since. Much of this area is outside the PSA. Grasslands in Section 5 did not contain potential ephemeral wetlands or vernal pools. Although species composition was similar to Section 4, this Section had a lower abundance of native wildflowers in spring 2010. *Layia munzii*, a rare endemic plant, was found to be common in the grassland areas at the southwest corner of the Section and in a strip of grassland along the west boundary of the PSA.

A kit fox den along the western boundary was occupied in March 2010, and a natal den territory was identified in the southeast corner of the Section. Badgers frequent the area, and were observed at a den in the southwest corner. Pronghorn enter the Section from the south by going under a barbed wire fence at the extreme southwestern corner and frequently pass through the area to more northern parcels. Elk do not occupy this area of the PSA.

## 3.3 Soils

The United States Department of Agriculture (USDA) Soil Survey of San Luis Obispo County, California, Carrizo Plain Area (2003) delineates eleven soil map units within the PSA: Capay clay, 0 to 2 percent slopes (109); Capay clay, 2 to 9 percent slopes (110); Seaback-Panoza-Jenks complex, 9 to 15 percent slopes (280), and 15 to 30 percent slopes (281); Yeguas-Pinspring complex, 0 to 2 percent slopes (310); Yeguas-Pinspring complex, 2 to 5 percent slopes (311); Thornhill loam, 2 to 5 percent slopes (321); Jenks clay loam, 2 to 9 percent slopes (330); Bellyspring-Panoza complex, 9 to 15 percent slopes (440); Wasioja loam, 0 to 2 percent slopes (490); and Wasioja-Pinspring-Yeguas complex, 2 to 5 percent slopes (497).

Soil map units typically encompass one or two dominant soils that cover more than 50 percent of the mapped area, and one to several soils that occur in small patches not differentiated in mapping at the 1 to 24,000 scale used for NRCS soil maps. Due to the procedures followed in making a soil survey, users of soil survey data are cautioned that not all areas included within a soil survey are closely sampled using soil pits and site descriptions, and a specific site may not have been sampled at all. Therefore, care must be taken in drawing conclusions regarding site-specific soil resources based solely on NRCS soil survey work. Digitized spatial data from the Carrizo Plain Soil Survey are shown as an overlay of soil map units on an aerial photo of the region with the following caution from NRCS regarding maps: "Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale." (Section 13.0, Figure 3).

Soils within the PSA can be generalized into two groups: (1) deep, alluvial soils on flats, fans, terraces, and low hills; and (2), shallow soils over soft, weathered bedrock on

foothills and steeper slopes. Typical surface soil textures range from loams to clay loams in both groups, with one alluvial soil, Capay, consisting of clay throughout the profile. The deep alluvial soils of the flats and gentlest slopes have accumulated by deposition of material carried by short ephemeral channels that cut through recently uplifted foothills and mountains of the Temblor Range east of the PSA, Hubbard Hill, Freeborn Mountain, and the La Panza Range west of the PSA, and the Caliente Range south of the PSA. Where these channels reach level or nearly level ground, they lose power, drop their sediment loads, and dissipate. Over time, deep layers of alluvium accumulate. On steeper slopes and hills, soils are shallower, often with only 10 to 20 inches of soil underlain by bedrock.

Soil formation and properties are heavily influenced by the properties of the soil parent material, which is partially controlled by the geology of a site and its immediate surroundings. For instance, soils formed from marine sedimentary rocks differ in chemistry and properties from soils formed in non-marine sedimentary rock; soils formed from volcanic rock often have higher metal and micronutrient content than soils formed from sedimentary rock. Hills northeast of the PSA contribute alluvium from Pliocene-Pleistocene non-marine sedimentary rock, typically Paso Robles formation (Dibblee 1999; Jennings 1959). The Paso Robles formation consists of non-marine, coarse-grained, braided-river deposits produced from continental alluvial outwashed during the Pliocene and Pleistocene (1.7 to 5.3 MYA). Hills west and south of the PSA contribute alluvium from Miocene marine sedimentary rock, including Monterey shale formation and Vaqueros sandstone. These formations are older than the rock in hills east of the PSA. In addition, small inclusions of a Miocene basaltic (volcanic) formation occur on hills southwest of the PSA, and could influence parent material of those soils.

Our observations of soils within the PSA found that they often vary from the mapped soil unit in the USDA Soil Survey, but tend to be consistent within the same soil order (Mollisol, Alfisol, Inceptisol, or Vertisol) as the mapped soil unit.

**Capay clays (109, 110)** are typically found in the western Carrizo Plain at elevations ranging from 1,800 to 2,095 feet. Map Unit 109 comprises areas of 0 to 2 percent slopes, and Map Unit 110 comprises areas of 2 to 9 percent slopes. Both map units consist of approximately 80 percent Capay soils, with minor components comprising the remaining 20 percent. Capay clay forms in alluvium derived from mixed rock types, and typically has a profile with clay textures over 60 inches deep. Capay soils are Vertisols, which are soils high in shrinking/swelling clay minerals that cause deep vertical cracks to form in the soil during the dry season. Capay is the only Vertisol soil series shown in the PSA on USDA soil survey maps.

**Seaback-Panoza-Jenks complex (280, 281)** is typically found in the central Temblor Range at elevations ranging from 2,000 to 2,600 feet. This complex occurs within the PSA on slopes ranging from 9 to 30 percent. It consists of approximately 35 percent Seaback soils, 30 percent Panoza soils, 15 percent Jenks soils, and 20 percent minor components. Occurring on hills and mountains, the major components of this complex are formed from weathered sandstone, shale, or conglomerate, in some areas calcareous. Seaback and Panoza soils are Inceptisols, soils with weakly developed subsurface horizons that are often not very dark in color or high in plant nutrients. Jenks soils are

Mollisols: thick, dark soils high in plant nutrients. Mollisols are often good agricultural soils.

**Yeguas-Pinspring complex (310, 311)** is generally located in the northern Carrizo Plain at elevations ranging from 2,000 to 2,295 feet. This complex occurs within the PSA on slopes ranging from 0 to 5 percent. It consists of approximately 40 percent Yeguas soils, 40 percent Pinspring soils, and 20 percent minor components. Occurring on alluvial pans and alluvial flats, the major components of this complex are alluvium derived from sandstone, shale, and basalt (Yeguas soil) and from mixed rocks (Pinspring soil). Yeguas and Pinspring soils are Alfisols, moderately leached soils that have a subsurface zone of clay accumulation, but are not as dark in color or nutrient rich as Mollisols. Alfisols can be productive agricultural soils but are typically less rich than Mollisols.

**Thornhill loam (321)** is usually located in the northern Carrizo Plain at elevations ranging from 1,895 to 2,400 feet. This map unit is comprised of approximately 80 percent Thornhill loam and 20 percent minor components. Occurring on alluvial pans and alluvial flats, this soil type is derived from mixed rock alluvium. Thornhill soils are Mollisols: thick, dark soils high in plant nutrients. Where they are not under cultivation, Mollisols often occur in grasslands.

**Jenks clay loam (330)** is generally located in the San Juan Hills at elevations ranging from 1,800 to 2,495 feet. This map unit is comprised of approximately 80 percent Jenks clay loam and 20 percent minor components. Occurring on hills, this soil type is formed from weathered soft sandstone or shale. Jenks soils are Mollisols: thick, dark soils high in plant nutrients.

**Bellyspring-Panoza complex (440)** is typically found in the San Juan Hills at elevations ranging from 2,200 to 3,300 feet. Map Unit 440 comprises areas of 9 to 15 percent slopes. It consists of approximately 35 percent Bellyspring soils and 25 percent Panoza soils, with minor components comprising the remaining 40 percent. The major components of this complex are formed from weathered sandstone, shale, or conglomerate, in some areas calcareous. Panoza soils are Inceptisols, soils with weakly developed subsurface horizons that are often not very dark in color or high in plant nutrients. Bellyspring soils are Alfisols, moderately leached soils that have a subsurface zone of clay accumulation, but are not as dark in color or nutrient rich as Mollisols.

**Wasioja loam (490)** is typically found in the central Carrizo Plain at elevations ranging from 1,895 to 2,495 feet. Map unit 490 comprises areas of 0 to 2 percent slopes. It consists of approximately 75 percent Wasioja soils, with minor components comprising the remaining 25 percent. The major component of this map unit forms in alluvium derived from mixed rock types, and a typical profile consists of loams and clay loams to over 60 inches in depth. Wasioja soils are Alfisols, moderately leached soils that have a subsurface zone of clay accumulation, but are not as dark in color or nutrient rich as Mollisols.

**Wasioja-Pinspring-Yeguas complex (497)** is typically located in the Carrizo Plain south of Carrizo Plain School at elevations ranging from 1,895 to 2,495 feet. Map unit 497 comprises areas of 2 to 5 percent slopes. It consists of approximately 35 percent Wasioja soils, 30 percent Pinspring soils, 15 percent Yeguas soils, with minor components comprising the remaining 20 percent. The major components of this map unit form in

alluvium derived from mixed rock types. Typical profiles have a mixture of loams, clay loams, sandy loams, and clay textures, and inclusions in the map unit often have bedrock as shallow as 20 inches below the soil surface. Yeguas, Pinspring, and Waisoja soils are Alfisols, moderately leached soils that have a subsurface zone of clay accumulation, but are not as dark in color or nutrient rich as Mollisols.

# 4.0 Special Status Plants and Animals

We reviewed records of special status species reported from the two USGS quadrangles that contain the PSA, as well as the surrounding ten quadrangles. The designated search area encompasses approximately 735 square miles (470,400 acres) of land, and is consistent with typical search area requirements by the California Department of Fish and Game. The CNDDB and the CNPS On-line Inventory of Rare and Endangered Plants of California contain records for 50 special status species and two sensitive natural communities within the designated search area (Tables 4, 5, and 6). The search area includes the following twelve USGS 7.5 minute quadrangles: La Panza NE, California Valley, La Panza, La Panza Ranch, Holland Canyon, Packwood Creek, Shale Point, Las Yeguas Ranch, Simmler, Chimineas Ranch, Branch Mountain, and Los Machos Hills.

Twenty-seven additional special status species were added to the list from our knowledge of the area, from review of museum specimen data and other private consultant survey reports from the region, and from results of on-site biological surveys of the PSA and vicinity. These additional species are marked with an asterisk (*). Appropriate habitat and soil conditions are present within the PSA for 20 special status plants and 31 special status animals.

Figure 4 in Section 13.0 depicts the current GIS data for special status species mapped in the vicinity of the PSA by the CNDDB. Biological resource maps indicating locations of special status species detected within the PSA are provided in Section 13.0.

### *4.1.1 Introduction to CNPS lists*

Plant species are considered rare when their distribution is confined to localized areas, when there is a threat to their habitat, when they are declining in abundance, or are threatened in a portion of their range. The listing categories range from species with a low threat (List 4) to species that are presumed extinct (List 1A). The 1096 plants of List 1B are rare throughout their range. All but a few species are endemic to California. All of them are judged to be vulnerable under present circumstances, or to have a high potential for becoming vulnerable.

### *4.1.2 Introduction to CNDDB definitions*

"Special Plants" is a broad term used to refer to all the plant taxa inventoried by the CNDDB, regardless of their legal or protection status (CDFG April 2010). Special plants include vascular plants and high priority bryophytes (mosses, liverworts, and hornworts).

"Special Animals" is a general term that refers to all of the animal taxa inventoried by the CNDDB, regardless of their legal or protection status (CDFG July 2009). The Special Animals list is also referred to by the CDFG as the list of “species at risk” or “special

status species". These taxa may be listed or proposed for listing under the California and/or Federal Endangered Species Acts, but they may also be species deemed biologically rare, restricted in range, declining in abundance, or otherwise vulnerable.

Each species included on the Special Animals list has a corresponding Global and State Rank (refer to Table 4). This ranking system utilizes a numbered hierarchy from one to five following the Global (G-rank) or State (S-rank) category. The threat level of the organism decreases with an increase in the rank number (1=Critically Imperiled, 5=Secure). In some cases where an uncertainty exists in the designation, a question mark (?) is placed after the rank. More information is available at www.natureserve.org.

Animals listed as California Species of Special Concern (SSC) may or may not be listed under California or Federal Endangered Species Acts. They are considered rare or declining in abundance in California. The Special Concern designation is intended to provide the Department of Fish and Game, biologists, land planners and managers with lists of species that require special consideration during the planning process in order to avert continued population declines and potential costly listing under federal and state endangered species laws. For many species of birds, the primary emphasis is on the breeding population in California. For some species that do not breed in California but winter here, emphasis is on wintering range. The SSC designation thus may include a comment regarding the specific protection provided such as nesting or wintering.

Animals listed as Fully Protected are those species considered by CDFG as rare or faced with possible extinction. Most, but not all, have subsequently been listed under the California Endangered Species Act (CESA) or the Federal Endangered Species Act (FESA). Fully Protected species may not be taken or possessed at any time and no provision of the CDFG code authorizes the issuance of permits or licenses to take any Fully Protected species.

### *4.1.3 Potential special status plant list*

Table 4 lists 33 special status plant species reported from the region. Federal and California State status, global and State rank, and CNPS listing status for each species are given. Typical blooming period, habitat preference, potential habitat on site, and whether or not the species was observed within the PSA are also provided.

TABLE 4. SPECIAL STATUS PLANT LIST. Thirty-three special status plants reported from the region are listed. Potentially suitable habitat is present within the PSA for 18 special status plant species.

| | Common and Scientific Names | Fed/State Status Global/State Rank CNPS List | Blooming Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 1. | **Forked Fiddleneck** *Amsinckia vernicosa furcata* | None/none G4T3/S3.2 List 4.2 | February–May | Cismontane woodland, valley and foothill grassland, often on shale outcrops, talus slopes, or gypsum-affected soils in disturbed, open sites. 50-1000 m. w SnJV, SCoRI | No. Suitable open shale, talus, or gypsum affected slopes do not occur within the PSA. | No |
| 2. | **Oval-leaved Snapdragon** *Antirrhinum ovatum* | None/none G3/S3.2 List 4.2 | May–November | Heavy, adobe-clay soils on gentle, open slopes, also disturbed areas; 200-1000 m. s SnJV, s SCoRI | Yes. Suitable clay soils are present within the PSA. | Yes<br>Option A |
| 3. | **Santa Margarita Manzanita** *Arctostaphylos pilosula* | None/none G2/S2.2 List 1B.2 | December–March | Shale outcrops, slopes, chaparral; 300-1100 m. s SCoRO Endemic to SLO County | No. Suitable shale outcrops are not present within the PSA. | No |
| 4. | **Indian Valley Spineflower** *Aristocapsa insignis* | None/none G2/S2.2 List 1B.2 | May–September | Cismontane woodland; 300-600 m. SCoRI | Yes. Potentially suitable sandy soils are present in the south end of Section 4. | No |
| 5. | **Salinas Milk-vetch*** *Astragalus macrodon* | None/none G3/S3.3 List 4.3 | April–July | Eroded pale shales or sandstone, or serpentine alluvium; 300-950 m. SCoR | Yes. Suitable habitat is present within the PSA. | Yes<br>Option A<br>Option B |
| 6. | **Heartscale** *Atriplex cordulata* | None/none G2?/S2.2 List 1B.2 | April–October | Alkaline flats and scalds in chenopod scrub, grassland, meadows; 1-375 m. s ScV, SnJV | No. Suitable alkaline wetlands are not present within the PSA. | No |
| 7. | **Lost Hills Crownscale** *Atriplex vallicola* | None/none G1/S1.1 List 1B.2 | April–August | Powdery, vernally moist alkaline soils in chenopod scrub, grassland, vernal pools; 0-605 m. SnJV | No. Suitable moist alkaline soils are not present within the PSA. | No |

| | Common and Scientific Names | Fed/State Status Global/State Rank CNPS List | Blooming Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 8. | **Round-leaved Filaree** *California macrophyllum* | None/none G3/S3.1 List 1B.1 | March–May | Clay soils in cismontane woodland, valley and foothill grassland; 15-1200 m. ScV, n SnJV, CW, SCo, n ChI | Yes. Suitable clay soils are present in Sections 4, 5, 32, and 33. | Yes Option A |
| 9. | **Palmer's Mariposa Lily** *Calochortus palmeri* var. *palmeri* | None/none G2T2/S2.1 List 1B.2 | May–July | Meadows, vernally moist places in yellow-pine forest, chaparral; 1200-2200 m. Teh, s CW, TR, SnJt | No. Suitable habitat is not present within the PSA. | No |
| 10. | **San Luis Obispo Mariposa Lily** *Calochortus simulans* | None/none G2/S2.3 List 1B.3 | April–May | Grassland, oak woodland & pine forest, on sand, granite, or serpentine; <1100 m. Endemic to SLO County | No. Suitable soil and habitat types are not present within the PSA. | No |
| 11. | **Dwarf Calycadenia** *Calycadenia villosa* | None/none G2/S2.1 List 1B.1 | May–October | Dry, rocky hills, ridges, in chaparral, woodland, meadows and seeps; <1100 m. c&s SCoRO | No. Suitable habitat is not present within the PSA. | No |
| 12. | **California Jewelflower** *Caulanthus californicus* | Endangered/ Endangered G1/S1.1 List 1B.1 | February–May | Chenopod scrub, grassland, pinyon-juniper woodland on sandy soils; 65-900 m. s SnJV | No. Suitable habitat conditions and soil types are not present within the PSA. | No |
| 13. | **Lemmon's Jewelflower** *Caulanthus coulteri* var. *lemmonii* | None/none G4T2/S2.2 List 1B.2 | March – May | Dry, exposed slopes; 80-800 m. sw SnJV, se SnFrB, e SCoRO, SCoRI | No. Suitable habitat conditions are not present within the PSA. | No |
| 14. | **Straight-awned Spineflower** *Chorizanthe rectispina* | None/none G1/S1.2 List 1B.3 | May–July | Chaparral, dry woodland, usually on granitic soil; 200-600 m. SCoRO | No. Suitable habitat and soil types are not present. | No |

| | Common and Scientific Names | Fed/State Status Global/State Rank CNPS List | Blooming Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 15. | **Hall's tarplant** *Deinandra halliana* | None/none G1/S1.1 List 1B.1 | April–May | Chenopod scrub, Cismontane woodlands, valley and foothill grasslands on variety of soil types including alkaline; 300- 950 m.; SCoRI | Yes. Suitable habitat is present within the PSA. | No |
| 16. | **Gypsum-loving Larkspur*** *Delphinium gypsophilum* ssp. *gypsophilum* | None/none G4T3/S3.2 List 4.2 | February - May | Chenopod scrub, cismontane woodland, grassland; s SNF, Teh, SnJV, SCoRI | Yes. Potentially suitable habitat is present in untilled annual grasslands within the PSA. | No |
| 17. | **Recurved Larkspur** *Delphinium recurvatum* | None/none G2/S2.2 List 1B.2 | March–June | Poorly drained alkaline soils in chenopod scrub, grassland, cismontane woodland; 3-685 m. GV | Yes. Potentially suitable habitat is present in untilled annual grasslands within the PSA. | No |
| 18. | **Umbrella Larkspur** *Delphinium umbraculorum* | None/none G2G3/S2S3.3 List 1B.3 | April–June | Moist oak forest; 400-1600 m. SCoRO, WTR | No. Suitable habitat is not present in the PSA. | No |
| 19. | **Hoover's Eriastrum** *Eriastrum hooveri* | Delisted/none G3/S3.2 List 4.2 | March–July | Sparsely vegetated alkaline alluvial pans in chenopod scrub, grassland, pinyon-juniper woodland; 50-915 m. s&e SCoR | No. Suitable soil conditions are not present within the PSA. | No |
| 20. | **Temblor Buckwheat** *Eriogonum temblorense* | None/none G3/S3.2 List 1B.2 | May–September | Barren clay in grassland, sandstone outcrops; 300-1000 m. s SCoRI | Yes. Marginally suitable habitat may be present in Sections 15 and 16. | No |
| 21. | **Spiny-sepaled Button Celery** *Eryngium spinosepalum* | None/none G2/S2.2 List 1B.2 | April - May | Vernal pools in valley and foothill grasslands, sometimes in granitic clays; 100-420 m. | Yes. Suitable vernal pool habitat is present within the PSA. | Yes<br>Option A |
| 22. | **Diamond-petaled California Poppy** *Eschscholzia rhombipetala* | None/none G1/S1.1 List 1B.1 | March–April | Alkaline clay flats and slopes in grasslands, fallow fields; 0-975 m. NCoRI, e SnFrB, e SCoRO, SCoRI | Yes. Suitable habitat is present in Section 5, and possibly elsewhere. | No<br>(Occurs Outside Option A Boundary) |

| | Common and Scientific Names | Fed/State Status Global/State Rank CNPS List | Blooming Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 23. | **Santa Lucia Dwarf Rush*** *Juncus luciensis* | None/none G3/S3 List 1B.2 | April – July | Vernal pools, ephemeral drainages, wet meadow habitats, and streams; 300-2040 m. n SNH, SCoRO, TR, PR | Yes. Suitable ephemeral aquatic habitat is present in the PSA. | Yes Option A |
| 24. | **Ferris' Goldfields** *Lasthenia ferrisiae* | None/none G3/S3.2 List 4.2 | February–May | Vernal pools or wet saline flats in alkaline clay soil; <700 m ScV, SnJV. | Yes. This species could occur in vernal pools and other mesic areas within the PSA. | Yes Option A Option B |
| 25. | **Coulter's Goldfields** *Lasthenia glabrata* ssp. *coulteri* | None/none G4T3/S2.1 List 1B.1 | February–June | Saline places, vernal pools; Occurs near Soda Lake in Carrizo Plain; <1000 m. s SCoRO, SCo, n ChI, PR, w DMoj | Yes. Suitable habitat may be present in the ephemeral aquatic habitats within the PSA. | No |
| 26. | **Pale-Yellow Layia** *Layia heterotricha* | None/none G1/S1.1 List 1B.1 | March–June | Alkaline or clay soils, open areas, in pinyon-juniper woodland, grassland; 270-1705 m. Teh, SnJV, SCoR, n WTR | Yes. Potentially suitable habitat is present in grasslands with clay soils. | No (See discussion in Section 4.1.4 I) |
| 27. | **Munz's Tidy-tips** *Layia munzii* | None/none G1/S1.1 List 1B.2 | March–April | Alkaline clay soils in chenopod scrub, grasslands; 45-760 m. SnJV | Yes. Suitable habitat is present. | Yes Option A Option B |
| 28. | **Jared's Peppergrass** *Lepidium jaredii* ssp. *jaredii* | None/none G1T1/S1.2 List 1B.2 | March–May | Alkali bottoms, slopes, washes, <500 m. SCoRI, SnJV | Yes. Potentially suitable habitat and soil conditions may be present in Section 4. | No |
| 29. | **Showy Madia** *Madia radiata* | None/none G2/S2.1 List 1B.1 | March–May | Grassy slopes, often in heavy clay; <900 m. w SnJV, e SnFrB, SCoRI | Yes. Suitable habitat is present within the PSA. | No |
| 30. | **San Joaquin Woollythreads** *Monolopia congdonii* | Endangered/none G3/S3.2 List 1B.2 | February–May | Chenopod scrub, grassland, in alkaline or loamy plains or sandy soils. 60-800 m. s SnJV | Yes. Suitable habitat is present in sandy and loamy areas of Section 4 and 5 in short grasslands. | No |
| 31. | **Paso Robles Navarretia*** *Navarretia jaredii* | None/none G3S3.3 List 4.3 | April–July | Open, grassy areas, often in clay or serpentine. 200-500 m. SCoRI, SW | Yes. Suitable habitat is present in untilled grasslands within the PSA. | Yes Option A Option B |

| | Common and Scientific Names | Fed/State Status Global/State Rank CNPS List | Blooming Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 32. | **Shining Navarretia** *Navarretia nigelliformis* ssp. *radians* | None/none G4T1/S1.1 List 1B.2 | May - July | Vernal pools, clay depressions, dry grasslands; 76-1000 m. SCoRI | Yes. Moderately suitable habitat and soil conditions are present within the PSA. | Yes Option A |
| 33. | **Parish's Checkerbloom** *Sidalcea hickmanii* ssp. *parishii* | None/Rare G3T1/S1.2 List 1B.2 | June– August | Disturbed, burned, or cleared areas on dry rocky slopes, mountain summits; 1000-2135 m. SCoRO, WTR, SnBr | No. Suitable habitat is not present within the PSA. | No |

Habitat Preference Abbreviations:

CCo: Central Coast
SCo: South Coast
SCoR: South Coast Ranges
SCoRO: Outer South Coast Ranges
SCoRI: Inner South Coast Ranges
SnFrB: San Francisco Bay
TR: Transverse Ranges
WTR: Western Transverse Ranges
SnJV: San Joaquin Valley
ScV: Sacramento Valley
SLO: San Luis Obispo
SN: Sierra Nevada
SnJt: San Jacinto Mtns
SnBr: San Bernardino
Teh: Tehachapi Mtn Area
CW: Central West
SW: South West
DMoj: Mojave Desert
PR: Peninsular Range

### *4.1.4 Special status plants discussion*

Twenty special status plant species could potentially occur within the PSA based on an analysis of known ecological requirements of these species and the habitat conditions present within the PSA. We discuss each species and describe habitat, range restrictions, known occurrences, and survey results for the PSA. Detailed discussions of special status plant occurrences within the PSA are provided in Section 6.3.

Nine special status plant species occur within the PSA. One additional special status plant species, diamond-petaled California poppy, was detected and mapped just outside the PSA boundary of Option A (Section 5). Locations of special status plants within the PSA are indicated by Option on BR Map 12 in Section 13.0. Photo Collection #2 in Section 14.0 contains representative photographs of some special status plants identified within the PSA. Potential project impacts on special status plants are discussed in detail in Section 10.4.1 and Tables 24 and 25.

Reference sites were visited for many of the special status species determined to have the potential to occur within the PSA. For each species which was observed at a reference site we include the survey information in the descriptions below. A full outline of reference site visits is provided in Section 6.1.3.

**A. Oval-leaved Snapdragon** (*Antirrhinum ovatum*) is a CNPS List 4.2 species with a limited distribution from Fresno County south to Ventura County. Although it has a low threat rank, it is a species of strong conservation interest due to its infrequent blooming episodes. It occurs in a variety of habitats, including cismontane woodlands, grasslands, and vernal pools, where it blooms from May to November. Fire and/or alternating wet and dry years that suppress the growth of competing grasses are likely to play a role in germination, such that the species can be abundant in some years, and entirely absent in other years. The Jepson Manual describes *A. ovatum* as "Abundant every 20 to 50 years". *A. ovatum* has bloomed rarely in San Luis Obispo County in the last 20 years (D. Keil, pers. comm.).

*Antirrhinum ovatum* is distinguished from other species of *Antirrhinum* by pedicels less than 2.6 centimeters long, not twining or hooked, a weakly erect stem that may cling to other plants and debris, flowers subtended by twining branchlets, unequal calyx lobes, a corolla lower lip base not swollen, and the presence of longitudinal folds in the corolla throat. Suitable grassland habitat with clay soils or clay loam soils high in gypsum occur within one area of the PSA, specifically in the west end of Section 5, Option A. The closest reported occurrence is a 1952 collection from Bitterwater Road approximately 5.4 miles north of the PSA. *A. ovatum* was grown from soil collected at this site in 1984, so the seed bank is presumed viable (CNDDB 7). Four additional collections (CNDDB 8, 11, 12 and 13) range from 6.6 miles east-southeast of the PSA to 10.4 miles northeast of the PSA in the Temblor Range.

Oval-leaved snapdragon occurs in one location within the PSA. Approximately 35 plants were found scattered in cropland habitat in the east end of Section 5, Option A.

**B. Indian Valley spineflower** (*Aristocapsa insignis*) is a CNPS List 1B.2 species that is endemic to Monterey and San Luis Obispo Counties. Indian valley spineflower is the

only taxon in California in the genus *Aristocapsa*. Key characteristics distinguishing *Aristocapsa* from other Polygonaceae genera are involucral bracts obviously fused into a funnel or tube-like involucre, with five dull awns, and one deeply three-lobed inflorescence bract per node that occurs on one side of the stem. Indian Valley spineflower typically blooms between May and September. The CNDDB contains records of four documented localities for this species; two in Monterey County and two in San Luis Obispo County. Potentially suitable sandy substrate occurs within the PSA for Indian Valley spineflower in the southern part of Option A in Section 4. The closest occurrence is approximately 1.4 miles west of the PSA, along San Juan Creek near Highway 58 (CNDDB 1), with the second report for the County on Black Mountain, approximately fourteen miles west of the PSA (CNDDB 2).

Botanical surveys conducted through July 2010 determined Indian valley spineflower does not occur within the PSA.

**C. Salinas Milk-vetch** (*Astragalus macrodon*) is a CNPS List 4.3 species that ranges from San Benito County south to San Luis Obispo County and east to Kern County. It is uncommon in most areas but occurs regularly in appropriate soil conditions. It usually occurs on sandstone, pale shales, or serpentinite soils in grassland, chaparral, and cismontane woodland habitats. *A. macrodon* is distinguished from the more common Douglas's milkvetch (*A. douglasii*) by its purple to red leaflet margins and midribs, wavy to incurled hairs on fruits and leaves, and 29 to 52 seeds per fruit.

Salinas milk-vetch, a perennial species, occurs within both project Options. Sections 15 and 16 are the only locations where Salinas milk-vetch occurs within Option B. In Option A, Salinas milk-vetch occurs in scattered patches in Sections 4, 5, and 33.

**D. Round-leaved Filaree** (*California macrophylla*) is a CNPS List 1B.1 annual species known from sporadic occurrences throughout the interior region of California. Round-leaved erodium is the only taxon occurring in California in the genus *California*. It is distinguished from other genera in the Geranium family by having stamens that are free and fertile, no staminodes, and a simple, palmately lobed and veined leaf. The red-veined leaves of round-leaved erodium are distinctive to experienced botanists familiar with the species (refer to Photo Collection 4, Section 14.0).

Round-leaved erodium occurs in clay soils in woodland and grassland habitats. The closest reported occurrence of this species is an old collection from Pinole Hills approximately 3.5 north-northeast of the PSA (CNDDB 106). We confirmed the bloom period for this species on March 26 and April 6, 2010 at a reference site located approximately 10 miles southeast of the PSA (CNDDB 105). We also observed this species in 2010 at a reference site for other rare plants at the corner of Belmont Trail and Clarksburg Road in California Valley, approximately 4.6 miles southeast of the PSA.

Round-leaved erodium occurs only in Option A, as scattered patches in two locations in Sections 5 and 33.

**E. Hall's Tarplant** (*Deinandra halliana*) is a CNPS List 1B.1 species that occurs in Fresno, San Benito, Monterey, and San Luis Obispo Counties, where it blooms in April and May. Hall's tarplant is distinguished from other species in the genus *Deinandra* by its yellow to brown anthers, lack of disk pappus, glabrous proximal leaves (sometimes with scabrous to bristly margins and midribs), hollow stems, and presence of 18 to 60 disk flowers. It reaches its southern distribution limit in eastern San Luis Obispo County north of the Carrizo Plain on the east side of Bitterwater Road just north of Pinole Spring (CNDDB 1). It is reported most commonly on clay soils in annual grassland habitat, but may also occur in sandy washes and other cismontane woodland vegetation communities. The PSA is located approximately five miles south of the southernmost occurrence of Halls's tarplant. Moderately appropriate habitat and soils are present for Hall's tarplant within the PSA. The CNPS Online Inventory (CNPS 2010) reports that this species appears only in unusually wet years; 2010 was an above average year thus this species should have been detectable had it occurred within the PSA.

Botanical surveys conducted through July 2010 determined Hall's tarplant does not occur within the PSA.

**F. Gypsum-loving larkspur** (*Delphinium gypsophilum* ssp. *gypsophilum*) is a CNPS List 4.2 subspecies known from scattered localities in eastern San Luis Obispo County, western Kern County, and elsewhere in interior southern California, where it blooms February through May. Hoover reports the range of *Delphinium gypsophilum* in San Luis Obispo County as the eastern part, from Caliente Mountain north and west to San Miguel (1970). Hoover's reports of this species in the Carrizo are from friable, light-colored clays and disintegrating shale or sandstone on hillslopes and spreading onto adjacent alluvial areas of the plain. CNDDB records are not currently available for most List 4 species; Althouse and Meade, Inc. botanists observed this species along Highway 58 west of the Carrizo Plain in late April 2010. Potentially suitable habitat occurs on annual grassland hill slopes in Option B, Sections 15 and 16.

Botanical surveys conducted through July 2010 determined gypsum-loving larkspur does not occur within the PSA.

**G. Recurved Larkspur** (*Delphinium recurvatum*) is a CNPS List 1B.2 species endemic to California that occurs in scattered populations through the San Joaquin Valley, reaching its southern distribution limit in the Carrizo Plain. Recurved larkspur is distinguished from other species of *Delphinium* by light blue reflexed lateral sepals, white petals, stems generally less than 60 centimeters, and its affinity for fine textured alkaline soils. It is common in chenopod scrub habitat in the Carrizo Plain National Monument in areas that are not over-grazed. The nearest documented occurrences include two locations in California Valley approximately 3.0 to 3.5 miles southeast of the PSA (CNDDB 39, 74). We visited a reference site on April 2, 2010 at Belmont Trail and Clarksburg Road in California Valley to observe this species in bloom. We also observed it blooming along Seven Mile Road on April 16, 2009. Moderate to poor quality habitat is present in areas of the PSA that have not been plowed recently.

Botanical surveys conducted through July 2010 determined recurved larkspur does not occur within the PSA.

**H. Temblor buckwheat** (*Eriogonum temblorense*) is a CNPS List 1B.2 species known from barren slopes extending through the Temblor range and adjoining hills north to Parkfield and Cottonwood Pass, where it typically blooms from May through September. The nearest reported occurrence to the PSA is a specimen from 1955 from approximately 11.6 miles northeast of the PSA, growing in "barren white shale on a hilltop" (CAS TWI55S0016, CNDDB 5). CNDDB records also report the species growing in shale talus, shale gravel, sandstone outcrops, and barren white and grey clays. Temblor buckwheat is distinguished from other annual buckwheats by having all of the following: involucres ribbed or angled, and tomentose; involucres appearing terminal, with lower involucres stalked; inflorescence repeatedly forked or umbel-like; perianth approximately 2 millimeters, white to red, and papillate when fresh, with styles 0.7 to 1.0 millimeters long; some cauline leaves or lowest bracts leaf-like. Moderately appropriate habitat is present on hill slopes in the north end of Section 16.

Botanical surveys conducted through July 2010 determined Temblor buckwheat does not occur within the PSA.

**I. Spiny-sepaled button-celery** (*Eryngium spinosepalum*) is currently a CNPS List 1B.2 species, with a distribution for the listed taxon presumed to be limited to Tulare County at the time this species was described for the first edition of The Jepson Manual (Hickman 1993). The CNPS Online Inventory now includes Fresno, Madera, Merced, Stanislaus, and Tuolumne Counties for spiny-sepaled button celery. However, recent revisions to the taxonomy of *Eryngium* based on molecular data and inspection of additional specimens may support revisions to the CNPS List status of spiny-sepaled button-celery because the taxon may be less rare than previously presumed. The original Jepson treatment did not resolve status of some specimens, did not satisfactorily account for species occurring well outside Tulare with features similar to *E. spinosepalum*, nor did it address specimens that intergrade between taxa described in the original text. The new treatment for the Jepson Manual Second Edition has resolved many of these problems with the descriptions and distribution of taxa in the genus *Eryngium*. Rob Preston, author of the new treatment, notes that the range of *Eryngium spinosepalum* extends from Kern County north to Fresno County, and into the west side of the valley as far as Contra Costa County and into eastern San Luis Obispo County (Preston and Keil 2009).

Spiny-sepaled button celery is distinguished from other species of button celery by the following features: plants are stout and erect; bracts and sepals are green and inner bracts are not lobed; bract margins are not thickened; outer bracts generally have spines on margins only, or only a few spines abaxially; leaf blades are much longer than petioles and are deeply pinnately or bipinnately lobed; sepals are pinnately lobed or toothed (occasionally entire), lanceolate, and tapered to a long tip-spine; fruit scales are oblong to ovate, and acute. In contrast, coyote thistle (*Eryngium vaseyi*), which occurs commonly in eastern San Luis Obispo County, is slender, decumbent to ascending, and has entire sepals that are aristate (abruptly narrowed at the tip, with a

short spine). The nearest reported occurrences of spiny-sepaled button celery in the CNDDB are from Tulare County (CNDDB 1-6, 10, 13-18, etc.), which is more than 40 miles northeast of the PSA. However, Hoover made collections "south of Simmler, Carrizo Plain", approximately 2 miles from the PSA, of a specimen he described as *Eryngium vaseyi* var. *globosum*, a synonym of *E. spinosepalum* (UC771669; Hoover 6171). Preston notes that this specimen, which had been annotated to *E. vaseyi*, is in fact *E. spinosepalum*. Appropriate habitat is present in vernal pools within the PSA for spiny-sepaled button-celery.

Spiny-sepaled button-celery was identified in Option A only, in one vernal pool in Section 4.

**J. Diamond-petaled California Poppy** (*Eschscholzia rhombipetala*) is a CNPS List 1B.1 species reported to occur (or once occurred) in Alameda, Contra Costa, Colusa, San Joaquin, Stanislaus, and San Luis Obispo Counties. Distinctive characteristics of the diamond-petaled California poppy include the presence of both basal and cauline leaves (sometimes minute), a barrel-shaped receptacle tapered at the base but with parallel sides distally, a peduncle as long as basal leaves, and yellow petals 3 to 15 millimeters long. It occurs on alkaline clay soils on slopes or flats. Most of the historic localities for this species are extirpated. The diamond-petaled California poppy is presently known from two populations, one in Livermore, California and one in the Carrizo Plain. Each population consists of two extant subpopulations. Three localities are reported from San Luis Obispo County. One locality in the La Panza District has not been verified since 1986, and the taxonomic identity of these plants is in question (CNDDB 1). The second locality is a 1950 collection from Camp Flat along Yeguas Creek, approximately 5.3 miles east of the PSA, however, this population has not been found since 1950 (CNDDB 5). The diamond-petaled California Poppy was rediscovered on the Carrizo Plain by Dr. David Keil in 1992, and was not seen again after 1995 (CNDDB 8) until its rediscovery in 2010 (Keil, pers. comm.).

During botanical surveys of the PSA in March and April 2010 a new population of the diamond-petaled California poppy was detected, taxonomically verified, and mapped. This small, isolated population is outside both project options, occurring just outside the Option A boundary, in the southwest quarter of Section 5.

**K. Santa Lucia dwarf rush** (*Juncus luciensis*) is a CNPS List 1B.2 species known from vernal pools, ephemeral drainages, wet meadows, and streamsides in coastal counties from San Diego County north to Monterey County, as well as interior areas from Placer County north through Modoc County. It blooms from April through July. This annual rush is reported from two occurrences in San Luis Obispo County, a 2001 collection from a clay vernal pool at Camp Roberts 44 miles northwest of the PSA (CNDDB 9) and a 1958 collection from Creston Road near Paso Robles, approximately 32 miles northeast of the PSA (CNDDB 8). Santa Lucia rush is distinguished from other annual rushes by stems that are leafless and un-branched, basal leaves, flowers or inflorescences terminal, two to three stamens, two inconspicuous, membranous inflorescence bracts that are shorter than the inflorescence and acute to acuminate, six perianth parts with sepals and petals that are

similar in size and shape, anthers less than 8 millimeters long and shorter than the filaments, perianth pale green to pale red in age with dark red midvein tips and perianth parts short and the same color as the capsule, one to two flowers per stem, more than 40 seeds per capsule with seeds striate, and seeds 0.3 to 0.4 millimeters in size. A similar annual rush, *Juncus uncialis*, has only one bractlet sheathing the stem, with truncate tip, and only one flower on every per stem. Appropriate habitat is present within the PSA in vernal pools and ephemeral wetlands.

Santa Lucia dwarf rush occurs in two vernal pools in Option A, Section 4.

**L. Ferris' Goldfields** (*Lasthenia ferrisiae*) is a CNPS List 4.2 species that typically occurs in vernal pools and alkali flats in the San Joaquin Valley. Ferris's goldfields is distinguished from other species of *Lasthenia* by phyllaries that are fused more than 2/3 their length, absence of pappus, and fruits that are not strongly flattened but have short curved hairs. Locality information for List 4 plants is not yet available through the CNDDB. We visited a known reference site at the corner of Belmont Trail and Clarksburg Road in California Valley on March 15, 2010 and observed Ferris's goldfields in bloom.

Ferris's goldfields were detected occurring as a single plant per observation in four locations scattered within both Options, in Sections 5, 28 and 33.

**M. Coulter's Goldfields** (*Lasthenia glabrata* ssp. *coulteri*) is a CNPS List 1B.1 species that typically blooms from February through June. Coulter's goldfields is distinguished from other species of *Lasthenia* by phyllaries that are fused more than two-thirds of their length, absence of pappus, and fruits that are not strongly flattened but are papillate. Near the coast, it occurs in salt marsh habitats and alkaline soils on coastal bluffs. In inland areas Coulter's goldfields occurs on alkaline soils in playas, sinks, grasslands, and vernal pools. The closest reported occurrence is from 1950, approximately 7.5 miles west of the PSA. The exact location is unknown and is mapped at the headwaters of Yeguas Creek (CNDDB 60). Moderately suitable habitat is present for Coulter's goldfields in mesic grassland areas of the PSA.

Botanical surveys conducted through July 2010 determined Coulter's goldfields does not occur within the PSA.

**N. Pale-yellow Layia** (*Layia heterotricha*) is a CNPS List 1B.1 species known from alkaline or clay soils in cismontane woodland, chaparral, and grassland habitats of central California. In San Luis Obispo County this species occurs in the La Panza Range, Elkhorn Hills, Carrizo Plain, the Temblor Range, and the vicinity of Lake Nacimiento. The nearest recorded occurrence is approximately seven miles southwest of the PSA. Found in 1937, this occurrence is mapped between Willow Canyon and Beartrap Creek (CNDDB 10). Moderate to poor quality habitat is present in annual grasslands within the PSA. URS reported a single individual pale-yellow layia plant occurring in Section 28 of the PSA in 2008 (URS 2009). However, a voucher was not collected thus identification of the species cannot be verified by an expert.

Our 2010 botanical surveys of the PSA identified *Layia pentachaeta* ssp. *albida* (identification of specimen verified by Dr. David Keil), which, like *Layia heterotricha*, has a pale creamy or whitish flower color. It is possible the URS survey misidentified *L. pentachaeta* ssp. *albida* as *L. heterotricha*. Pale yellow layia is distinguished from other species of *Layia* as follows: if pappus is absent, the plant is glandular, has paleae in one involucre-like series between disk and ray flowers, has a banana or apple scent, with basal leaves minutely dentate to minutely serrate; or, if pappus is present, pappus is of bristles or bristle-like scales proximally plumose, generally not woolly adaxially, and readily falling as a unit, with plants strongly scented, and basal leaves minutely dentate to minutely serrate. In contrast, *Layia pentachaeta* ssp. *albida* has strongly lobed basal leaves, persistent pappus, and lemon or acrid scent.

Botanical surveys conducted through July 2010 determined pale-yellow layia does not occur within the PSA.

**O. Munz's Tidy-tips** (*Layia munzii*) is a CNPS List 1B.2 species that occurs in Fresno, Kern, and San Luis Obispo Counties. It typically occurs in chenopod scrub and grassland habitats on white-grey alkaline clay soils. The nearest recorded occurrence is from 1932 and is located approximately six miles northeast of the PSA (CNDDB 8). At this location it occurs on rolling plains in the Yeguas Hills, between Choice Valley and Carrizo Plain. Appropriate soils are present within the PSA for Munz's tidy-tips. We visited a reference site along Belmont Trail in California Valley on April 15, 2008, March 30, 2009, and March 15, 25, and 26, 2010 to observe this species in bloom and to review the key characteristics differentiating this species from common tidy-tips (*Layia platyglossa*). Common tidy tips have a pappus of bristles, while the rare Munz's tidy-tips have a pappus of scales; leaf characteristics also differ between these two species. Common tidy-tips are widespread in grassland and some fallow cropland habitats within the PSA, most notably in Option A. Most of the suitable habitat within the PSA is highly disturbed from farming and grazing, which reduces the quality of the habitats for Munz's tidy-tips.

Despite a history of intensive land use, Munz's tidy-tips occur in both project Options, within Sections 4, 5, 26, 28, 32, 33, 34 and 35.

**P. Jared's Peppergrass** (*Lepidium jaredii* ssp. *jaredii*) is a CNPS List 1B.2 subspecies with extant populations known only from the vicinity of Soda Lake on the Carrizo Plain in San Luis Obispo County and Devil's Den in Kern County (CNDDB 2010). Jared's peppergrass occurs in grasslands and alkali bottoms, slopes, and washes, where it blooms from March to May. Jared's peppergrass is distinguished by having a style longer than the fruit tip notch, while also having yellow petals, an annual form, and lower pedicels four to five times the length of the fruit. We visited a reference site on April 25, 2010 on Belmont Trail in California Valley where Dr. Keil previously collected this species. We found Jared's peppergrass in bloom at the reference site. This reference site locality represents the closest occurrence, approximately 4.5 miles southeast of the PSA, for Jared's peppergrass. Moderately suitable habitat for Jared's peppergrass is present in limited areas of Option A.

Botanical surveys conducted through July 2010 determined Jared's peppergrass does not occur within the PSA.

**Q. Showy Madia** (*Madia radiata*) is a CNPS List 1B.1 species known to occur in interior areas of California from Contra Costa County to northeastern Santa Barbara County. Showy madia is distinguished by paleae readily falling, beaked ray fruit with beak adaxially offset and curved, rays 6 to 19 millimeters long, and yellow to brown anthers. It occurs in grassland, woodland, and chenopod scrub habitats, usually on adobe clay soils. The nearest recorded occurrence is located approximately 4.8 miles northeast of the PSA. It was found at this location in 1965 growing in friable clay soils on a broad grassland hillside at the head of Bitterwater Creek in the Pinole Hills (CNDDB 3). We visited a reference site for showy madia on Soda Lake-San Diego Creek Road on March 26 and April 6, 2010, where it was found in full bloom. Moderately suitable habitat is present for showy madia in Option A, Sections 4, 5 and 33.

Botanical surveys conducted through July 2010 determined showy madia does not occur within the PSA.

**R. San Joaquin Woollythreads** (*Monolopia congdonii*) is a federally listed endangered species (also CNPS List 1B.2) that occurs in interior areas of the southern San Joaquin Valley, extending westward into San Luis Obispo County. San Joaquin woolly threads is distinguished by disciform heads, minute rays, disk fruits that are 2-angled, and disk pappus of 2 to 7 scales. It occurs in grassland and chenopod scrub habitats, typically in sandy or loamy alkaline soils, where it blooms from February to May. The nearest recorded occurrence is a 1954 collection from approximately 14 miles east-northeast of the PSA, a site that is now presumed extirpated (CNDDB 17). This species is also reported from the Carrizo Plain National Monument, beginning approximately 19 miles southeast of the PSA (CNDDB 31, 45, 46, 79). A reference population in the Monument was visited on March 26, 2010 where this species was observed in flower.

Botanical surveys conducted through July 2010 determined the San Joaquin woollythreads does not occur within the PSA.

**S. Paso Robles Navarretia** (*Navarretia jaredii*) is a CNPS List 4.3 species endemic to Monterey and San Luis Obispo Counties. Paso Robles navarretia is distinguished from other *Navarretia* species by strap-shaped calyx ribs wider at base than membranes, axis of upper leaves and bracts wider above middle, central stem shorter than or equal in length to branches, with axis white-hairy. It grows in a variety of soils in areas with little competition from annual grasses. Its rarity status relates to the limited distribution of the species, but it may be found abundantly within this range in appropriate conditions. The closest known locality for this species is approximately 1.5 miles northwest of the PSA (Althouse and Meade, Inc. unpublished field notes, 2008).

This taxon is currently under revision and is likely genetically identical to *Navarretia mitracarpa*, which is presently considered a synonym of *N. pubescens* (D. Keil pers. comm. 2010; Johnson 2007). Johnson's taxonomic recommendation is to elevate *N.*

*mitracarpa* to full species, and consider *N. jaredii* a synonym. This recommendation has been accepted in the proposed key for the second edition of the Jepson Manual (in press; preliminary keys available at http://ucjeps.berkeley.edu/jepsonmanual/review/). Revision of the taxonomy for this genus could result in inclusion of the currently recognized *Navarretia jaredii* as part of a much more common taxon that does not meet criteria to remain on CNPS List 4.

Botanical surveys conducted through July 2010 detected *Navarretia jaredii* in scattered localities within Option A and Option B, Sections 4, 5, 28, 32, 33 and 34.

**T. Shining Navarretia** (*Navarretia nigelliformis* ssp. *radians*) is a CNPS List 1B.2 species known from Fresno, Merced, Monterey, San Benito, and San Luis Obispo Counties. Shining navarretia is distinguished from other *Navarretia* species by strap-shaped calyx ribs wider at base than membranes, axis of upper leaves and bracts not wider above middle, yellow corolla lobes and spotted corolla throat, a white-hairy inflorescence, 5 corolla lobes, a corolla 9 to 11 millimeters in length and grey green herbage. The similar *Navarretia nigelliformis* ssp. *nigelliformis*, adobe navarretia, a CNPS List 4.2 species, has a corolla length 12 to 16 millimeters and typically dark green herbage. This subspecies is not reported from San Luis Obispo County. Shining navarretia is the only species of *Navarretia* in San Luis Obispo County with a yellow flower. Shining navarretia reportedly grows in vernal pools, valley and foothill grassland, and cismontane woodland habitats. Recent reports from the Paso Robles area have not yet been included in the CNDDB, but the species has been observed in eastern Paso Robles in 2006, 2007, and 2008, approximately 32 to 35 miles northwest of the site (Dart collections 237, 279, 281, 317; Althouse collection 544). The closest known locality for this species is a 2003 collection from near Creston, approximately 28 miles west-northwest of the PSA (CNDDB 45).

Botanical surveys conducted through July 2010 detected *Navarretia nigelliformis* ssp. *radians* in a swale near the southwestern corner of Option A, in Section 5. Approximately 100 individuals were observed in a single patch. Shining navarretia was not located in any other localities within the PSA. The occurrence of shining navarretia in the PSA may indicate a range extension for the subspecies by more than 20 miles southeast of previous collections, based on searches of catalogued herbarium specimens and the CNDDB. Specimens collected within the PSA have corollas between 8 and 11 millimeters in length, and grey green to dark grey green herbage. Bract tips of the collected specimens are generally glabrous, which is typical for subspecies *radians.* The similar subspecies *nigelliformis* has longer corolla length and bract tips that are typically glandular puberulent.

Shining navarretia occurs in one small location within Option A, Section 5.

### *4.1.5 Potential special status animals list*

Table 5 lists 44 special status animal species reported from the region. Federal and California State status, global and State rank, and CDFG listing status for each species are given. Typical nesting or breeding period, habitat preference, potential habitat on site, and whether or not the species was observed within the PSA are also provided.

TABLE 5. SPECIAL STATUS ANIMAL LIST. Forty-four special status animals known or reported from the region are listed. Thirty-one special status animals could potentially occur within the PSA based on review of preferred habitat types.

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 1. | **Tricolored Blackbird*** *Agelaius tricolor* | None/none G2G3/S2 SSC (Nesting) | March 15 through August 15 | Requires open water, protected nesting substrate, & foraging area with insect prey near nesting colony. | No. Nesting habitat is not present within the PSA. Wintering habitat is present. | Yes Option A Option B Wintering Only |
| 2. | **California Tiger Salamander** *Ambystoma californiense* | Threatened/ Threatened G2G3/S2S3 SSC | Rainy season | Need underground refuges, ground squirrel burrows & vernal pools or other seasonal water for breeding. | No. Suitable habitat is not present within the PSA. No historic suitable aquatic habitat on the Carrizo Plain. No specimen records from region. | No |
| 3. | **Grasshopper Sparrow*** *Ammodramus savannarum* | None/none G5/S2 SSC (Nesting) | March 15 through August 15 | Nests in grassland habitats on mountain slopes, foothills, and valleys. May nest colonially. | Yes. Suitable nesting habitat is present within the PSA. | Yes Option B |
| 4. | **Nelson's Antelope Squirrel** *Ammospermophilus nelsoni* | None/Threatened G2/S2 SSC | Late winter to early spring | Dry, sparsely vegetated loamy soils in Western San Joaquin Valley; 200-1200 ft. | Yes. No current records from vicinity. Habitat within the PSA is highly disturbed. | No |
| 5. | **Silvery Legless Lizard** *Anniella pulchra pulchra* | None/none G3G4T3T4Q/S3 SSC | May - September | Sandy or loose loamy soils under coastal scrub or oak trees. Soil moisture essential. | No. Suitable habitat conditions are not present within the PSA. | No |
| 6. | **Pallid Bat** *Antrozous pallidus* | None/none G5/S3 SSC | Spring - Summer | Rock crevices, caves, tree hollows, mines, old buildings, and bridges. | Yes. Potentially suitable roosting habitat may be present in old buildings within the PSA. | No |

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 7. | **Golden Eagle*** *Aquila chrysaetos* | None/none BGEPA Protected G5/S3 SSC Fully Protected | March 15 through August 15 | Nests in large, prominent trees in valley and foothill woodland. Requires adjacent food source. | Yes. Potential nesting on power towers, few perches at abandoned ranch sites, and foraging habitat are present within the PSA. | Yes Option A Option B No nests onsite |
| 8. | **Short-eared Owl*** *Asio flammeus* | None/none G5/S3 SSC (Nesting) | March 15 through August 15 | Fresh and salt swamps, lowlands. Nests on dry ground in tules/tall grasses. | Yes. Suitable wintering habitat is present within PSA; poor nesting habitat due to lack of tall grass. | No |
| 9. | **Long-eared Owl** *Asio otus* | None/none G5/S3 SSC (Nesting | March 15 through August 15 | Roost and nest in woodlands; Require adjacent open land productive of mice and the presence of old nest of crows, hawks, or magpies for breeding. | Yes. Suitable nesting, roosting, and foraging habitat areas are present within the PSA. | No |
| 10. | **Burrowing Owl** *Athene cunicularia* | None/none G4/S2 SSC (Burrow sites and some wintering sites) | February 1 through August 31 | Burrows in squirrel holes in open habitats with low vegetation. | Yes. Suitable wintering and nesting habitat is present within the PSA. | Yes Option A Option B |
| 11. | **Longhorn Fairy Shrimp** *Branchinecta longiantenna* | Endangered/ None G1/S1 Special Animal | Rainy Season | Small clear water depressions in sandstone, and clear to turbid clay/grass bottomed pools in shallow swales. | Yes. Suitable aquatic habitat is present in ephemeral pools within the PSA. | Yes Option A Option B |
| 12. | **Vernal Pool Fairy Shrimp** *Branchinecta lynchi* | Threatened/none G3/S2S3 Special Animal | Rainy Season | Clear water sandstone depression pools, grassed swale, earth slump, or basalt flow depression pools. | Yes. Moderate to poor quality aquatic habitat is present in ephemeral pools in grassy swales within the PSA. | Yes Option A |

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 13. | **Ferruginous Hawk*** *Buteo regalis* | None/none G4/S3S4 Special Animal (Wintering) | October - April (Wintering) | Winters locally in open grassland or savannah habitats. More common in interior SLO County than coast. | Yes. Suitable wintering habitat is present within the PSA. Does not nest locally. | Yes Option A Option B |
| 14. | **Swainson's Hawk*** *Buteo swainsoni* | None/Threatened G5/S2 Special Animal (Nesting) | March 15 through August 15 | Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, agricultural fields. Does not nest in SLO County; occurs as seasonal migrant or transient in Carrizo Plain. | No. Suitable nesting habitat is not present within the PSA. Uncommon migrant in Carrizo Plain. | Yes Option A Migrant Only |
| 15. | **Costa's Hummingbird*** *Calypte costae* | None/none G5/S3? Special Animal (Nesting) | March 15 through August 15 | Nests in desert riparian and arid scrub foothill habitats. Nests in interior areas of SLO County and elsewhere in central and southern CA. | No. Suitable nesting habitat is not present within the PSA. | Yes Option A No nests onsite |
| 16. | **Mountain Plover*** *Charadrius montanus* | None/none G2/S2? SSC (Wintering) | November - February (Wintering) | Short grasslands, plowed fields, etc. Winters locally, does not nest in SLO County. | Yes. Winters in the Carrizo Plain National Monument, and could occur within the PSA. | Yes Option A |
| 17. | **Lark Sparrow*** *Chondestes grammacus* | None/none G5/SNR Special Animal (Nesting) | March 15 through August 15 | Nests on the ground near edges of grasslands and tree or shrublands. | Yes. Suitable nesting habitat is present within the PSA. | Yes Option A |
| 18. | **Northern Harrier*** *Circus cyaneus* | None/none G5/S3 SSC (Nesting) | March 15 through August 15 | Nests on ground in shrubby areas, usually near water. Forages in open areas. | No. Grasslands within the PSA do not have grass tall enough to attract nesting harriers. | Yes Option A Option B Wintering only |

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 19. | **Giant Kangaroo Rat** *Dipodomys ingens* | Endangered/ Endangered G2/S2 Special Animal | Spring - Summer | Sandy loamy soil on level and gently sloping ground with annual grasses, forbs, and scattered shrubs. sw SnJV | Yes. Potentially suitable habitat may be present within the PSA. | No Refer to Sections 4.1.6 J & 7.3.3 C |
| 20. | **Short-nosed Kangaroo Rat*** *Dipodomys nitratoides brevinasus* | None/none G3T1T2/S1S2 SSC | Spring - Summer | Grasslands with scattered shrubs, desert shrub association on powdery soils. | Yes. Potentially suitable habitat may be present within the PSA. | No |
| 21. | **Tipton Kangaroo Rat** *Dipodomys nitratoides nitratoides* | Endangered/ Endangered G3T1/S1 Special Animal | Spring - Summer | Arid-land vegetative communities with level or nearly level terrain. | No. Does not occur in Carrizo Plain per B. Stafford, CDFG and ESRP species profile. | No |
| 22. | **White-tailed Kite*** *Elanus leucurus* | None/none G5/S3 Fully Protected | March 15 through August 15 | Nests in dense tree canopy near open foraging areas | Yes. Potentially suitable nesting habitat may be present in landscape trees in Sections 16, 18, 28, and 33. | No |
| 23. | **Kern Primrose Sphinx Moth*** *Euproserpinus euterpe* | Threatened/None G1/S1 Special Animal | Spring | Host plant is evening primrose (*Camissonia contorta epilobioides*) and potentially other *Camissonia* species. | Yes. Potential habitat is present in sandy washes in Section 4 of the PSA. | No |
| 24. | **Merlin*** *Falco columbarius* | None/none G5/S3 Special Animal (Wintering) | September - April (Wintering) | Winters on seacoasts, estuaries, woodlands, savannas, grassland edges, deserts. Winters locally, does not nest in SLO County. | Yes. Suitable wintering habitat is present within the PSA. | Yes Option A Option B |

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 25. | **Prairie Falcon** *Falco mexicanus* | None/none G5/S3 Special Animal (Nesting) | March 15 through August 15 | Inhabits dry, open terrain. Nests on cliffs near open areas for hunting. | No. Suitable nesting habitat is not present within the PSA. Prairie falcons do forage within the PSA. | Yes Option A Option B |
| 26. | **Blunt-nosed Leopard Lizard** *Gambelia sila* | Endangered/ Endangered G1/S1 Fully Protected | Spring | Semiarid grasslands, alkali flats, and washes; SnJV and adjacent lands. 30-730 m. | Yes. However, most areas of the PSA are too disturbed. Grasslands are generally too densely vegetated, with no shrub cover. Suitable burrows are present. | No 2010 adult surveys complete. Juvenile survey results expected in September |
| 27. | **Lesser Sandhill Crane** *Grus canadensis canadensis* | None/none G5T4/SNR SSC (Wintering) | N/A | Feeds in short-grass plains and grain fields and roosts in groups in moist fields or shallow water | Yes. Suitable foraging habitat may be present on farm fields in the PSA. | No |
| 28. | **Greater Sandhill Crane** *Grus canadensis tabida* | None/Threatened G5T4/S2 Special Animal | N/A | Feeds in short-grass plains and grain fields and roosts in groups in moist fields or shallow water | Yes. Suitable foraging habitat may be present on farm fields in the PSA. | No |
| 29. | **California Condor** *Gymnogyps californianus* | Endangered/ Endangered G1/S1 Special Animal | March 15 through August 15 | Wide-ranging over Coast Ranges from Ventura to Big Sur, California. | Yes. Condors likely pass over the area on occasion, and could feed locally on carrion when available. | No |
| 30. | **Bald Eagle*** *Haliaeetus leucocephalus* | Delisted/ Endangered BGEPA Protected G4/S2 Special Animal (Nesting and Wintering) | March 15 through August 15 | Nests within 1 mile of water in tall live tree with open branches. | Yes. Migrant or transient bald eagles do occasionally forage on Carrizo Plain. Suitable nesting habitat is not present within the PSA or near vicinity. | Yes Option A Option B Wintering only |
| 31. | **Loggerhead Shrike*** *Lanius ludovicianus* | None/none G4/S4 SSC (Nesting) | March 15 through August 15 | Open areas with appropriate perches, near shrubby vegetation for nesting. | Yes. Nesting and foraging habitat is present within the PSA. | Yes Option A Option B |

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 32. | **San Joaquin Whipsnake** *Masticophis flagellum ruddocki* | None/none G5T2T3/S2? SSC | May | Open, dry, treeless areas, including grasslands and saltbush scrub; takes refuge in burrows and under shaded vegetation | Yes. Moderately Suitable habitat is present within the PSA. | Yes<br>Option A |
| 33. | **Long-billed Curlew*** *Numenius americanus* | None/none G5/S2 Special Animal (Nesting) | March 15 through August 15 | Breeds in upland short grass prairies in NE California. Favors gravelly habitats on rolling terrain. | No. This species does not breed locally, but does winter in Carrizo Plain and forages within the PSA. | Yes<br>Option A<br>Option B<br>Wintering only |
| 34. | **Tulare Grasshopper Mouse** *Onychomys torridus tularensis* | None/none G5T1T2/S1S2 SSC | May through July | Hot arid valleys and scrub deserts in southern San Joaquin Valley. Eats arthropods. | Yes. Suitable habitat is present within the PSA. | Yes<br>Option A<br>Option B |
| 35. | **San Joaquin Pocket Mouse** *Perognathus inornatus inornatus* | None/none G4T2T3/S2S3 Special Animal | n/a | Grasslands and blue oak savannahs with friable soil and occasional shrubs. Also chaparral. | No. Reports of this subspecies from Carrizo Plain are incorrect. Museum specimens used as the basis of CNDDB reports are annotated to *P. inornatus neglectus.* | No |
| 36. | **McKittrick Pocket Mouse*** *Perognathus inornatus neglectus* | None/none G4T2T3 S2S3 Special Animal | n/a | Arid annual grasslands and desert scrub communities. Needs friable soils for digging. | Yes. *Perognathus inornatus* was identified within the PSA, and is presumed to be ssp. *neglectus* based on range. | Yes<br>Option A<br>Option B |
| 37. | **Blainville's (Coast) Horned Lizard** *Phrynosoma blainvillii* | None/none G4G5/S3S4 SSC | May - September | Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. | Yes. Suitable habitat is present in some areas of the PSA. | No |

| | Common and Scientific Names | Fed/State Status Global/State Rank DFG Rank | Nesting/ Breeding Period | Habitat Preference | Potential Habitat? | Detected Within PSA? |
|---|---|---|---|---|---|---|
| 38. | **Oregon Vesper Sparrow*** *Pooecetes gramineus affinis* | None/none G5T?/S? SSC (nonbreeding/ wintering) | March 15 through August 15 | Winters in grassland habitats and may frequent agricultural fields. | Yes. Suitable wintering habitat is present within the PSA; does not breed locally. | Yes Option A Option B |
| 39. | **California Red-legged Frog** *Rana draytonii* | Threatened/none G4T2T3/S2S3 SSC | January - March | Lowlands and foothills in or near sources of deep water with dense, shrubby or emergent riparian vegetation. | No. Suitable habitat is not present within the PSA. | No |
| 40. | **Western Spadefoot Toad** *Spea hammondii* | None/none G3?/S3? SSC | January – August | Vernal pools in grassland and woodland habitats | Yes. Suitable breeding habitat may be present in ephemeral pools within the PSA. | Yes Option A Option B |
| 41. | **American Badger** *Taxidea taxus* | None/none G5/S4 SSC | February – May | Needs friable soils in open ground with abundant food source such as California ground squirrels. | Yes. Suitable foraging and denning habitat is present within the PSA. | Yes Option A Option B |
| 42. | **Two-striped Garter Snake** *Thamnophis hammondii* | None/none G2G3/S2 SSC | Spring | Coastal California from Salinas to Baja, sea level to 7000', aquatic, in or near permanent water, streams with rocky beds and riparian growth | No. Suitable habitat not present within the PSA. | No |
| 43. | **San Joaquin Kit Fox** *Vulpes macrotis mutica* | Endangered/ Threatened G4T2T3/S2S3 Special Animal | December – July | Annual grasslands or grassy open stages with scattered shrubby vegetation. | Yes. Suitable foraging and denning habitat is present within the PSA. | Yes Option A Option B |
| 44. | **Yellow-headed Blackbird*** *Xanthocephalus xanthocephalus* | None/none G5/S3S4 SSC (Nesting) | March 15 through August 15 | Nests in freshwater emergent wetlands with dense vegetation and deep water. | No. This species does not nest locally, but may be present as a rare transient during migration. | Yes Option B Winter transient |

Habitat characteristics are from the Jepson Manual and the CDNNB.
*not listed in the CNDDB or CNPS for the search area, but possibly for the location.

### *4.1.6 Special status animals discussion*

Thirty special status animal species could potentially occur within the PSA. We discuss each species and describe habitat, range restrictions, known occurrences, and survey results. Locations of special status animals occurring within the PSA are indicated on maps provided in Section 13.0. Wildlife survey methods and results are discussed in Section 7.0.

**A. Grasshopper sparrow** *(Ammodramus savannarum*) is a California Species of Special Concern that breeds in grassland habitats in San Luis Obispo County, and elsewhere in California. It has no state or federal status. Grasshopper sparrows have been extirpated from much of their former range in Southern California but continue to breed locally in ungrazed grasslands. Singing male grasshopper sparrows were detected in Section 15 east of the PSA boundary in 2009. A single singing male was detected in 2010 on hills in the north end of Section 16. Grasshopper sparrows likely nest in low numbers in ungrazed annual grasslands within the PSA.

**B. Nelson's Antelope Squirrel** *(Ammospermophilus nelsoni*), also known as the San Joaquin antelope squirrel, is listed as a threatened species in the state of California. It inhabits the arid grassland, shrubland, and alkali sink habitats of the San Joaquin Valley and adjacent foothills, including some portions of the Carrizo Plain. Antelope squirrels are active year-round and live in burrows that they construct themselves or that are modifications of kangaroo rat burrows. They are most active above ground between April 1 and September 30. Their diet consists mainly of insects, but also includes green vegetation, fungi, and seeds. The nearest recorded occurrence is from 1969, located approximately four miles southeast of the PSA in the Simmler USGS quadrangle along State Highway 58 (CNDDB 262). In May of 2008 Althouse and Meade, Inc. biologists observed Nelson's antelope squirrels at reference sites approximately 30 miles southeast of the PSA along Elkhorn Road in the foothills of the Temblor Range.

Protocol surveys for the Nelson's antelope squirrel, which are complete as of July 2010, were conducted concurrently with protocol surveys for the blunt-nosed leopard lizard (BNLL). In consultation with Dave Hacker of the California Department of Fish and Game (CDFG) during a meeting at the San Luis Obispo CDFG office on April 17, 2008, it was agreed upon that protocol surveys for these two species could be conducted simultaneously.

Field surveys for the Nelson's antelope squirrel covered 1,584 acres of potentially suitable habitat within the PSA in 2008. An additional 229 acres of habitat was surveyed in 2009. Nelson's antelope squirrels were not detected in 2008 or 2009. In 2010, approximately 2,010 acres of annual grassland habitat was surveyed. The 12 full passes conducted for the 2010 BNLL adult period confirmed Nelson's antelope squirrels do not occur within the 2010 survey area.

**C. Pallid bat** (*Antrozous pallidus*) is a California Special Concern species. This is a large, long-eared bat occurring throughout the state from deserts to moist forests. *Antrozous pallidus* is primarily a crevice roosting species and selects roosts where

they can retreat from view. They frequently occur in oak woodlands where they roost in tree cavities. These roosts are generally day or night roosts for one or a few bats. Attics may be used as roosts and during hot days they may emerge from crevices and roost on open rafters. Communal wintering or maternity colonies are more common in rock crevices and caves. Pallid bats are known to roost and forage in the Carrizo Plain region (CNDDB 26, 281, 287, 288, 290). Numerous specimens have been collected in the Carrizo Plain region, and roosts have been identified in rock outcroppings and abandoned buildings. Potentially suitable roost areas are located in buildings within Sections 16, 18, 22, 27, 28, and 33. Visual surveys of structures in Sections 27, 28, and 33 found no evidence of roosting bats. Structures in Sections 16, 18, and 22 are not abandoned and were not surveyed. We expect pallid bats may forage in grassland and cropland habitats within the PSA seasonally, but do not roost on site.

**D. Golden Eagle** (*Aquila chrysaetos*) is a California Species of Special Concern. It is not listed under the California Endangered Species Act (CESA) or the Federal Endangered Species Act (FESA). Golden eagles are designated a Fully Protected species by the California Department of Fish and Game (CDFG). The primary federal legislation governing golden eagles is the Federal Bald and Golden Eagle Protection Act.

Golden eagles occur throughout the western United States, Alaska, and large portions of Canada and Mexico. They occupy nearly all habitats in the western U.S., including deserts, grasslands, woodlands, and all but the densest forests where hunting is impractical (Johnsgard 1990). Highly adaptable, golden eagles readily occupy habitats where basic needs are met. These basic needs include suitable nesting sites (typically large trees or cliffs), dependable food supplies, and large open areas for foraging.

California supports both wintering and nesting golden eagle populations. In winter, regional populations increase with the influx of northern breeders that migrate south. Occupied wintering habitats often contain a mix of adult and sub-adult birds. Golden eagles do not form large wintering congregations in California, as is reported for bald eagles in Alaska and elsewhere, however they can be abundant in some regions. As the nesting season commences, territorial behaviors limit the number of golden eagles in a particular area. Territory size of a breeding pair is highly variable, depending upon the resources available. Average breeding territories reported in Southern California are approximately 36 square miles. In Northern California, territories are approximately 48 square miles (Johnsgard 1990). One of the highest densities reported for the species is from the vicinity of the Altamont Pass Wind Energy Resource Area east of the San Francisco Bay near Livermore, where at least 44 pairs were documented in an area of approximately 317 square miles (Hunt 1998). The eagle density was thus one pair every 7.3 square miles. In less productive environments, or where potential nest sites are scarce, breeding territories of up to 60 square miles are reported (Johnsgard 1990).

The Carrizo Plain region, extending from the southern tip of the Carrizo Plain National Monument to the extreme northern end of the plain north of the PSA, and

including portions of both the Temblor Range and the Caliente Range, is approximately 500,000 acres (781 square miles) in size. Based on estimated average territory sizes for Southern and Northern California, this area could support between 16 and 22 breeding pairs if sufficient nesting sites and prey availability are present.

The approximately 10,000-acre (15.6 square mile) PSA contains limited potential nesting habitat for golden eagles. Trees associated with abandoned ranch compounds are very poorly suited for golden eagle nest construction. The PG&E towers that pass through the PSA could be utilized for nesting purposes by golden eagles; red-tailed hawks and ravens presently nest on the towers within the PSA. There are no cliff faces or other suitable nesting areas on site. Golden eagles did not nest within the PSA in 2008, 2009, or 2010. Grassland and cropland habitats within the PSA are suitable foraging grounds for golden eagles, especially in winter (refer to Section 7.0 for details of golden eagle nest survey methods and results).

**E. Short-eared Owl** (*Asio flammeus*) is one of the most globally widespread of all owls (Peeters 2007); however it is declining in certain areas of its range and is designated as a Species of Special Concern in California. The short-eared owl can be active by day and night, and usually roosts and nests on the ground, concealed by tall grass or other vegetation. It is a year-round resident in select areas of California, where its breeding range fluctuates with prey availability. In drought years, when prey availability is reduced, the breeding range contracts (Shuford 2008). In winter, the California population of short-eared owls inflates dramatically with the influx of migrants. In the winter it often roosts communally and may sometimes roost in trees. Short-eared owl prey commonly includes small mammals such as vole, shrew, pocket gopher, and pocket mice and occasionally small birds. Short-eared owls are reported as uncommon residents in the Carrizo Plain region (Cooper 2004). Short-eared owls were not detected within the PSA, but could forage on-site. Habitats within the PSA are unlikely to attract short-eared owls for nesting.

**F. Long-eared Owl** (*Asio otus*) is a California Species of Special Concern that prefers riparian habitats as well as belts of live oak paralleling stream courses. The long-eared owl requires adjacent open land for foraging and the presence of old nests of crows, hawks, or magpies for breeding. Old nests are present in large trees planted within ranch compounds throughout the PSA and may provide limited potential nesting habitat. The nearest reported occurrence is located approximately 13.8 miles southeast of the PSA. Two adults and three fledglings were observed nesting in a blue oak near the Chimineas Ranch headquarters. Habitat consisted of oak woodland, annual grassland, and mixed chaparral (CNDDB 53). Long-eared owls were not detected within the PSA. We expect the long-eared owl could roost on rare occasion in trees within the PSA, but do not regularly roost on site. Long-eared owls did not nest within the PSA in 2008, 2009, or 2010.

**G. Burrowing Owl** (*Athene cunicularia*) is a California Species of Special Concern that prefers open, dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Burrowing owls usually nest in abandoned burrows of ground squirrels, badgers, or other small mammals, although they may dig their own

burrow in soft soil. Primarily nocturnal, the burrowing owl hunts insects, small mammals, and birds from a perch or in low flights. During daylight hours they are often seen perched conspicuously at the entrance to their burrow. Rosenberg (2007) conducted a study in grassland habitats of the Carrizo Plain National Monument and found burrowing owl nests were present at an average density of one nest per 1.4 square kilometers (346 acres) of suitable nesting habitat. Nesting territories are generically defined as a 100-meter radius around an occupied nest in which the owls regularly utilize satellite burrows (Rosenberg 2007). Burrowing owls show high site fidelity from year to year, and therefore it is recommended that a site be considered occupied if a burrowing owl has been observed occupying a burrow within the last three years (California Burrowing Owl Consortium 1993).

Approximately 3,463 acres of annual grassland habitat is present within the PSA, with varying suitability for burrowing owls. If all grassland areas of the PSA are suitable for nesting, the PSA could potentially support 10.6 breeding pairs at a nest density of one nest per 346 acres. We detected burrowing owls at wintering and nesting den sites in grasslands within Option A and Option B. Nesting and wintering sites could vary from year to year (refer to Sections 7.2.5 and 7.3.5 for details of burrowing owl survey methods and results).

**H. Vernal Pool Fairy Shrimp** (*Branchinecta lynchi*) is a federally listed threatened species, and **Longhorn Fairy Shrimp** (*Branchinecta longiantenna*) is a federally listed endangered species; neither is listed under the California Endangered Species Act. These rare fairy shrimp occur in vernal pools and other ephemeral pool types in the Carrizo Plain region. Appropriate seasonal aquatic habitat is present for fairy shrimp in various ephemeral pool types throughout the PSA, and in puddles in existing agricultural roads. Vernal pool fairy shrimp were detected in vernal pools in Section 4, and longhorn fairy shrimp were detected in Section 20 during protocol wet season surveys in the winter of 2010 by Advantage Environmental Consultants, LLC (refer to Section 7.3.4 for details of protocol surveys).

**I. Ferruginous Hawk** (*Buteo regalis*) is a California Species of Special Concern that winters in grassland habitats in California. It does not breed in San Luis Obispo County, but is considered a sensitive wintering raptor. Ferruginous hawks choose open perches, both man-made and natural, while they are hunting. They generally feed on small mammals, snakes, insect swarms, and occasionally birds taken on the ground. Ferruginous hawks were observed roosting throughout the PSA in grassland and bare cropland habitats.

**J. Mountain Plover** (*Charadrius montanus*) is a California Species of Special Concern that winters in California and nests in short-grass prairie habitats from Wyoming to New Mexico. In California, the CDFG listing status is for wintering birds. The U.S. Fish and Wildlife Service (USFWS) published a proposed rule to list the mountain plover as threatened in 1999 and again in 2002. In 2003, the listing was withdrawn because new information suggested the threats to mountain plovers were not as serious as previously thought.

The wintering population in California accounts for approximately 50 percent of the total mountain plover population (Andres 2009). Mountain plovers prefer short grass habitats such as heavily grazed pastures, burned fields, fallow fields, and tilled fields (without furrows). Historic wintering colonies in the Central Valley of California were often associated with kangaroo rat precincts and California ground squirrel den complexes (Andres 2009). Wintering (non-breeding) mountain plovers are highly nomadic. Mountain plovers occur regularly in the Carrizo Plain National Monument in low to moderate numbers (a few hundred) primarily from November through March. In winter they are regularly found in the vicinity of Panorama Road, over 20 miles south of the PSA. Mountain plovers were observed foraging on three occasions within the PSA during the 2010 winter season, with a maximum count of 17 individuals.

**K. Lark Sparrow** (*Chondestes grammacus*) is a Special Animal that is a common inhabitant of inland grassland habitats in San Luis Obispo County. Lark sparrows are usually found in open areas near trees or shrubs. They occur infrequently in the PSA, preferring areas with more shrub development. We did not locate any nests, but expect lark sparrows were nesting in Section 8 based on observations of adult breeding behaviors in April and May of 2008 and 2009. In 2010, fledglings were observed along the west PSA boundary fence in Sections 5 and 32, Option A, where they presumably nested in the adjacent olive grove.

**L. Giant Kangaroo Rat** (*Dipodomys ingens*) is listed as an endangered species under the Federal and California Endangered Species Acts. It inhabits the arid southwestern edge of central California's San Joaquin Valley and adjacent valleys and plateaus of the Inner Coastal Ranges, including the Carrizo Plain. Giant kangaroo rats are described by the Endangered Species Recovery Program (ESRP) as inveterate diggers that frequently remodel their burrows, closing old entrances and creating new ones. These burrows also provide shelter for the federally listed endangered blunt-nosed leopard lizard, state-listed threatened Nelson’s antelope squirrel, and other animals. The nearest reported occurrence in the CNDDB is located approximately three miles east of the PSA. The occurrence was recorded in 1979 and is located at the north end of the Carrizo Plain, approximately 3.5 air miles north-northeast of Simmler (CNDDB 110).

Surveys conducted within the PSA for the giant kangaroo rat consisted of visual burrow searches, small mammal trapping studies, and a scat and burrow measurement study (refer to Section 7.3.3 for detailed survey results). The federally listed endangered giant kangaroo rat does not occur within the PSA.

**M. Short-nosed Kangaroo Rat** (*Dipodomys nitratoides brevinasu*) is a California Species of Special Concern that occurs in grasslands with scattered shrubs and desert-shrub associations on friable soils. It occurs along the western edge of the San Joaquin Valley, including in highly alkaline soils near Soda Lake. The only CNDDB record listed for San Luis Obispo County is occurrence 70, from a capture and release study conducted from 1987 to 1991 in an area between the Temblor Mountains and the Carrizo Plain (CNDDB 2010). Habitats within the PSA are poorly suited to short-

nosed kangaroo rat due to the lack of shrub development and the frequent disturbance by farming operations. Small mammal trapping studies were conducted in 2008, 2009 and 2010 (refer to Section 7.3.3 for detailed survey results). The short-nosed kangaroo rat does not occur within the PSA.

**N. White-tailed kite** (*Elanus leucurus*) is a Fully Protected species that nests primarily in solitary evergreen trees near meadows, marshes, or grasslands. They are often seen perched along roadsides on telephone wires or dead snags. They prey primarily on small rodents. No records of white-tailed kite exist in the vicinity of the PSA; however, it is listed on the Bureau of Land Management's website for Birds of the Carrizo Plain National Monument (BLM 2010). Evergreen trees near scattered homesteads within the PSA could provide low quality nesting habitat. White-tailed kites were not observed during wildlife surveys conducted throughout the PSA.

**O. Kern Primrose Sphinx Moth** (*Euproserpinus euterpe*) is a federally listed threatened species known from Ventura, Santa Barbara, Kern, and San Luis Obispo Counties. This sphinx moth is a medium-sized, day-flying moth that has been found in cropland, hedge rows, grassland, herbaceous areas, shrubland, chaparral, and open weedy areas in desert scrub. The sphinx moth requires the presence of the larval host plant, evening primrose (*Camissonia* ssp.). Grassland and sandy washes provide potentially suitable habitat for the sphinx moth. Potential low quality habitat is present in sandy washes that contain patches of *Camissonia strigulosa* in Section 4 of the PSA (Arnold 2010). A single-day survey by Richard Arnold of Entomological Consulting Services Ltd. did not detect the Kern primrose sphinx moth (refer to Section 7.3.2 for detailed survey results).

**P. Merlin (***Falco columbarius*) is a Special Animal that winters in various habitats in San Luis Obispo County. Merlins do not breed locally, but are considered a sensitive wintering raptor. Appropriate wintering habitat is present within the PSA. The wide-open spaces and abundance of wintering horned larks, savannah sparrows, and other prey provide very good foraging habitat. Merlins were observed hunting in several areas within the PSA during 2010 winter bird surveys.

**Q. Blunt-nosed Leopard Lizard** (*Gambelia sila*) is a federal and state-listed endangered species. It is a Fully Protected species by CDFG, meaning no take may be authorized. Blunt-nosed leopard lizards live in the San Joaquin Valley and Carrizo Plain in expansive, arid areas with scattered vegetation. They inhabit non-native grassland and alkali sink scrub communities of the valley floor marked by poorly drained, alkaline, and saline soils. Insects comprise the major portion of their diet, although other lizards also are eaten. They are opportunistic when foraging for animals, feeding on whatever prey is of appropriate size for capture and consumption. BNLL use small mammal burrows such as those of ground squirrels and kangaroo rats for permanent shelter and dormancy. Seasonal activity above ground depends on weather conditions, especially temperature. The optimum activity period occurs when air temperatures are between 77 and 95 °F and soil temperatures are between 86 and 122 °F. The breeding season begins in April and lasts into or through June. Eggs are laid in June and July, with young emerging in August or September. The nearest

recorded occurrence, from July of 1958, is located approximately 13.5 miles south of the PSA, 8.75 miles northwest of Painted Rock (CNDDB 134).

A protocol level survey for BNLL was conducted in 2008 on 1,584 acres of the land. The survey area included portions of the PSA, and some surrounding lands that are no longer part of the project proposal. A second protocol level survey for BNLL was conducted in 2009 in suitable grassland habitat within parcels added to the PSA in early 2009. For each survey, all areas of potentially suitable habitat were surveyed 17 times; 12 surveys for adult BNLL were conducted in the spring and five surveys for juveniles were conducted in the fall. The BNLL was not detected during the 2008 and 2009 protocol surveys. A third protocol survey is presently being conducted on 2,010 acres within the PSA. As of July 15 BNLL had not been detected during 12 full-coverage passes for the adult survey period. A 2010 protocol survey report will be provided as an addendum to this report in September 2010 after completion of five full-coverage passes for the juvenile survey period.

**R. Lesser Sandhill Crane** (*Grus canadensis canadensis*) **and Greater Sandhill Crane** (*Grus canadensis tabida*) are uncommon winter visitors to the Carrizo Plain. The lesser sandhill crane is a California Species of Special Concern and the greater sandhill crane is a State-listed threatened species. The most common subspecies inhabiting the Carrizo Plain National Monument are lesser sandhill cranes with approximately 5 to 10 percent of the population estimated to be greater sandhill crane. Sandhill cranes are closely associated with standing water in Soda Lake and forage in nearby farm fields. Preferred night roosting sites are associated with shallow water, an open shoreline, level terrain, and isolated locations away from human disturbance. Cranes have been observed flying between Soda Lake habitats and the San Joaquin Valley during the winter season. Historically, sandhill cranes were present annually at the Carrizo Plain from November to February, but numbers have dropped dramatically. No cranes have been recorded during the last four Carrizo Plain Christmas Bird Counts dating back to December 31, 2005 (National Audubon Society 2009). Sandhill cranes were not observed within the PSA, but could potentially forage in low numbers within the PSA during years when Soda Lake has filled.

**S. California Condor** (*Gymnogyps californianus*) is a federal and state-listed endangered species. It is a Fully Protected species by CDFG, meaning no take may be authorized. Condors utilize vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges of moderate altitude. Deep canyons containing clefts in rocky walls provide nesting sites. The California condor may forage up to 100 miles from its nightly roosting site.

From the late 1970's until 1987, wild condors foraged in foothills bordering the San Joaquin Valley, including San Luis Obispo County. The Elkhorn Hills-Cuyama Valley-Carrizo Plain complex and the southern San Joaquin Valley were the primary feeding areas for wild condors after 1982 (USFWS 1996b).

The United States Fish and Wildlife Service designated nine critical habitat areas for the California Condor, including one area in San Luis Obispo County. The area in San Luis Obispo County is split into the East and West Units of the High Mountain-

Beartrap Condor Area. The PSA is situated approximately 5.5 miles east of the closer 8,320 acre East Unit. The Carrizo Plain is not part of a critical habitat area for the California Condor, although its proximity and potential food sources make it suitable foraging habitat.

There are no adequate roosting or nesting areas within the PSA for California Condors. However, large open areas for foraging are present, and cattle and wild ungulate carcasses in the region may provide feeding opportunities that could attract condors to the Carrizo Plain periodically. The California condor could potentially feed within the PSA if a large mammal carcass was present. Condors were not observed in the vicinity of the PSA during our 2008, 2009 and 2010 field surveys.

**T. Bald Eagle** (*Haliaeetus leucocephalus)* is delisted from FESA, and is listed as endangered under CESA. The bald eagle is a Fully Protected species, with additional protections provided under the Federal Bald and Golden Eagle Protection Act. Bald eagles are wide ranging migrants that typically nest within one mile of water. In San Luis Obispo County, there is a small nesting population of reintroduced bald eagles at Lake Nacimiento, and recent records of a nest at Santa Margarita Lake and possibly Lopez Lake. Adults and young are wide ranging and often migratory. Preferred prey is fish, although they will occasionally hunt water fowl, small mammals, and will scavenge carrion. Migrating or transient bald eagles will hunt ground squirrels and other prey, or feed on carrion, on the Carrizo Plain during the non-breeding season. A bald eagle was observed in the vicinity of the PSA in February 2008 (DFG 2008c). We observed an adult bald eagle along Bitterwater Road at the west edge of Section 18 of the PSA in March 2009. A sub-adult bald eagle was observed in Section 32 of the PSA in February 2010. These and other observations in the region suggest bald eagles occasionally forage on the Carrizo Plain during the non-breeding season; however, no breeding habitat is present.

**U. San Joaquin Whipsnake** (*Masticophis flagellum ruddocki*) is a California Species of Special Concern known to occur in the Sacramento Valley, San Joaquin Valley and in the South Coast Ranges. The San Joaquin whipsnake prefers open, dry, treeless areas, including grassland and saltbush scrub and typically takes refuge in rodent burrows, under shaded vegetation, and under surface objects. Suitable habitat is present within the PSA for the San Joaquin whipsnake. The closest occurrence reported in the CNDDB is a road-killed specimen collected on Seven Mile Road near Highway 58, approximately 10 miles southeast of the PSA (CNDDB 63). The San Joaquin whipsnake was not observed during our wildlife surveys or during the protocol survey for the blunt-nosed leopard lizard within the PSA in 2008, 2009 and through July of 2010. However, a piece of shedded snake skin found in the northeast corner of Section 28 was positively identified by Paul Collins as a shed from a San Joaquin whipsnake. The San Joaquin whipsnake is a highly mobile species that is likely present within the PSA in low numbers.

**V. Tulare Grasshopper Mouse** (*Onychomys torridus tularensis*) is a California Species of Special Concern that occurs along the western margin of the Tulare Basin, including western Kern County, Carrizo Plain, along the Cuyama Valley side of the Caliente Mountains in San Luis Obispo County, and the Ciervo-Panoche region in Fresno and San Benito Counties. Tulare grasshopper mice typically inhabit arid shrubland communities in hot, dry grassland and shrubland communities. They eat mostly arthropods, but may take lizards, frogs, and other small rodents. The closest reported occurrence is approximately seven miles west of the PSA along Placer Creek (CNDDB 31) where one specimen was collected in 1930. Cropland areas of the PSA are poorly suited to sustaining a population of the Tulare grasshopper mouse due to the regular disturbance from the farming operation and lack of shrub cover. Grassland areas of the PSA are moderately suitable. The Tulare grasshopper mouse was detected in one location within the PSA (refer to Section 7.3 for small mammal survey methods and results).

**W. McKittrick Pocket Mouse** (*Perognathus inornatus neglectus*) is a Special Animal closely related to the San Joaquin pocket mouse (*P. inornatus inornatus*). The McKittrick pocket mouse occurs on the western side of the San Joaquin valley and areas to the west in Alameda, Fresno, Kern, Merced, San Benito, San Luis Obispo, and San Joaquin Counties, whereas the San Joaquin pocket mouse occurs on the eastern side and floor of the San Joaquin Valley in Fresno, Kern, Kings, Madera, and Stanislaus Counties. The two subspecies are very similar in appearance, with the McKittrick pocket mouse averaging slightly larger with a relatively longer tail (Best 1993). The McKittrick pocket mouse prefers arid annual grasslands and desert scrub communities, where they dig burrow systems in friable soils. Diet consists mainly of seeds, but some soft-bodied insects and earthworms are eaten. McKittrick pocket mice were commonly captured during small mammal trapping studies conducted within the PSA in 2008, 2009, and 2010 (refer to Section 7.3).

**X. Blainville's (Coast) Horned Lizard** (*Phrynosoma blainvillii*) is a California Special Concern species. Horned lizards are found in dry habitats from coastal dunes to inland deserts. Populations in San Luis Obispo County are widespread, but the lizards are always uncommon. There are no reports of coast horned lizard in the vicinity of the PSA, however suitable habitat is present and horned lizards are known from the Carrizo Plain. The coast horned lizard was not observed within the PSA during our wildlife surveys or during protocol surveys for the blunt-nosed leopard lizard.

**Y. Oregon Vesper Sparrow** (*Pooecetes gramineus affinis*) is a California Species of Special Concern that winters in grassland habitats in California. It nests in the Pacific Northwest from Oregon into Canada. It is considered very rare on its nesting grounds, and is a regular but uncommon winter migrant to the Carrizo Plain and other areas of the Central Coast from mid September to March (Lehman 1994). Winter bird surveys conducted within the PSA in February and March 2009 found Oregon vesper sparrows to be uncommon winter residents in mixed flocks of savanna sparrows and horned larks. They frequent weedy areas and un-grazed fence lines. Vesper sparrows were not observed during 2010 winter bird surveys within the PSA,

but were seen over 15 miles north of the PSA near the Palo Prieto Conservation Bank on April 9, 2010.

**Z. Western Spadefoot Toad** (*Spea hammondii*) is a California Species of Special Concern known from ephemeral pools in open grassland habitats across the interior region of San Luis Obispo County. During the dry season, spadefoot toads excavate burrows up to three feet deep. Sandy, gravelly, or other friable (crumbly) soil types are a prerequisite to spadefoot toad occurrence. While in the burrows, the toads are completely surrounded by soil and are likely in a state of torpor (USFWS 2005). Between February and May spadefoot toads emerge from their burrows and move into ephemeral pools to breed. The length of time required for larval development from egg to metamorph depends upon environmental factors associated with the breeding pool. Larval development is typically completed in three to eleven weeks. Shallow warm pools with short inundation periods facilitate faster larval development. Deeper cooler pools stall metamorphosis while the larvae attain larger size. After metamorphosis is complete, the young spadefoot toads disperse into the surrounding upland habitat. Little is known about dispersal distances, or minimum habitat size requirements to support a local population.

The nearest reported occurrence of the Western spadefoot toad is from approximately 4.9 miles southeast of the PSA along Soda Lake Road (CNDDB 7). Fourteen Western spadefoot toad breeding localities were documented within the PSA in 2010 (refer to Section 7.3, and BR Map 7 in Section 13.0).

**AA. American Badger** (*Taxidea taxus*) is a California Species of Special Concern known from open grassland habitats throughout San Luis Obispo County and elsewhere in California. Badgers were observed within the PSA in many locations during our surveys. They are residents of grassland areas, but also forage in croplands on occasion in areas where California ground squirrels have become established. They are highly mobile and could be present anywhere within the PSA.

**BB. San Joaquin Kit Fox** (*Vulpes macrotis mutica)* is listed as endangered under the Federal Endangered Species Act, and threatened under the California Endangered Species Act. The Carrizo Plain National Monument population is a core population located in San Luis Obispo County. Prior to our surveys, kit foxes were documented as occurring regularly in the vicinity of the PSA (CNDDB 973, 974, 77, 1112). The San Joaquin kit fox was determined to occur within the PSA, in both Project Options, in 2008, 2009 and 2010. Details of our surveys are provided in Section 7.0, and a map of den locations, direct observations, and camera detections is provided as BR Map 14, Section 13.0).

TABLE 6. SENSITIVE NATURAL COMMUNITIES. Two sensitive natural communities reported from the region are listed.

| | Common Name | Federal/State Status Global/State Rank | Potential Habitat? |
|---|---|---|---|
| 1. | **Northern Claypan Vernal Pool** | None/none G1/S1.1 | Yes. Vernal pools occur in the PSA. Vernal pools on site do not fit described classifications of sensitive natural community types, however they are sensitive habitats. Refer to discussion in Section 5.2.3. |
| 2. | **Valley Sink Scrub** | None/none G1/S1.1 | No. Valley sink scrub habitat is not present within the PSA. Shrubs and other vegetation typical of sink scrub habitat are not present. |

### *4.1.7 Special status species not expected to occur within the PSA*

The remaining 27 special status species reported to occur in the La Panza NE, California Valley, La Panza, La Panza Ranch, Holland Canyon, Packwood Creek, Shale Point, Las Yeguas Ranch, Simmler, Chimineas Ranch, Branch Mountain, and Los Machos Hills quadrangles are not expected to occur within the PSA due to the absence of required soil type, lack of appropriate habitat, or because the PSA is substantially outside the known range of the species.

### *4.1.8 Tule elk and pronghorn antelope*

Tule elk (*Cervus elaphus nannodes*) and pronghorn antelope (*Antilocarpa americana*) herds in the Carrizo Plain and elsewhere in the state of California are managed by the California Department of Fish and Game. They are reintroduced herds, with local groups that live year round in the Carrizo Plain National Monument (CPNM) and surrounding public and private lands. CDFG tracks the population status and movement patterns of both species (refer to BR Maps 3 and 4 in Section 13.0). The number of hunting tags issued annually is based on population status. Tule elk and pronghorn antelope are not listed under FESA or CESA, and are not designated as Species of Special Concern by CDFG. Both animals are regulated game mammals (CDFG code 3950) that are provided protections under CEQA typical to any wildlife species (refer to Section 8.3).

The Fish and Game Code provisions regarding elk primarily deal with management and regulation of hunting of the animals, and provide the Department with the ability to move elk. The Code provisions regarding pronghorn antelope only address hunting regulations and define the animal as a game mammal. No special protection is afforded these species. Regarding tule elk, Fish and Game Code section 3951 states:

> *"The commission may authorize the taking of tule elk pursuant to Section 332. When relocating tule elk, the department shall relocate the elk in areas suitable to them in the state and shall cooperate to the maximum extent possible with Federal and local agencies and private property owners in relocating tule elk in suitable areas under their jurisdiction or ownership. When property or environmental damage occurs, emphasis shall be placed on managing each tule elk herd at a biologically sound level through the use of relocation, regulated hunting, or other appropriate methods, individually or in combination, as determined by the department in accordance with the statewide elk management plan developed pursuant to Section 3952, after consulting with local landowners."*

### *4.1.9 Sensitive natural communities and special aquatic sites*

The CNDDB recognizes several types of vernal pools as sensitive natural communities, including Northern claypan vernal pools, San Jacinto Valley vernal pools, and San Diego Mesa claypan vernal pools that share some characteristics with vernal pools located in the PSA. However, vernal pools in the PSA do not fit habitat descriptions or typical species composition for vernal pool habitats listed as sensitive natural communities. See Section 5.2.3 for more discussion of vernal pools in the PSA compared with listed vernal pool alliances.

A delineation of wetlands and other waters of the U.S. was prepared for the project in 2010 (Althouse and Meade, Inc. and Huffman-Broadway Group, Inc. 2010). Delineation of wetlands and waters was performed according to federal standards presented in the 1987 Army Corps of Engineers *Wetlands Delineation Manual*, the 2008 *Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States: A Delineation Manual*, and the 2008 Army Corps of Engineers *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*. The Army Corps of Engineers (USACE) uses a three-factor approach to defining wetlands, requiring presence of hydric soil, wetland hydrology, and dominance of hydrophytic vegetation over an area at least five feet in diameter to define a wetland. Discussion of wetland and other aquatic habitat types in this biological report are intended as discussion of habitat function and value, and do not consider jurisdictional status. Refer to the 2010 wetland delineation for a complete discussion of findings and potential regulatory jurisdiction over wetland and other federal jurisdictional surface waters.

# 5.0 Habitat Types

## 5.1 Habitat Survey Methods

Each habitat type occurring within the PSA was inspected, described, and catalogued. Representative photographs were taken of each land Section, of all habitat types, and of native plants and animals where feasible. Representative photographs of all habitat types are provided in Photo Collection 2 in Section 14.0. Agricultural fields plowed bare and planted with grain were surveyed by ATV and on foot. An ATV was used to scout cropland fields and cropland fence lines in order to locate any areas of non-crop vegetation, wetlands, drainage channels, or other sensitive resources. Annual grasslands were systematically surveyed by walking transects with two to eight surveyors at a time (refer to Botanical Transect Methods, Section 6.1.1). Habitat features, variation in vegetation type, and aquatic habitat type locations were identified during transect walking surveys and during an aerial survey. The aerial survey was conducted in a Cessna 172XP airplane flying at slow speeds during peak inundation of aquatic habitats in March 2010. High-resolution photographs taken from the plane were geo-referenced using Arc-GIS software, and the approximate coordinates of pools were sent to teams on the ground for field verification. We investigated all non-drainage aquatic habitats for hydrophytic vegetation, wetland hydrology, and hydric soils.

## 5.2 Habitat Types in the PSA

We describe eight habitat types within the PSA: cropland (6,205 acres), California annual grassland (3,463 acres), vernal pool (2.2 acres), ephemeral wetland depression (0.7 acres), natural non-wetland pool (0.7 acres), anthropogenic non-wetland pool (0.77 acres), agricultural reservoir (0.04 acres) and anthropogenic (28 acres). Table 7 provides habitat acreages by project Option. Ephemeral drainages within the PSA are described in detail in the TSF wetland delineation (Althouse and Meade, Inc. and Huffman-Broadway Group, Inc. 2010), and are not discussed here as a habitat type. BR Map 1 in Section 13.0 indicates the locations of each habitat type within the PSA. Photo Collection 3 in Section 14.0 contains representative photographs of each habitat type.

All habitat types within the PSA are either created for or by agricultural activities, or show signs of past agricultural management practices (refer to Land Use History map, Figure 5, Section 12.0). No habitats remain within the PSA in their natural condition. Croplands are those areas that are in active agricultural use as of the 2010 spring season, either planted with grain, plowed bare, or fallow less than three years. Annual grasslands were historically farmed, but most have not been farmed for many years and are now dominated by introduced annual grasses typical of grasslands in the region. Anthropogenic areas indicate residences or abandoned buildings and associated lands. Ephemeral aquatic habitat types are distinguished based on flora and fauna present and length of inundation.

TABLE 7. HABITAT ACREAGES. Acreages of each habitat type are provided separately for the entire PSA, Option A, and Option B. Note that the project Options overlap and the combined total of acreages does not equal the size of the PSA acreage for each habitat type.

| Habitat Type | PSA (Acres) | Option A (acres) | Option B (acres) |
|---|---|---|---|
| Cropland | 6,205 | 4,380 | 4,712 |
| California Annual Grassland | 3,463 | 3,356 | 1,689 |
| Vernal Pool | 2.2 | 2.2 | 0.1 |
| Ephemeral Wetland Depression | 0.7 | 0.6 | 0.6 |
| Natural Non-wetland Pool | 1.1 | 1.0 | 0.2 |
| Anthropogenic Non-wetland Pool | 0.77 | 0.7 | 0.1 |
| Agricultural Reservoir | 1,742 sq. ft. (0.04 acres) | 1,742 sq. ft. (0.04 acres) | 1,742 sq. ft. (0.04 acres) |
| Anthropogenic | 28 | 23 | 25 |

### *5.2.1 Cropland*

Land in varying stages of dry-farm production constitutes approximately 6,205 acres, or 64 percent, of the PSA. Option A includes approximately 4,380 acres and Option B includes approximately 4,712 acres of cropland habitat. The cropland habitat designation includes fields planted to grain and fields left bare during rotation. Farming on the parcels utilizes a summer fallow program. Summer fallow is the practice of idling farmland and removing weeds for up to 14 months to allow soil moisture to increase. Barley and wheat, non-irrigated grain crops planted in alternate years, are harvested for grain and then the stubble is used for cattle grazing. Herbicides are regularly used to control weeds in planted fields. Cropland habitat supports few native plant species, and is generally low quality wildlife habitat.

Although wildlife use of the cropland habitat is limited, several species are regular inhabitants. Ferruginous hawk is a Species of Special Concern that winters in the region, and was observed roosting on the bare ground croplands in the PSA. Deer mice (*Peromyscus maniculatus*) occur in fallow grain fields, notably along fence-lines. Mammals such as kit fox and badger may forage for squirrels and other rodents that live in the habitat. San Joaquin kit fox were photographed by motion detecting camera moving regularly along a fence line on bare cropland field adjacent to annual grasslands in Section 21 in spring 2008. Farm fields are used as resting and feeding areas for elk and pronghorn antelope and as late season grazing habitat when bindweed (*Convolvulus arvensis*), a preferred forage plant, becomes common.

### *5.2.2 California annual grassland*

Annual grassland habitat constitutes approximately 3,463 acres, or 36 percent, of the PSA. Option A includes approximately 3,356 acres, and Option B includes approximately 1,689 acres. It is a dry seasonal habitat consisting of low-lying annual grasses and forbs. California annual grassland habitat in the PSA is dominated by non-native and native annual grass species, with varying percentages of native and introduced forbs. This habitat type is ubiquitous throughout the State of California where cultivation and grazing for the past century or more has converted native annual or perennial grasslands to annual grasslands. Throughout its range the California annual grassland habitat type takes on many forms, and the PSA likewise contains several forms depending upon the land use history. The CRP lands within the PSA have been untilled for at least 20 years and generally show significant recovery in terms of native forb diversity and abundance. These areas include Sections 4, 5, 8, 26, 34 and 35. Some areas of the PSA, such as Sections 16 and 28, were removed from farming more recently. These grasslands are predominantly composed of introduced annual grasses and support a lower diversity of native forbs and grasses.

Early season vegetation in all grasslands within the PSA is dominated by redstem filaree (*Erodium cicutarium*), an introduced species. CRP lands develop large areas of native annual fescue (*Vulpia microstachys*) with significant patches of soft chess brome (*Bromus hordeaceus*) and introduced annual fescue (*Vulpia myuros*). In addition, native wildflowers such as *Layia platyglossa, Lupinus bicolor*, *Castilleja* ssp., and *Lasthenia gracilis* are common to abundant. Other native forbs common in the CRP grasslands are *Microseris* ssp., *Uropappus lindleyi*, *Stebbinsoseris heterocarpa*, *Lotus humistratus*, and *Calandrinia ciliata*.

Fallow agricultural fields that have recently reverted to annual grasslands tend to be dominated by introduced annual grasses such as wild oats (*Avena fatua*), soft chess brome, introduced annual fescue, and foxtail barley (*Hordeum murinum*). Common and sometimes abundant native wildflowers include the native Great Valley phacelia (*Phacelia ciliata*) and several species of fiddleneck (*Amsinckia menziesii*, *A. lycopsoides*, and *A. tessellata*).

Grassland habitat within the PSA is suitable for several special status animal species. American badger (*Taxidea taxus*) and burrowing owl (*Athene cunicularia*) occur regularly in all grassland areas. San Joaquin kit fox (*Vulpes macrotis mutica*) was

documented using grassland habitat for denning and foraging. In addition, several special status plants occur in the grassland habitat on site.

### *5.2.3 Vernal pool*

Forty-seven vernal pools occur within the PSA, with a complex of vernal pool/upland mosaic concentrated in Option A, Section 4, and scattered vernal pools in Sections 19, 20, 32, and 35. All 47 vernal pools are within Option A, and 2 vernal pools are located within Option B. Vernal pool habitat occurs over approximately 2.2 acres (92,347 square feet) of the PSA, with approximately 2.2 acres situated within Option A and 0.1 acre in Option B. Vernal pools within the PSA occur in topographic depressions that are isolated from drainages and do not, under normal circumstances, experience flow of water. They occur in shallow loamy soil up to 8 inches deep over an abrupt textural change to clay at 6 to 8 inches depth. A continuous, cemented hardpan was not encountered during pits excavated as part of wetland delineation, although exposed bedrock of marine sedimentary mudstone and sandstone is visible in a streambed adjacent to these vernal pools, at approximately 24 to 36 inches depth. The Carrizo Soil Survey identifies Pinspring, a soil map unit component mapped across the site, as having a sandy loam horizon weakly cemented by silica at 30 to 39 inches depth. A backhoe pit was not excavated to avoid unnecessary damage to sensitive vernal pool habitat and surrounding upland during the wet season, but would be required to determine whether the exposed layer observed in the streambed is bedrock or cemented soil.

Vegetation typically consists of several species from a suite of plant species strongly affiliated with vernal pools in the region, including hair grass (*Deschampsia danthonioides*), water starwort (*Callitriche marginata*), water pygmyweed (*Crassula aquatica*), mousetails (*Myosurus minimus, M. sessilis*), woolly marbles (*Psilocarphus brevissimus, P. chilensis*), inch-high rush (*Juncus uncialis*), pillwort (*Pilularia americana*) and alkali plagiobothrys (*Plagiobothrys leptocladus*). Many of these pools also support another species of woolly marbles (*P. oregonus*), toad rush (*Juncus bufonius*), wandering speedwell (*Veronica peregrina*), loosestrife (*Lythrum hyssopifolia*), and adobe allocarya (*Plagiobothrys acanthocarpus*), but these species also occur in other mesic habitat types in the PSA and do not have a high fidelity to vernal pool habitat. Not all vernal pools in the PSA have all species listed here, but vernal pools we mapped had at least two species with high fidelity to vernal pool habitat in the region (meaning they typically occur in vernal pools and not in other habitats).

Vernal pool habitat includes several pools that have not been farmed for 20 years or more in Sections 4 and 35, as well as a few additional pools that have been regularly disturbed by farming activities in the last 2 years, in Sections 19, 20, and 32. Pools in Sections 19 and 20 were planted with barley in 2010; pools in Section 32 were fallow two years then plowed in 2010. Despite plowing and planting activities in 2009-2010, these pools support *Psilocarphus* spp., *Plagiobothrys leptocladus*, *Myosurus* spp., *Crassula aquatic*, and *Callitriche marginata.* Cultivated barley is generally absent from within vernal pools because it does not tolerate long periods of inundation, although it may be present around the upper margins.

Vernal pools on site also had strong indication of wetland hydrology via biotic crusts, algal mats, and oxidized rhizospheres, as well as clear indication of hydric soils. Many

vernal pools in the PSA support fairy shrimp (*Branchinecta* spp.) and many other aquatic invertebrates including seed shrimp, backswimmers, and *Daphnia*. A few of the larger pools also support breeding Western spadefoot toads.

Adjacent upland habitat surrounding undisturbed vernal pools supports a variety of wildflowers and grasses, including *Vulpia microstachys*, *Bromus madritensis* ssp. *rubens*, *Erodium cicutarium*, *Lasthenia gracilis*, *Microseris douglasii* ssp. *tenellus*, and *Castilleja* ssp. In farmed vernal pools, surrounding vegetation is predominantly cultivated barley.

Classification of vernal pools has been addressed through several approaches, at several scales, ranging from a system based solely on landform to a system presented in the Manual of California Vegetation based on geographic region, type of aquatard, and indicator species, to the recently developed vernal pool vegetation classification system, which identifies three orders of plant communities based on studies of how species co-occur (Solomeshch et al, 2007; Solomeshch and Barbour, 2008; Sawyer and Keeler-Wolf, 1995). Sawyer and Keeler-Wolf (1995) initially identified eight vernal pool groups from an ecosystem approach. In the 1995 edition of the Manual of California Vegetation, the authors note the difficulties associated with classifying vernal pools. Vernal pools in the PSA lack *Downingia*, a common vernal pool plant, and do not fit well with any of the descriptions under the Sawyer Keeler-Wolf scheme. Species composition is most similar to San Diego mesa claypan vernal pools or San Jacinto valley vernal pools. However, geographic location, soil conditions, and species diversity vary. Also, presence of an abrupt increase in clay content and shallow bedrock/weakly cemented hardpan are more similar to Northern claypan vernal pools, but species composition described in the Manual for this alliance is not consistent with our site observations, with only one of the described species for this alliance observed on the PSA.

Using the Solomesch and Barbour key (2008), vernal pools in the PSA clearly meet diagnostic criteria for vernal pool vegetation, with seven of the listed diagnostic species regularly occurring on the site. Vernal pools occurring within the PSA best fit the *Lasthenia fremontii-Downingia bicornuta* group of alliances (in spite of the fact that neither species named in the alliance title occur in the PSA) due to freshwater conditions, absence of spikerush, and presence of *Deschampsia danthonioides* and *Psilocarphus brevissimus*. The association occurring in the PSA has not been classified and does not key any further than group of alliances in the Solomesch-Barbour key because the appropriate combination of species and substrate are not an option in this key.

Vernal pools observed in the PSA do not fit any of the described alliances or vernal pool "types" very well, and do not match criteria for vernal pool habitats listed as sensitive natural communities by the CNDDB (refer to Section 4.1.9). Although they do not match published descriptions, they do qualify as vernal pools for reasons described above, and should be regarded as sensitive habitat types.

### *5.2.4 Ephemeral wetland depression*

Some isolated pools occur in the PSA that do not meet criteria for vernal pools, although they do support wetland vegetation, have hydric soils, and wetland hydrology. These pools occur in both project Options, specifically in Sections 4, 15, 16, 18, and 35, and have a total area of 0.7 acres (30,006 square feet). These features are described as ephemeral wetland depressions. Typical vegetation includes *Polygonum arenastrum*,

*Psilocarphus oregonus*, *Veronica peregrina*, *Plagiobothrys acanthocarpus* and *Chamomilla suaveolens*. Ephemeral wetland depressions are not considered vernal pools because they lack plant species with high fidelity to vernal pools in the vicinity (refer to Section 5.2.3, above). Ephemeral wetland depressions in the PSA vary in size from approximately 250 square feet to nearly 5,000 square feet.

Vegetation is sparse and stunted in the ephemeral wetland depressions. Some pools contain clear redoximorphic features such as oxidized rhizospheres and redoximorphic concentrations in the soil matrix and pore linings. Others lack clear indication of hydric soils, probably due to a number of factors, including high soil pH, which interferes with formation of visible iron oxides; low carbon, which slows microbial activity that usually generates redoximorphic features in soil; and ephemeral nature of the pools. These problematic soils meet USACE criteria for problematic hydric soils because water is ponded or soil is saturated for more than 14 days continuously (USACE 2008, p. 101).

The presence of ponded water in the ephemeral wetland depressions appears to be very limited, but may be suitable breeding habitat in some years for the Western spadefoot toad (*Spea hammondii*), a California Species of Special Concern, and is potential habitat for common and federally listed fairy shrimp. Ephemeral wetland depressions in Section 16 did not fill in 2009, while two filled in 2010.

### *5.2.5 Natural non-wetland pool*

Numerous naturally occurring pools that do not meet wetland criteria due to absence of hydric soils and/or non-dominance of hydrophytic vegetation occur within the PSA. The pools are situated within both project Options in Sections 4, 15, 17, 20, 29, 32 and 34, occupying a total of approximately 1.1 acres. Some hydrophytic plant species such as *Plagiobothrys leptocladus*, *Plagiobothrys acanthocarpus*, and *Psilocarphus oregonus* are present in low quantities but do not form dominant cover. Upland species are present in equal or greater quantities, including such species as *Plagiobothrys canescens*, *Chamomilla suaveolens*, *Erodium cicutarium*, and *Microseris douglasii* ssp. *douglasii*. In Section 20, cultivated barley, while stunted, continues to grow as one of the dominant species in the non-wetland pools observed, whereas in vernal pools in section 20, this saturation-intolerant species is absent. Despite lacking dominance of hydrophytic vegetation, in years with above average rainfall, these naturally occurring non-wetland pools provide habitat for fairy shrimp and other aquatic invertebrates, and larger pools provide potential breeding habitat for spadefoot toads.

### *5.2.6 Anthropogenic non-wetland pool*

Use of unpaved roads during the wet season has generated many ruts and depressions within the roadways that, while not meeting criteria for wetlands due to lack of hydric soils and/or non-dominance of hydrophytic vegetation, do provide poor quality habitat for aquatic invertebrates and spadefoot toads in wet years. These pools occupy approximately 0.77 acre of the PSA, and are separated from naturally occurring non-wetland pools because they are more transitory in nature, with pools being created or enlarged during the wet season and eliminated during regular road maintenance in the dry season. Some hydrophytic species, such *Plagiobothrys acanthocarpus* and *Psilocarphus oregonus*, are present in low quantities but do not form dominant cover and often form

less than five percent total cover. Upland species are present in equal or greater quantities, including *Chamomilla suaveolens* and *Lepidium nitidum* var. *nitidum*.

### *5.2.7 Agricultural reservoir*

Four agricultural reservoirs are located within the PSA. Two of the reservoirs are dilapidated and no longer are capable of holding ponded water, and therefore are not considered potential aquatic habitat. These are located in Sections 28 and 29, and are not indicated on the habitat map. They both were created above ground by earthen berms, and were one time plumbed so that they could be filled from a well and water could be pumped for irrigation. The piping is dilapidated and no longer usable.

Two reservoirs, one in Section 20 and one in Section 28, hold water and are indicated on the habitat map. The one in Section 20 filled with rainwater to several feet deep in 2010, and was used by Western spadefoot toads as a breeding pool. Insufficient water was present in 2008 and 2009 for spadefoot toad breeding. Several pronghorn antelope were observed resting in this reservoir in May 2008 when it was dry. In Section 28, the westernmost reservoir held a few inches of rainwater in 2010 and was filled by a well in April 2010. Pacific chorus frog, Western toad, and Western spadefoot toad larvae were detected during aquatic amphibian dip-net surveys (refer to Section 7.3.7).

### *5.2.8 Anthropogenic*

All areas within the PSA that are heavily influenced by human development are mapped and described as anthropogenic habitat. Anthropogenic habitat includes abandoned and occupied ranch compounds and other structures within both project Options, specifically in Sections 16, 18, 21, 22, 28 and 33. Approximately 28 acres of anthropogenic habitat occurs in the PSA. Several of the ranch compounds are liberally planted with ornamental trees and shrubs, which create areas of tree canopy and shrub understory that are otherwise entirely lacking in the vicinity. A variety of bird species utilize the vegetated portions of the anthropogenic habitat for nesting, wintering, and general foraging. Loggerhead shrikes were documented nesting in three areas of the PSA, all mapped as anthropogenic habitat. Migrant species such as warblers, hummingbirds, and orioles find temporary refuge as well.

# 6.0 Floristic Inventory

## 6.1 Methods

Botanical surveys conducted by Althouse and Meade, Inc. from March 2008 through July 2010, by Dr. David Keil in 2008 and 2010, and by URS Corp in 2007 and 2008 (URS 2008) resulted in a comprehensive floristic inventory of vascular plant species that occur within the PSA (refer to Table 3 for survey dates). A floristic inventory is a compilation of all plants on a given site, generally compiled using a large amount of resources in order to ensure detection of rare, threatened, or endangered species that could potentially be present. Botanical surveys conducted within the PSA were thorough, appropriate to the terrain, and consistent with botanical survey protocols published by the California Department of Fish and Game (CDFG 2009), United States Fish and Wildlife (USFWS 2000), and California Native Plant Society (CNPS 2001).

Botanical surveys conducted in 2008 and 2009 were conducted on foot, utilizing meandering transect and focused survey methods. Croplands that were plowed bare were surveyed on an all-terrain vehicle (ATV). The surveyor in this case drove transects searching for patches of vegetation, and all species present were then identified. Approximately 6,030 acres of land were surveyed in 2008, and in 2009 approximately 5,970 acres were surveyed (Table 8).

In 2010, botanical surveys commenced in March on approximately 10,000 acres of land, and continued through July. Some of the 2010 survey areas overlapped land covered by previous surveys. Numerous areas, mostly within Option B, including Sections 7, 8, 16-18, 20-22, and 29 were surveyed at least three consecutive seasons (Table 8). Botanical surveys conducted in 2010 utilized a combination of transect survey and focused survey methods. Transect survey methods are described in Section 6.1.1, and focused survey methods are described in Section 6.1.2. Transect surveys were conducted to ensure adequate coverage over the PSA, and to collect data in a systematic format that is both repeatable and comparable. The focused survey method allowed our botanists to target specific areas or micro-habitats of the PSA for additional survey time. Typically this was done to search for special status plants in areas of suitable habitat, but information on weeds and other species was also gathered. Additionally, focused surveys worked on collecting, identifying, and vouchering specimens of taxonomic interest.

Surveys in agricultural fields were accomplished primarily by walking transects. An ATV was utilized for the early season survey of Section 27, just prior to plowing. All other surveys of agricultural fields were conducted on foot.

Identification of botanical resources included field observations and laboratory analysis of collected material. Voucher specimens were collected for all special status species and for many other common species, particularly those for which previous botanical surveys in the region resulted in misidentifications (refer to Section 6.2, below). Collection numbers for voucher specimens are indicated after the scientific name of the plant in Table 10. All voucher specimens will be deposited in the R. F. Hoover Herbarium at Cal Poly.

Botanical nomenclature used in this document generally follows the Jepson Manual (Hickman 1993). An effort was made to use the most recent published scientific names, and where more recent nomenclature is used, the Jepson Manual name is provided in brackets.

TABLE 8. BOTANICAL SURVEYS. Botanical surveys were conducted in portions of the PSA from 2007 through 2009. In 2010, the entire PSA was surveyed. All surveys were conducted by Althouse and Meade, Inc., except where noted.

| Township, Range, Section | 2007 Survey | 2008 Survey | 2009 Survey | 2010 Survey |
|---|---|---|---|---|
| T30 S, R18 E, **S4** | | | | X |
| T30 S, R18 E, **S5** | | | | X |
| T29 S, R18 E, **S7** | | X | X | X |
| T29 S, R18 E, **S8** | | X | X | X |
| T29 S, R18 E, **S15** | | | X | X |
| T29 S, R18 E, **S16** | | X | X | X |
| T29 S, R18 E, **S17** | | X | X | X |
| T29 S, R18 E, **S18** | | X | X | X |
| T29 S, R18 E, **S19** | | | X | X |
| T29 S, R18 E, **S20** | | X | X | X |
| T29 S, R18 E, **S21** | | X | X | X |
| T29 S, R18 E, **S22** | | X | X | X |
| T29 S, R18 E, **S26** | | | | X |
| T29 S, R18 E, **S27** | | | X | X |
| T29 S, R18 E, **S28** | X (URS) | X (URS) | | X |
| T29 S, R18 E, **S29** | | X | X | X |
| T29 S, R18 E, **S32** | | | | X |
| T29 S, R18 E, **S33** | X (URS) | X (URS) | | X |
| T29 S, R18 E, **S34** | | | | X |
| T29 S, R18 E, **S35** | | | | X |
| **Total** | **~1,020 acres** | **~6,030 acres** | **~5,970 acres** | **~10,000 acres** |

### *6.1.1 Transect survey methods*

Botanical surveys conducted in 2010 utilized a transect survey method in which botanists covered parallel belts of land in north-south orientation across all 3,463 acres of annual grasslands and approximately 6,205 acres of croplands within the PSA[2]. Each transect belt was 660 feet wide and up to 5,280 feet (one mile) long. Botanists walked meandering lines within each transect, ultimately compiling a complete flora for every Section. Land Sections within the PSA were sampled individually to generate a separate dataset for each Section (refer to Table 11). Each botanist compiled a list of all plants

[2] Habitat acreages are slightly different than reported in the preliminary biological report (Althouse and Meade, Inc. May 2010) due to changes in the project layout.

encountered during their first transect in a new Section; only plant species new for the Section were listed on subsequent transect data sheets. Some plants that could not be positively identified in the field were collected, pressed, and identified in the lab. In addition to compiling plant lists, the botanists recorded notes on dominant species, percent cover, percent bare ground, and vegetation height in all transects. When the botanists identified rare plant populations, they recorded coordinates taken by hand-held GPS, number of plants present, and the approximate size of the occurrence. This data was used to direct focused surveys to completely map rare plant populations (refer to Section 6.1.2). The 2010 transect surveys reported herein completed total ground cover once in March, once in April, and once in May.

The benefit of the transect survey method is that a dataset is generated that can be used in a comparative analysis. By generating datasets for each land Section individually, we were able to compare vegetative diversity, height, and percent cover to better understand which Section(s) have a higher value for native plants and wildlife. We also wanted to create a dataset that represents the baseline vegetative conditions within the PSA so that future studies can be conducted and compared to the baseline. For example, botanical transect surveys can be conducted within the completed solar farm to determine how the installation affected the baseline condition. Additionally, because the proposed solar farm would be a temporary project with plans to return the PSA to natural conditions after it is decommissioned, project biologists would be able to compare post-project vegetative conditions to pre-project conditions.

### *6.1.2 Focused survey methods*

We conducted focused surveys for botanical resources throughout the spring season. Focused surveys were conducted by senior botanists, often working with Dr. David Keil, Curator of the R.F. Hoover Herbarium at Cal Poly, in order to make determinations on species identity questions raised during transect surveys, collect voucher specimens, map rare plant populations, and to fully investigate complex habitat types such as vernal pools.

### *6.1.3 Botanical reference sites*

Botanical surveys were timed to coincide with the typical blooming period for special status plant species with potential to occur in the PSA (refer to Section 4.0 and Table 4). In order to verify that our surveys were conducted at appropriate times, and to make sure all surveyors were adequately familiar with potential special status species, site visits were made to known locations of special status species in the Carrizo Plain region.

We visited nine botanical reference sites to observe special status plants in full bloom. Repeat visits were necessary to find certain species in flower.

1. **Intersection of Belmont Trail and Clarksburg Road, California Valley**
   Coordinates: 35.307827° N, 119.943151° W (WGS 84)
   Site Visit Dates: April 15, 2008, March 30, 2009, March 15, 25, and 26, 2010
   Species Observed: *Layia munzii, Lasthenia ferrisiae, Atriplex vallicola, Delphinium recurvatum, Eschscholzia rhombipetala,* and *California macrophylla*
2. **Belmont Trail 0.2 mile east of Soda Lake Road, California Valley**
   Coordinates: 35.30797° N, 119.98409° W (WGS 84)
   Site Visit Dates: March 25, 2010
   Species Observed: *Delphinium recurvatum, Lepidium jaredii*
3. **Belmont Trail and Courtland Road, California Valley**
   Coordinates: 35.30757° N, 119.95402° W (WGS 84)
   Site Visit Dates: March 25 and April 6, 2010
   Species Observed: *Delphinium recurvatum, Layia munzii*, and *Lasthenia ferrisiae*
4. **Soda Lake San Diego Creek Road, approximately 3.6 mile south of intersection with Soda Lake Road**
   Coordinates: 35.21833° N, 120.95264° W (WGS 84)
   Site Visit Dates: March 26 and April 6, 2010
   Species Observed: *Madia radiata* and *California macrophylla*
5. **Soda Lake Road, Carrizo Plain National Monument**
   Coordinates: 35.08211° N, 119.67530° W (WGS 84)
   Site Visit Dates: March 26, 2010
   Species Observed: *Monolopia congdonii*
6. **Soda Lake Road, Carrizo Plain National Monument**
   Coordinates: 35.07780° N, 119.66692° W (WGS 84)
   Site Visit Dates: March 26, 2010
   Species Observed: *Caulanthus californicus*
7. **Unnamed Dirt Road, Carrizo Plain National Monument**
   Coordinates: 35.167910° N, 119.77370° W (WGS 84)
   Site Visit Dates: March 26, 2010
   Species Observed: *Lepidium jaredii, Layia munzii, Lasthenia ferrisiae*, *Atriplex vallicola*
8. **Soda Lake San Diego Creek Road, Chimineas Ranch**
   Coordinates: 35.13654° N, 119.97633° W (WGS 84)
   Site Visit Dates: March 27, 2010
   Species Observed: *Caulanthus coulteri* var. *lemmonii*
9. **Highway 58 Roadcut, 0.1 mile West of La Panza Road**
   Coordinates: 35.46855° N, 120.38026° W (WGS 84)
   Site Visit Dates: May 25, 2010
   Species Observed: *Delphinium gypsophilum* ssp. *gypsophilum*

## 6.2 Previous Botanical Surveys Conducted on the PSA

Botanical surveys were conducted within portions of the PSA since 2007 (Table 8). URS Corp conducted botanical surveys within Section 28 and the north half of Section 33 in 2007 and 2008 during the planning process for the former Ausra solar project (URS 2008). A total of approximately 1,020 acres were surveyed. Althouse and Meade, Inc. (A&M) initiated botanical surveys in potential project areas in March 2008. Results of the 2008 and 2009 botanical surveys were reported in the Biological Report for the Topaz Solar Farm (Althouse and Meade, Inc. 2009b). Some plant species included in the A&M 2009 report are not included here because they occurred on lands not part of the current PSA (e.g. *Atriplex vallicola*). The URS 2008 report contains numerous plant species that we believe do not occur within the PSA, as explained in Table 9. Therefore these species are not included on our current vascular plant list for the PSA (Table 10).

TABLE 9. PLANTS ERRONEOUSLY REPORTED FROM THE PSA. The following plant species were reported from Sections 28 and the north half of 33 during botanical surveys conducted for the former Ausra project (URS 2008), but are not included on the 2010 floristic inventory.

| Species Reported by URS 2008 | Species Reported by A&M 2010 | Reason for Omission |
|---|---|---|
| ***Amsinckia eastwoodiae*** | ***A. lycopsoides***<br>***A. menziesii*** var***. menziesii***<br>***A. menziesii*** var. ***intermedia***<br>***A. tessellata*** var. ***tessellata***<br>***A. tessellata*** var. ***gloriosa*** | Presumed misidentification. *A. tessellata* has large flowers similar to *A. eastwoodiae*, but has 3 calyx lobes instead of 5. *A. menziesii* has 5 calyx lobes, but small flowers, and anthers that are appressed to the stigma, unlike *A. eastwoodiae*. |
| ***Acroptilon repens*** | **None** | Presumed misidentification. We did not find *Acroptilon repens* in PSA. |
| ***Camissonia californica*** | ***C. strigulosa, C. contorta, C. campestris*** | Presumed misidentification. |
| ***Cryptantha flaccida, C. muricata, C. oxygona*** | ***C. intermedia*** | Presumed misidentification. Only one species present within the PSA. |
| ***Deinandra*** *(=Hemizonia)* ***fascicularis*** | ***Deinandra*** *(=Hemizonia)* ***pentactis*** | *D. fascicularis* is a coastal species that is similar in form to *D. pentactis*. No specimen records of *D. fascicularis* are from the Carrizo Plain region. |
| ***Deinandra*** *(=Hemizonia)* ***kelloggii*** | ***Deinandra*** *(=Hemizonia)* ***pentactis*** | *D. kelloggii* differs from *D. pentactis* in color of anthers. Could occur in region, but all plants identified from PSA by A&M were *D. pentactis*. |
| ***Eschscholzia glyptosperma*** | ***E. californica*** | Misidentification of small-flowered *E. californica*. Desert species, does not occur in SLO County. |
| ***Eschscholzia minutiflora*** | ***E. californica*** | Misidentification of small-flowered *E. californica*. Desert species, does not occur in SLO County. |
| ***Gilia minor*** | ***G. clivorum*** | Misidentification. The two species are distinguished primarily by types of hairs, presence of glands, and leaf characters. |

| Species Reported by URS 2008 | Species Reported by A&M 2010 | Reason for Omission |
|---|---|---|
| ***Juncus capitatus*** | ***Juncus uncialis***<br>***Juncus bufonius*** var. ***bufonius***<br>***Juncus luciensis*** | Misidentification. *J. capitatus* does not occur in SLO County |
| ***Lasthenia californica*** | ***Lasthenia gracilis*** | *L. californica* occurs in northern California only. *L. gracilis* is the local form. These two species were formerly considered one species. |
| ***Layia heterotricha*** | ***L. platyglossa, L. munzii, L. pentachaeta*** ssp. ***albida*** | Habitat unlikely, but could occur as a waif. Similar species, *L. pentachaeta* collected along Bitterwater Road (Dart 362) and observed in Section 15. No specimen for *L. heterotricha* within the PSA available, and photo in URS 2008 is inconclusive. |
| ***Logfia*** (=*Filago*) ***depressa*** | ***Logfia gallica, Logfia filaginoides*** | *Logfia depressa* is a desert species that does not occur in SLO County. |
| ***Lotus wrangelianus*** | ***L. humistratus*** | Presumed misidentification. |
| ***Lupinus concinnus*** | ***L. microcarpus, L. bicolor*** | Presumed misidentification. *L. concinnus* occurs along Highway 58 near Santa Margarita, but is not known from Carrizo Plain. |
| ***Lastarriaea coriacea*** | **None** | Was not verified by July 2010. |
| ***Mentzelia albicaulis*** | ***M. affinis*** | Misidentification. Seeds in one row above mid-ovary; seeds with grooved angles, therefore *M. affinis.* |
| ***Papaver rhoeas*** | ***P. hybridum*** | Presumed misidentification; Keil 30494. |
| ***Plagiobothrys collinus*** var. ***fulvescens*** | ***P. canescens***<br>***P. acanthocarpus***<br>***P. leptocladus*** | Occurs in coastal areas of SLO County. Not known from Carrizo Plain region. |
| ***Raphanus sativus*** | ***R. raphanistrum*** | Presumed misidentification. *R. raphanistrum* is occasional in farm fields and roadsides within the PSA. |
| ***Schismus barbatus*** | ***S. arabicus*** | Presumed misidentification. All plants collected within PSA have lower lemmas greater than 2.5 mm; therefore *S. arabicus*. |
| ***Trifolium bifidum*** | ***T. gracilentum*** | Presumed misidentification. Superficially similar to *T. gracilentum*, differs in calyx size and hairs on peduncle. *T. bifidum* not reported from Carrizo Plain region. |
| ***Triphysaria micrantha*** | ***Castilleja brevistyla, C. densiflora, C. exserta*** (and hybrids) | Presumed misidentification of small *Castilleja* spp. and/or hybrids. |
| ***Vicia americana*** var. ***americana*** | ***Vicia villosa*** ssp. ***varia*** | Woodland species. Does not occur in Carrizo Plain. |
| ***Vicia benghalensis*** | ***Vicia villosa*** ssp. ***varia*** | Misidentification. Inflorescence is greater than subtending leaf, therefore *V. villosa*. |
| ***Vulpia octoflora*** | ***V. myuros***<br>***V. microstachys*** | Presumed misidentification. |

## 6.3 Final Botanical Survey Results

Botanical surveys conducted from March 2008 through July 2010 identified 248 species, subspecies, varieties, and hybrids of vascular plant taxa within the PSA (Table 10). The list includes 160 species native to California and 88 introduced (naturalized or planted) species. Landscape plants that have persisted in abandoned farm and ranch compounds (not currently inhabited or maintained) within PSA were included. Landscape plants in currently maintained landscaped areas surrounding existing inhabited residences were not included.

Native plant species account for approximately 65 percent of the flora within the PSA; introduced species account for approximately 35 percent. Approximately 83 percent of the flora in the State of California is native, while 17 percent is introduced (Hickman 1993). The significantly lower than the state-wide average percent of native species and higher than average percent of introduced species is indicative of the land use history within the PSA. The flora of land Sections within the PSA that have cropland as the dominant habitat type average 62 percent native species, 38 percent introduced. The flora of land Sections within the PSA that have annual grassland as the dominant habitat type average 68 percent native species and 32 percent introduced.

Fifty-two plant families are represented in the flora of the PSA. These include 1 fern family, 2 gymnosperm families, and among angiosperms, species from 45 families of dicotyledons and 4 families of monocotyledons.

TABLE 10. VASCULAR PLANT LIST. The 248 species of vascular plants identified at the PSA consist of 146 native species and 73 introduced species. The vascular plant list is separated into general life form categories, within which the taxa are listed alphabetically by family and scientific name.

**Ferns and Fern Allies – 1 species**

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Pilularia americana*** | Pillwort | Marsileaceae | None | Native | ✓ | ✓ | Vernal pools; Keil 30692, 30729. |

**Gymnosperms – 5 species**

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Calocedrus decurrens*** | Incense cedar | Cupressaceae | None | Planted | ✓ | | Section 33 residential area |
| ***Juniperus californicus*** | California juniper | Cupressaceae | None | Native | ✓ | | Section 5, west edge |
| ***Juniperus*** sp. | Juniper | Cupressaceae | None | Planted | ✓ | | Section 33 |
| ***Cedrus deodora*** | Deodar cedar | Pinaceae | None | Planted | ✓ | ✓ | Sections 16 and 18 residential areas. |
| ***Pinus*** sp. | Pine | Pinaceae | None | Planted | ✓ | | Section 33 residential area. |

**Angiosperms, Dicotyledons – 201 species**

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Amaranthus albus*** | Tumbleweed | Amaranthaceae | None | Introduced | ✓ | ✓ | Common in croplands throughout PSA. Keil 30919. |
| ***Amaranthus blitoides*** | Procumbent pigweed | Amaranthaceae | None | Native | ✓ | ✓ | Common along roads throughout PSA. |
| ***Eryngium spinosepalum*** | Spiny-sepaled button-celery | Apiaceae | **List 1B.2** | Native | ✓ | | Very uncommon, located in one vernal pool in Section 4; Keil 30737-1. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Lomatium utriculatum*** | Biscuit root | Apiaceae | None | Native | ✓ | ✓ | Occasional in untilled annual grasslands throughout PSA. |
| ***Vinca major*** | Periwinkle | Apocynaceae | None | Planted | ✓ | | Section 33 ranch compound. |
| ***Asclepias eriocarpa*** | Milkweed | Apocynaceae | None | Native | ✓ | ✓ | Very uncommon; Section 18. |
| ***Asclepias fascicularis*** | Narrow-leaved milkweed | Apocynaceae | None | Native | ✓ | ✓ | Occasional in annual grasslands throughout PSA. |
| ***Ancistrocarphus filagineus*** | Woolly fish-hooks | Asteraceae | None | Native | ✓ | ✓ | Very uncommon; Section 28 north end. |
| ***Achyrachaena mollis*** | Blow-wives | Asteraceae | None | Native | ✓ | ✓ | Common in grasslands throughout PSA. |
| ***Agoseris grandiflora*** | Giant dandelion | Asteraceae | None | Native | ✓ | | Occasional in grasslands in Sections 4 and 5. |
| ***Agoseris heterophylla*** | Annual mountain dandelion | Asteraceae | None | Native | ✓ | ✓ | Common in annual grasslands throughout PSA. |
| ***Anthemis cotula*** | Mayweed | Asteraceae | None | Introduced | ✓ | ✓ | Occasional along roads and in croplands. |
| ***Blepharizonia laxa*** | Big tarweed | Asteraceae | None | Native | ✓ | | Occasional in Sections 5 and 33. Perry 10-52. |
| ***Centaurea melitensis*** | Tocolote | Asteraceae | None | Introduced | ✓ | ✓ | Uncommon in ruderal areas of the PSA. |
| ***Centaurea solstitialis*** | Yellow star-thistle | Asteraceae | None | Introduced | ✓ | ✓ | Uncommon in ruderal areas of the PSA. |
| ***Centromadia*** *[=Hemizonia]* ***fitchii*** | Fitch's tarweed | Asteraceae | None | Native | ✓ | ✓ | Common in annual grasslands throughout PSA. |
| ***Centromadia*** *[=Hemizonia]* ***pungens*** | Hayfield tarweed | Asteraceae | None | Native | ✓ | ✓ | Occasional in grassland areas of Option A. |
| ***Chaenactis glabriuscula*** | Pincushion | Asteraceae | None | Native | ✓ | ✓ | Very uncommon; few plants in north end of Section 16. |
| ***Chamomilla suaveolens*** | Pineapple weed | Asteraceae | None | Introduced | ✓ | ✓ | Very common in dirt ranch roads throughout PSA |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Chondrilla juncea*** | Skeleton weed | Asteraceae | None | Introduced | ✓ | | Noxious weed. One infestation in Section 5 cropland. |
| ***Conyza bonariensis*** | Asthmaweed | Asteraceae | None | Introduced | ✓ | ✓ | Uncommon along fence lines and other disturbed areas. |
| ***Corethrogyne*** [=*Lessingia*] ***filaginifolia*** | California aster | Asteraceae | None | Native | ✓ | ✓ | Uncommon in Sections 4 and 5. |
| ***Deinandra*** [=*Hemizonia*] ***pentactis*** | Salinas River tarplant | Asteraceae | None | Native | ✓ | ✓ | Occasional in grasslands within PSA |
| ***Gnaphalium palustre*** | Marsh cudweed | Asteraceae | None | Native | ✓ | ✓ | Wet areas; Section 4 |
| ***Gutierrezia californica*** | Snakeweed | Asteraceae | None | Native | ✓ | ✓ | Very uncommon; Section 15 north end |
| ***Heterotheca sessiliflora*** ssp. ***echioides*** | Goldenaster | Asteraceae | None | Native | ✓ | ✓ | Occasional in untilled grasslands in the southern portion of the PSA |
| ***Hypochaeris glabra*** | Smooth cat's-ear | Asteraceae | None | Introduced | ✓ | ✓ | Uncommon in annual grasslands throughout PSA |
| ***Hypochaeris radicata*** | Rough cat's ear | Asteraceae | None | Introduced | ✓ | | Uncommon in annual grasslands throughout PSA |
| ***Isocoma acradenia*** | Alkali goldenbush | Asteraceae | None | Native | ✓ | ✓ | Very uncommon in untilled grasslands in Sections 8, 15, 16, and notably in Section 4 |
| ***Lactuca serriola*** | Prickly lettuce | Asteraceae | None | Introduced | ✓ | ✓ | Uncommon in fallow croplands |
| ***Lagophylla ramosissima*** ssp. ***ramosissima*** | Slender hare-leaf | Asteraceae | None | Native | ✓ | ✓ | Common in annual grasslands throughout PSA |
| ***Lasthenia ferrisiae*** | Ferris' goldfields | Asteraceae | **List 4.2** | Native | ✓ | ✓ | Very uncommon, occurs as a wind-blown waif |
| ***Lasthenia gracilis*** | Common goldfields | Asteraceae | None | Native | ✓ | ✓ | Abundant in annual grasslands throughout PSA. Notable in Sections 4, 5, 34, 35 |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Lasthenia minor*** | Coastal goldfields | Asteraceae | None | Native | ✓ | ✓ | Very uncommon in annual grasslands within PSA, usually occurring as a single plant |
| ***Layia munzii*** | Munz's tidy-tips | Asteraceae | **List 1B.1** | Native | ✓ | ✓ | Section 5 main population, scattered in Sections 4, 32, 33, 26. Dart 371, 374; Perry 10-23. |
| ***Layia pentachaeta*** ssp. ***albida*** | Tidy-tips | Asteraceae | None | Native | ✓ | ✓ | Very uncommon; few plants in Section 15. Also observed along Hwy 58 just north of PSA; Dart 362. |
| ***Layia platyglossa*** | Tidy-tips | Asteraceae | None | Native | ✓ | ✓ | Abundant and widespread in PSA |
| ***Leptosyne*** [=*Coreopsis*] ***calliopsidea*** | Tickseed | Asteraceae | None | Native | ✓ | ✓ | Very uncommon; Sections 15, 16, 22 |
| ***Lessingia glandulifera*** var. ***pectinata*** | Annual lessingia | Asteraceae | None | Native | ✓ | | Locally common in sandy areas of Sections 4, 5, and 32. |
| ***Logfia*** *[=Filago]* ***gallica*** | Herba impia | Asteraceae | None | Introduced | ✓ | ✓ | Occasional throughout PSA. |
| ***Logfia filaginoides*** *[=Filago californica]* | Cottonrose | Asteraceae | None | Native | ✓ | ✓ | Uncommon in grasslands. Dart 366. |
| ***Malacothrix californica*** | California dandelion | Asteraceae | None | Native | ✓ | ✓ | Uncommon on hills in Sections 15 and 16. |
| ***Malacothrix coulteri*** | Snake's head | Asteraceae | None | Native | ✓ | ✓ | Uncommon in grasslands throughout PSA. |
| ***Micropus californicus*** var. ***californicus*** | Slender cottonweed | Asteraceae | None | Native | ✓ | ✓ | Common in patches in grasslands throughout PSA; Dart 341. |
| ***Microseris douglasii*** ssp. ***douglasii*** | Douglas' silverpuffs | Asteraceae | None | Native | ✓ | ✓ | Common in grasslands throughout PSA. Keil 30493, 30744, 30745; Dart 370, 377. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Microseris douglasii*** ssp***. tenella*** | Douglas' silverpuffs | Asteraceae | None | Native | ✓ | ✓ | Common in grasslands throughout PSA |
| ***Microseris elegans*** | Silverpuffs | Asteraceae | None | Native | ✓ | ✓ | Occasional in annual grasslands throughout PSA |
| ***Monolopia lanceolata*** | Common hillside daisy | Asteraceae | None | Native | ✓ | ✓ | Uncommon as a waif in grasslands. |
| ***Psilocarphus brevissimus*** var. ***brevissimus*** | Woolly-heads | Asteraceae | None | Native | ✓ | ✓ | Vernal pools in Sections 4, 19, and 20; Dart 363; Perry 10-28; Keil 30703, 30736. |
| ***Psilocarphus chilensis*** *[=P. tenellus* var. *globiferous]* | Round woolly-marbles | Asteraceae | None | Native | ✓ | | Vernal pools in Section 4. Perry 10-27; Keil 30697, 30734. |
| ***Psilocarphus oregonus*** | Oregon woolly-heads | Asteraceae | None | Native | ✓ | ✓ | Vernal pools and ephemeral wetland depressions throughout PSA; Keil 30704, 30735. |
| ***Senecio vulgaris*** | Common groundsel | Asteraceae | None | Introduced | ✓ | ✓ | Occasional in fallow croplands |
| ***Sonchus oleraceus*** | Common sow-thistle | Asteraceae | None | Introduced | ✓ | ✓ | Uncommon in ranch compounds |
| ***Stebbinsoseris heterocarpa*** | Grassland silverpuffs | Asteraceae | None | Native | ✓ | ✓ | Common in grasslands throughout PSA; Dart 345. |
| ***Stephanomeria pauciflora*** | Wire lettuce | Asteraceae | None | Native | ✓ | ✓ | Common in annual grasslands throughout PSA. Keil 30747. |
| ***Stephanomeria elata*** (Tentative ID based on immature fruits) | Annual wire lettuce | Asteraceae | None | Native | ✓ | ✓ | Common in annual grasslands. |
| ***Stylocline gnaphalioides*** | Everlasting nest straw | Asteraceae | None | Native | ✓ | | Occasional in grassland habitat |
| ***Uropappus lindleyi*** | Silver puffs | Asteraceae | None | Native | ✓ | ✓ | Common in grasslands throughout PSA; Dart 346. |
| ***Xanthium strumarium*** | Cocklebur | Asteraceae | None | Native | ✓ | | Uncommon in ephemeral drainages. |
| ***Amsinckia lycopsoides*** | Fiddleneck | Boraginaceae | None | Native | ✓ | ✓ | Common throughout PSA; Keil 30668. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Amsinckia menziesii*** ssp. ***intermedia*** | Common fiddleneck | Boraginaceae | None | Native | ✓ | ✓ | Abundant throughout PSA |
| ***Amsinckia menziesii*** ssp. ***menziesii*** | Menzies' fiddleneck | Boraginaceae | None | Native | ✓ | ✓ | Common throughout PSA |
| ***Amsinckia tessellata*** ssp. ***gloriosa*** | Bristly fiddleneck | Boraginaceae | None | Native | ✓ | ✓ | Occasional in PSA, especially in north; Keil 30667. |
| ***Amsinckia tessellata*** ssp. ***tessellata*** | Bristly fiddleneck | Boraginaceae | None | Native | ✓ | ✓ | Common throughout PSA; Keil 30666. |
| ***Cryptantha intermedia*** | Cryptantha | Boraginaceae | None | Native | ✓ | ✓ | Occasional throughout PSA. Perry 10-21; Dart 375. |
| ***Heliotropium curassavicum*** | Salt heliotrope | Boraginaceae | None | Native | ✓ | ✓ | Uncommon in seasonally moist areas |
| ***Pectocarya linearis*** ssp. ***ferocula*** | Pectocarya | Boraginaceae | None | Native | ✓ | ✓ | Common in patches within annual grasslands throughout PSA; Dart 344. |
| ***Pectocarya penicillata*** | Pectocarya | Boraginaceae | None | Native | ✓ | ✓ | Common in patches within annual grasslands throughout PSA; Dart 343 |
| ***Plagiobothrys acanthocarpus*** | Adobe allocarya | Boraginaceae | None | Native | ✓ | ✓ | Common in wet areas throughout PSA. Dart 313; Keil 30691, 30731. |
| ***Plagiobothrys canescens*** | Valley popcorn flower | Boraginaceae | None | Native | ✓ | ✓ | Abundant in grasslands throughout PSA. |
| ***Plagiobothrys leptocladus*** | Alkali Plagiobothrys | Boraginaceae | None | Native | ✓ | ✓ | Occurs in vernal pools, wetlands in southern regions of the PSA. Keil 30732. |
| ***Athysanus pusillus*** | Common sandweed | Brassicaceae | None | Native | ✓ | | Uncommon in grasslands; Dart 340. |
| ***Brassica nigra*** | Black mustard | Brassicaceae | None | Introduced | ✓ | ✓ | Uncommon agricultural weed |
| ***Capsella bursa-pastoris*** | Shepherd's purse | Brassicaceae | None | Introduced | ✓ | ✓ | Common in croplands and mesic roadsides throughout PSA. |
| ***Descurainia pinnata*** | Western tansy mustard | Brassicaceae | None | Native | ✓ | | Very uncommon; Section 33 |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Descurainia sophia*** | Tansy mustard | Brassicaceae | None | Introduced | ✓ | ✓ | Abundant throughout PSA |
| ***Guillenia lasiophylla*** | California mustard | Brassicaceae | None | Native | ✓ | ✓ | Common in grasslands |
| ***Heterodraba unilateralis*** | Ladies' tongue mustard | Brassicaceae | None | Native | ✓ | ✓ | Uncommon in untilled annual grasslands |
| ***Hirschfeldia incana*** | Field mustard | Brassicaceae | None | Introduced | ✓ | ✓ | Common in fallow croplands and annual grasslands throughout PSA. |
| ***Lepidium acutidens*** | Alkali pepperwort | Brassicaceae | None | Native | ✓ | ✓ | Very uncommon along dirt ranch roads |
| ***Lepidium dictyotum*** | Peppergrass | Brassicaceae | None | Native | ✓ | ✓ | Common on dirt ranch roads. Perry 10-07, 10-10; Dart 347, 376. |
| ***Lepidium lasiocarpum*** var. ***lasiocarpum*** | Peppergrass | Brassicaceae | None | Native | ✓ | ✓ | Uncommon in PSA, along dirt ranch roads and fence lines |
| ***Lepidium latifolium*** | Perennial peppercress | Brassicaceae | None | Introduced | ✓ | ✓ | Uncommon; Section 28, 33. |
| ***Lepidium nitidum*** var. ***nitidum*** | Peppergrass | Brassicaceae | None | Native | ✓ | ✓ | Common on dirt ranch roads, occasional in croplands and grasslands |
| ***Raphanus raphanistrum*** | Jointed charlock | Brassicaceae | None | Introduced | ✓ | | Uncommon waif |
| ***Sisymbrium altissimum*** | Tumble mustard | Brassicaceae | None | Introduced | ✓ | ✓ | Uncommon weed |
| ***Sisymbrium irio*** | London rocket | Brassicaceae | None | Introduced | ✓ | ✓ | Very uncommon weed |
| ***Sisymbrium orientale*** | Hedge mustard | Brassicaceae | None | Introduced | ✓ | ✓ | Common in fallow fields |
| ***Thysanocarpus curvipes*** | Lace pod | Brassicaceae | None | Native | ✓ | ✓ | Commonly in scattered patches within annual grasslands throughout PSA. |
| ***Tropidocarpum gracile*** | Dobie pod | Brassicaceae | None | Native | ✓ | ✓ | Very common in grasslands throughout PSA |
| ***Cholla*** sp. | Cholla | Cactaceae | None | Planted | | ✓ | Section 18 ranch compound. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Opuntia*** sp. | Prickly pear | Cactaceae | None | Planted | ✓ | | Section 4 ranch compound. |
| ***Callitriche marginata*** | Water starwort | Callitrichaceae | None | Native | ✓ | ✓ | Vernal and ephemeral pools throughout PSA; Keil 30698. |
| ***Sambucus nigra*** ssp. ***caerulea*** *[=S. mexicana]* | Blue elderberry | Caprifoliaceae | None | Planted | ✓ | | Section 33 ranch compound. |
| ***Herniaria hirsuta*** ssp. ***cinerea*** | Rupture wort | Caryophyllaceae | None | Native | ✓ | ✓ | Very common in annual grasslands throughout PSA. |
| ***Spergularia rubra*** | Sand spurrey | Caryophyllaceae | None | Introduced | ✓ | ✓ | Occasional along Section 19 roadsides. |
| ***Stellaria media*** | Common chickweed | Caryophyllaceae | None | Introduced | ✓ | ✓ | Uncommon weed in shady areas of ranch compounds. |
| ***Stellaria nitens*** | Shining starwort | Caryophyllaceae | None | Native | ✓ | | Section 33 ranch compound. |
| ***Atriplex serenana*** var. ***serenana*** | Saltbush | Chenopodiaceae | None | Native | ✓ | ✓ | Uncommon; Section 4 east fence, Section 19 west fence. |
| ***Chenopodium album*** | Lamb's quarters | Chenopodiaceae | None | Introduced | ✓ | ✓ | Common in agricultural fields. |
| ***Croton*** [=*Eremocarpus*] ***setigerus*** | Turkey mullein | Chenopodiaceae | None | Native | ✓ | ✓ | Occasional in annual grasslands throughout PSA. |
| ***Monolepis nuttalliana*** | Poverty weed | Chenopodiaceae | None | Native | | ✓ | Dirt ranch road at border of Sections 7 and 18; Dart 361. |
| ***Salsola tragus*** | Russian-thistle | Chenopodiaceae | None | Introduced | ✓ | ✓ | Common in disturbed areas throughout PSA. |
| ***Convolvulus arvensis*** | Field bindweed | Convolvulaceae | None | Introduced | ✓ | ✓ | Abundant in croplands throughout PSA |
| ***Cressa truxillensis*** | Alkali weed | Convolvulaceae | None | Native | ✓ | ✓ | Localized in areas of Option A, Sections 33 and 34. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Crassula aquatica*** | Water pygmy weed | Crassulaceae | None | Native | ✓ | ✓ | Occasional in vernal pools and ephemeral depressions; Keil 30700. |
| ***Crassula connata*** | Pygmy weed | Crassulaceae | None | Native | ✓ | ✓ | Common throughout PSA |
| ***Crassula tillea*** | Pygmy weed | Crassulaceae | None | Introduced | ✓ | ✓ | Uncommon in vernal pools in Section 4. |
| ***Elatine rubella*** | Waterwort | Elatinaceae | None | Native | ✓ | | Vernal pools; Keil 30699. |
| ***Chamaesyce ocellata*** ssp. ***ocellata*** | Prostrate spurge | Euphorbiaceae | None | Native | ✓ | | Very uncommon; one location in Option A, Section 4. |
| ***Euphorbia spathulata*** | Spurge | Euphorbiaceae | None | Native | ✓ | | Uncommon; Section 5 west end. |
| ***Astragalus didymocarpus*** var. ***didymocarpus*** | Dwarf white milkvetch | Fabaceae | None | Native | ✓ | ✓ | Locally common in grasslands throughout PSA. Keil 30741, 30742, 30746. |
| ***Astragalus macrodon*** | Salinas milk-vetch | Fabaceae | **List 4.3** | Native | ✓ | ✓ | Occasional throughout PSA. Keil 30743. |
| ***Astragalus oxyphysus*** | Milk-vetch | Fabaceae | None | Native | ✓ | | Uncommon; Section 34 along Hwy 58 |
| ***Lotus humistratus*** | Hill lotus | Fabaceae | None | Native | ✓ | ✓ | Abundant in annual grasslands throughout PSA. |
| ***Lupinus bicolor*** | Miniature lupine | Fabaceae | None | Native | ✓ | ✓ | Abundant in grasslands throughout PSA. |
| ***Lupinus microcarpus*** var. ***microcarpus*** | Chick lupine | Fabaceae | None | Native | ✓ | ✓ | Common in patches within annual grasslands throughout PSA. |
| ***Lupinus succulentus*** | Succulent lupine | Fabaceae | None | Native | ✓ | ✓ | Uncommon; Section 5. |
| ***Medicago polymorpha*** | California bur-clover | Fabaceae | None | Introduced | ✓ | ✓ | Occasional in ephemeral drainages throughout PSA. |
| ***Medicago sativa*** | Alfalfa | Fabaceae | None | Introduced | ✓ | ✓ | Section 28, roadside waif. |
| ***Melilotus indica*** | Annual sweet-clover | Fabaceae | None | Introduced | ✓ | ✓ | Uncommon in ephemeral drainages. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Robinia pseudoacacia*** | Black locust | Fabaceae | None | Planted | ✓ | ✓ | Residential landscape tree; Sections 28 and 33. |
| ***Trifolium albopurpureum*** var. ***albopurpureum*** | Dove clover | Fabaceae | None | Native | ✓ | ✓ | Common in annual grasslands throughout the PSA. |
| ***Trifolium depauperatum*** var. ***depauperatum*** | Cowbag clover | Fabaceae | None | Native | ✓ | ✓ | Uncommon in wet areas; Sections 4, 8, 15, 35; Dart 373. |
| ***Trifolium gracilentum*** var. ***gracilentum*** | Pinpoint clover | Fabaceae | None | Native | ✓ | ✓ | Very common in annual grasslands throughout PSA. |
| ***Trifolium hirtum*** | Rose clover | Fabaceae | None | Introduced | ✓ | ✓ | Uncommon to locally common weed in croplands areas of the PSA. |
| ***Trifolium microcephalum*** | Miniature clover | Fabaceae | None | Native | ✓ | ✓ | Uncommon in annual grasslands. |
| ***Trifolium willdenovii*** | Tomcat clover | Fabaceae | None | Native | ✓ | | Section 4 roadside ditch. Dart 368. |
| ***Vicia hassei*** | Hasse's vetch | Fabaceae | None | Introduced | ✓ | | Uncommon; Section 5 west end. Dart 378; Keil 30740. |
| ***Vicia villosa*** ssp. ***varia*** | Winter vetch | Fabaceae | None | Introduced | ✓ | ✓ | Common in fallow croplands and grasslands throughout PSA. |
| ***Frankenia salina*** | Alkali heath | Frankeniaceae | None | Native | ✓ | ✓ | Uncommon in seasonal wetlands. |
| ***Zeltnera*** *[=Centaurium]* ***exultata*** | Centaury | Gentianaceae | None | Native | ✓ | | Occasional in Section 4 and 5 grasslands. Dart 418. |
| ***California macrophylla*** | Round-leaved filaree | Geraniaceae | **List 1B.1** | Native | ✓ | | Very uncommon; Sections 5 and 33. |
| ***Erodium botrys*** | Storkbill filaree | Geraniaceae | None | Introduced | ✓ | | Uncommon; Section 4. |
| ***Erodium cicutarium*** | Redstem filaree | Geraniaceae | None | Introduced | ✓ | ✓ | Extremely abundant throughout PSA. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Phacelia ciliata*** | Great Valley phacelia | Hydrophyllaceae | None | Native | ✓ | ✓ | Common in annual grasslands and fallow croplands throughout PSA. |
| ***Lamium amplexicaule*** | Henbit | Lamiaceae | None | Introduced | ✓ | ✓ | Uncommon agricultural weed in Sections 19 and 20. |
| ***Marrubium vulgare*** | Horehound | Lamiaceae | None | Introduced | ✓ | | Uncommon. Section 33 around compound, Section 4 around old equipment. |
| ***Trichostema lanceolatum*** | Vinegar weed | Lamiaceae | None | Native | ✓ | ✓ | Abundant in annual grasslands throughout PSA |
| ***Mentzelia affinis*** | Yellowcomet | Loasaceae | None | Native | ✓ | ✓ | Occasional in grasslands and fallow croplands throughout PSA. |
| ***Lythrum hyssopifolia*** | Loosestrife | Lythraceae | None | Introduced | ✓ | ✓ | Uncommon in wetlands. |
| ***Malva nicaeensis*** | Bull mallow | Malvaceae | None | Introduced | ✓ | ✓ | Occasional in weedy areas of the PSA. |
| ***Malvella leprosa*** | Alkali-mallow | Malvaceae | None | Native | ✓ | ✓ | Occasional in alkaline or other mesic areas of the PSA. |
| ***Calandrinia ciliata*** | Red maids | Montiaceae | None | Native | ✓ | ✓ | Common throughout the PSA. |
| ***Morus alba*** | Mulberry | Moraceae | None | Planted | ✓ | | Section 33 ranch compound . |
| ***Syringa*** sp. | Cultivated lilac | Oleaceae | None | Planted | ✓ | | Section 33 at ranch compound. |
| ***Camissonia campestris*** ssp. ***campestris*** | Sun cup | Onagraceae | None | Native | ✓ | ✓ | Very uncommon; Section 28. |
| ***Camissonia contorta*** | Sun cup | Onagraceae | None | Native | ✓ | | Locally common in sandy areas of Sections 4 and 5; Keil 30738. |
| ***Camissonia strigulosa*** | Sun cup | Onagraceae | None | Native | ✓ | ✓ | Occasional in patches within annual grasslands throughout PSA; Dart 338, 367; Keil 30701, 30739. |
| ***Clarkia affinis*** | Farewell-to-spring | Onagraceae | None | Native | ✓ | ✓ | Common in annual grasslands throughout PSA. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Clarkia purpurea*** | Wine cups | Onagraceae | None | Native | ✓ | ✓ | Occasional in annual grasslands in southern portions of the PSA. |
| ***Epilobium brachycarpum*** | Annual willow-herb | Onagraceae | None | Native | ✓ | ✓ | Uncommon in ruderal areas of the PSA. |
| ***Epilobium pygmaeum*** | Pygmy willow-herb | Onagraceae | None | Native | ✓ | ✓ | Ephemeral aquatic habitats throughout PSA. Keil 30733. |
| ***Eschscholzia californica*** | California poppy | Papaveraceae | None | Native | ✓ | ✓ | Locally common in annual grasslands in Sections 28 and 33, uncommon elsewhere. |
| ***Eschscholzia rhombipetala*** | Diamond-petaled California poppy | Papaveraceae | **List 1B.1** | Native | ✓ | | Section 5, west edge, just outside the PSA boundary. Perry 10-03. |
| ***Papaver hybridum*** | Round pricklyhead poppy | Papaveraceae | None | Introduced | | ✓ | Occasional in croplands throughout PSA. Keil 30494. |
| ***Platystemon californicus*** | Cream cups | Papaveraceae | None | Native | ✓ | ✓ | Very uncommon; Sections 28 and 32. Dart 339. |
| ***Antirrhinum ovatum*** | Oval-leaved snapdragon | Plantaginaceae | **List 4.2** | Native | ✓ | | Very uncommon, in Section 5 on clay soil with deep vertical cracks. Keil 30907; Dart 421. |
| ***Plantago erecta*** | California plantain | Plantaginaceae | None | Native | ✓ | ✓ | Occasional in patches within grassland habitat throughout PSA. |
| ***Veronica peregrina*** ssp. ***xalapensis*** | Wandering speedwell | Plantaginaceae | None | Native | ✓ | ✓ | Ephemeral pool habitats throughout the PSA. Dart 369; Keil 30730. |
| ***Eriastrum pluriflorum*** | Many-flowered eriastrum | Polemoniaceae | None | Native | ✓ | | One individual observed, in Section 33. |
| ***Gilia clivorum*** | Purple-spot gilia | Polemoniaceae | None | Native | ✓ | ✓ | Occasional in scattered patches in annual grasslands throughout the PSA. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Leptosiphon**[=Linanthus] **pygmaeus*** ssp**. *continentalis*** | Baby-stars | Polemoniaceae | None | Native | ✓ | | Uncommon; Sections 4, 35. Perry 10-22. |
| ***Navarretia atractyloides*** | Navarretia | Polemoniaceae | None | Native | ✓ | | Uncommon; Section 4 south fence. |
| ***Navarretia jaredii*** | Paso Robles navarretia | Polemoniaceae | **List 4.3** | Native | ✓ | ✓ | Occasional in local patches within the PSA. Dart 416, 417, 420. |
| ***Navarretia nigelliformis*** ssp. ***radians*** | Shining navarretia | Polemoniaceae | **List 1B.2** | Native | ✓ | | Very uncommon; one patch in Section 5, southeast corner. Perry 10-49. |
| ***Phlox gracilis*** | Slender phlox | Polemoniaceae | None | Native | ✓ | ✓ | Common in annual grasslands throughout the PSA. |
| ***Chorizanthe obovata*** | Spoon-sepal spineflower | Polygonaceae | None | Native | ✓ | | Very uncommon; one plant found in Section 4. |
| ***Chorizanthe uniaristata*** | One-awn spineflower | Polygonaceae | None | Native | ✓ | ✓ | Uncommon; Sections 4, 28, and 33. Perry 10-44. |
| ***Chorizanthe xanti*** | Turkish rugging | Polygonaceae | None | Native | ✓ | ✓ | Very uncommon; one plant found in Section 4, one plant in Section 28. |
| ***Eriogonum angulosum*** | Angle-stem buckwheat | Polygonaceae | None | Native | ✓ | | Uncommon, scattered in Sections 5 and 34. |
| ***Eriogonum baileyi*** var. ***baileyi*** | Bailey's buckwheat | Polygonaceae | None | Native | ✓ | ✓ | Very uncommon, in sandy wash in Section 4; also in Section 29 prior to plowing. Keil 30908. |
| ***Eriogonum gracillimum*** | Rose-and-white buckwheat | Polygonaceae | None | Native | ✓ | ✓ | Occasional in dry areas of the PSA. |
| ***Polygonum aviculare*** ssp. ***depressum*** *[= P. arenastrum]* | Knotweed | Polygonaceae | None | Introduced | ✓ | ✓ | Common weed of croplands, roadsides, and mesic areas. |
| ***Rumex crispus*** | Dock | Polygonaceae | None | Introduced | ✓ | ✓ | Very uncommon; Section 28. |
| ***Claytonia parviflora*** ssp. ***parviflora*** | Miner's lettuce | Portulacaceae | None | Native | ✓ | | Occasional in ranch compounds; Sections 28 and 33. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Anagallis arvensis*** | Scarlet pimpernel | Primulaceae | None | Introduced | ✓ | ✓ | Very uncommon weed in anthropogenic areas. |
| ***Dodecatheon clevelandii*** | Shooting star | Primulaceae | None | Native | ✓ | | Very uncommon; Section 5. |
| ***Delphinium parryi*** ssp. ***parryi*** | Larkspur | Ranunculaceae | None | Native | ✓ | ✓ | Very uncommon; Sections 5 and 8. |
| ***Myosurus minimus*** | Mousetails | Ranunculaceae | None | Native | ✓ | ✓ | Section 20 vernal pool. Perry 10-08, 10-29. |
| ***Myosurus sessilis*** | Mousetails | Ranunculaceae | None | Native | ✓ | | Section 4 vernal pools. Perry 10-11; Keil 30689. |
| ***Cotoneaster lacteus*** | Cotoneaster | Rosaceae | None | Planted | ✓ | | Section 33 ranch compound. |
| ***Photinia fraseri*** | Photinia | Rosaceae | None | Planted | ✓ | | Section 33 ranch compound. |
| ***Prunus*** sp. | Cherry | Rosaceae | None | Planted | ✓ | | Section 33 ranch compound. |
| ***Populus fremontii*** ssp. ***fremontii*** | Fremont cottonwood | Salicaceae | None | Native | ✓ | | Section 33 drainage, one tree. |
| ***Salix laevigata*** | Red willow | Salicaceae | None | Native | ✓ | | Section 33 drainage, very uncommon, heavily grazed. |
| ***Castilleja attenuata*** | Valley tassels | Scrophulariaceae | None | Native | ✓ | ✓ | Uncommon in annual grasslands throughout PSA; Dart 365. |
| ***Castilleja brevistyla*** | Owl's clover | Scrophulariaceae | None | Native | ✓ | ✓ | Common in annual grasslands throughout PSA. Dart 364; Perry 10-13, 10-26; Keil 30695 (Determined by Margriet Weatherwax). |
| ***Castilleja brevistyla x densiflora*** | Hybrid owl's clover | Scrophulariaceae | None | Native | ✓ | | Common in Section 4; Keil 30694, 30696 (Determined by Margriet Weatherwax). |
| ***Castilleja densiflora*** ssp. ***densiflora*** | Owl's clover | Scrophulariaceae | None | Native | ✓ | | Uncommon in Section 4. Perry 10-14, 10-25; Keil 30693 (Determined by Margriet Weatherwax). |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Castilleja densiflora*** ssp***. gracilis*** | Owl's clover | Scrophulariaceae | None | Native | ✓ | | Occasional in patches in Sections 4 and 5. Perry 10-24; |
| ***Castilleja exserta*** ssp. ***exserta*** | Purple owl's clover | Scrophulariaceae | None | Native | ✓ | ✓ | Common to locally abundant in untilled grasslands throughout PSA |
| ***Ailanthus altissima*** | Tree of Heaven | Simaroubaceae | None | Planted | ✓ | ✓ | Ranch compounds in Sections 28, 33. |
| ***Datura wrightii*** | Jimson weed | Solanaceae | None | Native | ✓ | ✓ | Common in fallow and bare croplands throughout PSA. Keil 30909. |
| ***Nicotiana quadrivalvis*** | Tobacco | Solanaceae | None | Native | ✓ | ✓ | Occasional in croplands throughout PSA. |
| ***Solanum elaeagnifolium*** | Horse nettle | Solanaceae | None | Introduced | ✓ | | A few individuals along roadside at Highway 58 in Section 34. Noxious weed. Perry 10-53. |
| ***Tamarix parviflora*** | Tamarisk | Tamaricaceae | None | Planted | ✓ | ✓ | Section 28. |
| ***Ulmus*** sp. | Elm | Ulmaceae | None | Planted | ✓ | ✓ | Sections 18, 28, 33. |
| ***Verbena lasiostachys*** | Verbena | Verbenaceae | None | Native | ✓ | | Very uncommon. Section 33. |
| ***Parthenocissus vitacea*** | Virginia creeper | Vitaceae | None | Planted | ✓ | ✓ | Section 28 ranch compound. |
| ***Tribulus terrestris*** | Puncture vine | Zygophyllaceae | None | Introduced | ✓ | ✓ | Along Bitterwater road in section 19. |

**Angiosperms, Monocotyledons – 41 species**

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Agave*** sp. | Agave | Agavaceae | None | Planted | ✓ | ✓ | Section 15 near water trough |
| ***Juncus bufonius*** var. ***bufonius*** | Toad rush | Juncaceae | None | Native | ✓ | ✓ | Vernal pools and ephemeral wetlands throughout PSA; Keil 30727. |
| ***Juncus luciensis*** | Santa Lucia dwarf rush | Juncaceae | **List 1B.2** | Native | ✓ | | Vernal pools in Section 4; Keil 30728. |
| ***Juncus mexicanus*** | Mexican rush | Juncaceae | None | Native | ✓ | | Uncommon; seasonal wetlands in ephemeral drainages |
| ***Juncus uncialis*** | Inch-high rush | Juncaceae | None | Native | ✓ | | Section 4 vernal pools. Perry 10-09; Dart 360; Keil 30688. |
| ***Aegilops triuncialis*** | Barbed oatgrass | Poaceae | None | Introduced | ✓ | ✓ | Very uncommon in PSA. One stand identified in Section 16 in 2008. |
| ***Avena fatua*** | Slender wild oat | Poaceae | None | Introduced | ✓ | ✓ | Common in grasslands and croplands throughout PSA. |
| ***Bromus catharticus*** | Rescue grass | Poaceae | None | Introduced | ✓ | ✓ | Very uncommon. Observed in southern Section 15. |
| ***Bromus diandrus*** | Ripgut brome | Poaceae | None | Introduced | ✓ | ✓ | Common along fence lines throughout PSA. |
| ***Bromus hordeaceus*** | Soft chess brome | Poaceae | None | Introduced | ✓ | ✓ | Abundant in annual grasslands throughout PSA |
| ***Bromus madritensis*** ssp. ***rubens*** | Red top brome | Poaceae | None | Introduced | ✓ | ✓ | Abundant in annual grasslands throughout PSA |
| ***Bromus tectorum*** | Cheat grass | Poaceae | None | Introduced | ✓ | ✓ | Uncommon in annual grasslands throughout PSA. |
| ***Crypsis schoenoides*** | Swamp pricklegrass | Poaceae | None | Introduced | ✓ | | Very uncommon; Section 33 main drainage. |
| ***Cynodon dactylon*** | Bermuda grass | Poaceae | None | Introduced | ✓ | ✓ | Along Highway 58, and other anthropogenic habitats. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Deschampsia danthonioides*** | Hairgrass | Poaceae | None | Native | ✓ | | Vernal pools; Keil 30690, 30737. |
| ***Distichlis spicata*** | Salt grass | Poaceae | None | Native | ✓ | ✓ | Locally common in seasonal wetlands. |
| ***Elymus elymoides*** | Squirrel-tail | Poaceae | None | Native | | ✓ | Very uncommon; Section 8. |
| ***Hordeum depressum*** | Alkali barley | Poaceae | None | Native | ✓ | | Very uncommon; vernal pools in Section 4. Perry 10-30; Keil 30725. |
| ***Hordeum marinum*** ssp. ***gussoneanum*** | Mediterranean barley | Poaceae | None | Introduced | ✓ | ✓ | Very uncommon; vernal pools in Section 4; Dart 335; Perry 10-12. |
| ***Hordeum murinum*** ssp. ***murinum*** | Foxtail barley | Poaceae | None | Introduced | ✓ | ✓ | Common in grasslands, roadsides, and fence lines throughout PSA. Dart 342. |
| ***Hordeum murinum*** ssp. ***leporinum*** | Foxtail barley | Poaceae | None | Introduced | ✓ | ✓ | Common in grasslands, roadsides, and fence lines throughout PSA. |
| ***Hordeum vulgare*** | Cultivated barley | Poaceae | None | Introduced | ✓ | ✓ | Primary grain crop in agricultural lands, occasional in grasslands. |
| ***Koeleria phleoides*** | Annual June grass | Poaceae | None | Introduced | | ✓ | Uncommon; Section 8. |
| ***Leymus triticoides*** | Creeping wildrye | Poaceae | None | Native | ✓ | ✓ | Uncommon; Sections 5, 28, 29. |
| ***Lolium multiflorum*** | Italian ryegrass | Poaceae | None | Introduced | ✓ | ✓ | Uncommon around pool in Section 19; scattered individuals in Sections 15 and 16. |
| ***Nassella cernua*** | Slender needlegrass | Poaceae | None | Native | ✓ | ✓ | Very uncommon; Sections 27 and 28, and along Highway 58 near Section 34. |
| ***Poa annua*** | Annual bluegrass | Poaceae | None | Introduced | ✓ | ✓ | Occasional agricultural weed. |
| ***Poa bulbosa*** | Bulbous bluegrass | Poaceae | None | Introduced | ✓ | | Uncommon in grasslands in southern end of PSA. |

| Scientific Name | Common Name | Family | Status | Origin | Option A | Option B | Notes and Collection Numbers |
|---|---|---|---|---|---|---|---|
| ***Poa secunda*** ssp. ***secunda*** | One-sided bluegrass | Poaceae | None | Native | ✓ | ✓ | Very uncommon in grasslands throughout PSA. |
| ***Polypogon monspeliensis*** | Annual beardgrass | Poaceae | None | Introduced | ✓ | ✓ | Section 32, near water tank . |
| ***Schismus arabicus*** | Mediterranean grass | Poaceae | None | Introduced | ✓ | ✓ | Abundant in dry grasslands and croplands throughout PSA |
| ***Secale cereale*** | Merced Rye | Poaceae | None | Introduced | ✓ | ✓ | Uncommon in croplands throughout PSA. |
| ***Triticum aestivum*** | Cultivated wheat | Poaceae | None | Planted | ✓ | ✓ | Occasional in croplands throughout PSA. |
| ***Vulpia microstachys*** ssp. ***ciliata*** | Annual fescue | Poaceae | None | Native | ✓ | ✓ | Common in untilled annual grasslands. |
| ***Vulpia microstachys*** ssp. ***pauciflora*** | Annual fescue | Poaceae | None | Native | ✓ | ✓ | Common in untilled annual grasslands. |
| ***Vulpia myuros*** ssp. ***hirsuta*** | Annual fescue | Poaceae | None | Introduced | ✓ | ✓ | Common in disturbed grasslands and fallow croplands. |
| ***Vulpia myuros*** ssp. ***myuros*** | Annual fescue | Poaceae | None | Introduced | ✓ | ✓ | Common in disturbed grasslands and fallow croplands. |
| ***Bloomeria crocea*** | Common goldenstar | Themidaceae | None | Native | ✓ | ✓ | Very uncommon; Section 8. |
| ***Brodiaea terrestris*** ssp. ***kernensis*** | Brodiaea | Themidaceae | None | Native | ✓ | | Locally common in Section 4; Keil 30726. |
| ***Dichelostemma capitatum*** | Blue dicks | Themidaceae | None | Native | ✓ | ✓ | Occasional in untilled annual grasslands. |
| ***Muilla maritima*** | Common Muilla | Themidaceae | None | Native | ✓ | | Uncommon in untilled annual grasslands. |

### *6.3.1 Botanical data*

Data collected during our transect and focused botanical surveys conducted from March through July 2010 was compiled according to USGS land Section (Table 11). With data compiled in this manner we then calculated species richness (the total number of taxa in a given area) within each Project Option (Table 12). Table 13 provides a comparison of the overall botanical data by Project Option.

Species richness varies by land Section, and is loosely correlated to the number of habitats and dominant habitat type within each Section. Sections with more habitats, particularly when habitats are of higher quality such as vernal pools, tended to support a greater number of plant species.

The dominant habitat types, by size, within the PSA are cropland and annual grassland. Annual grassland within the PSA contains a higher botanical diversity than cropland. Proposed Option A, comprised of the southerly land Sections of the PSA, contains a greater percent cover of annual grassland than Option B, and therefore supports a higher species richness; 242 species versus 185 species. Additionally, the higher quality of habitat within Option A supports a higher number of special status plant species; 9 species versus 4 species in Option B (Tables 12 and 13).

TABLE 11. SPECIES RICHNESS BY SECTION. Species richness data is presented for all land Sections within the PSA. The list is organized in descending order of total number of species.

| Section | Species Richness | Percent of Total Species in PSA | Percent Native | Percent Introduced | Number of Plant Families | Vernal Pools Present? |
|---|---|---|---|---|---|---|
| **4** | 147 | 60 | 73 | 27 | 35 | ✓ |
| **33** | 141 | 57 | 63 | 37 | 37 | ✓ |
| **28** | 122 | 49 | 66 | 34 | 31 | |
| **5** | 121 | 49 | 74 | 26 | 30 | |
| **34** | 119 | 48 | 71 | 29 | 26 | ✓ |
| **35** | 100 | 40 | 72 | 28 | 23 | |
| **16** | 97 | 39 | 62 | 38 | 27 | |
| **15** | 93 | 38 | 67 | 33 | 24 | |
| **8** | 88 | 36 | 64 | 36 | 22 | |
| **29** | 73 | 30 | 64 | 36 | 19 | |
| **22** | 73 | 30 | 70 | 30 | 21 | |
| **27** | 73 | 30 | 75 | 25 | 23 | |
| **26** | 72 | 29 | 74 | 26 | 20 | |
| **32** | 70 | 28 | 76 | 24 | 24 | ✓ |
| **21** | 67 | 27 | 55 | 45 | 20 | |
| **17** | 55 | 22 | 53 | 47 | 16 | |
| **18** | 52 | 21 | 52 | 48 | 22 | |
| **20** | 47 | 19 | 57 | 43 | 23 | ✓ |
| **19** | 46 | 19 | 57 | 43 | 22 | ✓ |
| **7** | 40 | 16 | 48 | 53 | 13 | |

TABLE 12. SPECIES RICHNESS BY PROJECT OPTION. Botanical species richness data is presented for Options A and B.

| Option | Species Richness (Total No. Taxa) | Percent of Total Taxa in PSA | Percent of Option is Cropland Habitat | Percent of Option is Grassland Habitat |
|---|---|---|---|---|
| **A** | 243 | 98 | 56% (4,380 acres) | 43% (3,356 acres) |
| **B** | 185 | 75 | 74% (4,712 acres) | 26% (1,689 acres) |

TABLE 13. BOTANICAL DATA PROJECT OPTION COMPARISON. Botanical data is provided for both proposed project Options.

| Category | Option A | Option B |
|---|---|---|
| Total Number of Plant Species (Species Richness) | 243 | 185 |
| Percent of Total PSA List | 98% | 75% |
| Number of Species by Life Form | 1 Fern<br>5 Gymnosperms<br>198 Dicot Angiosperms<br>39 Monocot Angiosperms | 1 Fern<br>1 Gymnosperm<br>151 Dicot Angiosperms<br>32 Monocot Angiosperms |
| Origin | 158 Native<br>66 Introduced<br>19 Planted (complete landscape list not compiled)[3] | 117 Native<br>59 Introduced<br>9 Planted (complete landscape list not compiled)[3] |
| Number of Plant Families | 52 Families | 41 Families |
| FESA or CESA species | None | None |

[3] Landscape plants that have persisted in areas of the PSA that are not currently inhabited were included. Landscape plants in currently maintained landscaped areas surrounding existing inhabited residences were not included.

| Category | Option A | Option B |
|---|---|---|
| CNPS List 1B species | **5 Species**<br>Round-leaved Filaree CNPS List 1B.1<br>Spiny-sepaled Button Celery CNPS List 1B.2<br>Santa Lucia Dwarf Rush CNPS List 1B.2<br>Munz's Tidy-tips CNPS List 1B.2<br>Shining Navarretia CNPS List 1B.2 | **1 Species**<br>Munz's Tidy-tips CNPS List 1B.2 |
| CNPS List 4 species | **4 Species**<br>Oval-leaved Snapdragon CNPS List 4.2<br>Salinas Milk-vetch CNPS List 4.3<br>Ferris' Goldfields CNPS List 4.2<br>Paso Robles Navarretia CNPS List 4.3 | **3 Species**<br>Salinas Milk-vetch CNPS List 4.3<br>Ferris' Goldfields CNPS List 4.2<br>Paso Robles Navarretia CNPS List 4.3 |

*6.3.2 Special status plants identified within and adjacent to the PSA*

We identified nine special status plant species within the PSA boundaries and one additional special status plant species just outside the PSA boundary. The locations of special status plants identified within and adjacent to the PSA are indicated on BR Map 12 in Section 13.0. Detailed results of special status plant occurrences within the PSA, including separate listings for Option A and Option B, are provided below (subsections A through J, and Table 14).

**A. Oval-leaved Snapdragon** (*Antirrhinum ovatum*) is a CNPS List 4.2 species that occurs in one area of cropland habitat in the east end of Section 5, Option A. It was first located during a botanical survey conducted by J. Dart and M. Perry in cropland areas of Option A, Section 5, on June 30, 2010. Continued focused surveys for *A. ovatum* were conducted on July 5 with Dr. David J. Keil to determine the extent of the occurrence and to search for additional localities. A total of approximately 35 individuals were located over an area of 0.8 acres (Table 14). The plants were widely scattered in a cropland field planted to grain. Clay soils with deep vertical cracks characteristic of Vertisol soils were typical of the occurrence area. Soils observed at this location were consistent with the soil map unit depicted by the NRCS Carrizo soil survey for this location. This Vertisol soil does not occur on NRCS maps anywhere else in the PSA, and characteristic heavy clay content and deep soil cracks have not been observed elsewhere in the PSA during our extensive site surveys. West of the

occurrence the adjacent cropland field was plowed bare at the time oval-leaved snapdragon was blooming in June. Soils in a portion of this area may be suitable for oval-leaved snapdragon, and a viable seed bank may be present. We expect this occurrence is localized where found, with a possible extension to the west if farming practices were eliminated.

**B. Salinas Milk-vetch** (*Astragalus macrodon*) is a CNPS List 4.3 species that occurs in scattered patches throughout the PSA, in both TSF Project Options. It is much more common in southern areas of the PSA, in Option A, where approximately 646 plants were counted. In Option B, a total of approximately 139 plants were counted. Salinas milk-vetch occurs over an area of approximately 14,575 square feet (0.33 acre) in Option A, and 5,825 square feet (0.1 acres) in Option B.

**C. Round-leaved Filaree** (*California macrophylla*) is a CNPS List 1B.1 species that occurs in two locations within the PSA, in Sections 5 and 33 of Option A. It does not occur in Option B. A total of approximately 200 plants are present, 100 in each occurrence. In all, round-leaved filaree occurs over an area of approximately 59,661 square feet (1.4 acres). In Section 5, round-leaved filaree was located along the west edge of Option A, just uphill from a recently cultivated field, occurring as scattered individuals within an approximately 1,500 square foot area. In Section 33, approximately 100 individuals are widely scattered over 1.3 acres (58,161 square feet).

**D. Spiny-sepaled Button-celery** (*Eryngium spinosepalum*) is a CNPS List 1B.2 species that occurs in one large vernal pool in the northern part of Section 4, Option A. Five individuals were present. This species was not located in any other vernal pools within the PSA.

**E. Diamond-petaled California Poppy** (*Eschscholzia rhombipetala*) is a CNPS List 1B.1 species that occurs in a small isolated population just outside and southwest of the Option A boundary in Section 5. The locality is in a recently plowed strip of land, adjacent to a barley field. This occurrence represents a new locality for the species, and is currently the second verified extant population in San Luis Obispo County. This population was visited three times in spring 2010 to estimate population size, map the occurrence, photo-document the occurrence with photos of key features for the taxon, and watch for seed set. Diamond-petaled California poppy was first detected on March 19, when a single individual was observed, and the occurrence was estimated at less than 20 individuals in a 20-foot by 10-foot area. Dr. David J. Keil visited the population with M. Perry and J. Dart on March 22 to get a photographic record, population count, and a description of the site characteristics. The population consisted of 33 plants in an area less than 1,000 square feet in size. Dr. Keil, Perry and Dart revisited the site on April 27 and found only 13 plants, some in bloom and some in fruit.

**F. Santa Lucia Dwarf Rush** (*Juncus luciensis*) is a CNPS List 1B.2 species that is locally abundant in two vernal pools in Section 4, Option A. This species was identified during a site visit with Dr. David J. Keil on April 27, 2010 during which this species was distinguished from the common inch-high rush (*Juncus uncialis*) that is also abundant in the vernal pools. The area of occurrence is estimated at 1,000 square feet in each of two pools. Santa Lucia dwarf rush was not identified in any

other habitat type, but the population in Section 4 is presumed stable and this species is expected to occur regularly in those years in which the vernal pools receive adequate rainfall for plants to germinate.

**G. Ferris' Goldfields** (*Lasthenia ferrisiae*) is a CNPS List 4.2 species that occurs only as scattered individuals within the Option A and Option B, Sections 28, 33, and 5, with no locations having more than one individual. The low number of plants at each occurrence suggests habitat within the PSA is marginal at best for this species. These waif-like occurrences likely represent germination of windblown seed from large populations in California Valley south and east of the PSA.

**H. Munz's tidy-tips** (*Layia munzii*) is a CNPS List 1B.2 species that occurs as scattered individuals or small patches in Sections 26, 28, 32, 33, 34, and 35, with larger, more stable patches occurring in Sections 4 and 5. Approximately 630 plants were counted in Option A, spread out over 39.8 acres of land. Only 12 plants were counted in Option B, within an area of approximately 220 square feet. Most of the suitable habitat within the PSA is highly disturbed from farming and grazing, which reduces the quality of the habitats for Munz's tidy-tips. In Section 26, three scattered individuals were found; in Section 28 the species was observed in two patches, consisting of 1 and approximately 10 individuals; four individuals were located in Section 32, at three distinct locations; Section 33 had four individuals, in four distinct locations. Two individual plants were located just outside the PSA boundary in Section 34, and only one individual was observed in Section 35. These patches and scattered individuals have a population density of only a few plants per square mile.

Section 4 supports one occurrence estimated at 200 plants in an area of approximately 9.7 acres. Only 2.4 acres of this area is within the PSA boundary. Section 5 has the highest density of Munz's tidy-tips, which occurs as a common, consistent member of an annual grassland community that occupies an area adjacent to barley fields at the west and southwest edges of the Option A, with additional scattered individuals and small patches occurring west of the Option A in CRP grasslands with scattered junipers. Munz's layia is expected to be a stable component of annual grassland habitat in Option A, with a high probability of occurring in Sections 4 and 5 annually. All other localities of Munz's tidy-tips are of one or a few plants which we consider accidental introductions subject to annual variability in terms of location and abundance.

**I. Paso Robles Navarretia** (*Navarretia jaredii*) is a CNPS List 4.3 species that occurs as scattered patches throughout the southern areas of the PSA. Where present, it can be locally abundant in small areas of suitable soil. A total of approximately 2,918 plants were estimated in Option A, over an area of 23,150 square feet (0.5 acre). In Option B, a total of 1,000 plants were estimated occurring in an area of approximately 1,500 square feet.

**J. Shining Navarretia (***Navarretia nigelliformis* ssp. *radians*) is a CNPS List 1B.2 species that occurs in one isolated occurrence in Option A, Section 5. The occurrence consists of approximately 100 plants over an area of about 800 square feet. Most of the plants are clustered in the bottom of an ephemeral swale. Shining navarretia was not detected in any other locations within the PSA.

TABLE 14. SPECIAL STATUS PLANT OCCURRENCE DATA. Data is provided for all special status plant locations within and immediately adjacent to the PSA. Totals are provided for Option A and Option B separately.

| Common Name | Scientific Name | Status | Topaz Solar Farm Project Option | USGS Land Section | Date Observed | Latitude (WGS 84) | Longitude (WGS 84) | Approx. Number of Plants | Size of Occurrence (sq. ft.) (Minimum size 10 sq. ft.) |
|---|---|---|---|---|---|---|---|---|---|
| Oval-leaved Snapdragon | *Antirrhinum ovatum* | CNPS List 4.2 | A | 5 | 6/30/10 7/5/2010 | 35.34943 | -120.05766 | 35 | 34,072 (0.8 acre) |
| Oval-leaved Snapdragon Total | | | A | | | | | ~35 plants | 34,072 (0.8 acre) |
| Oval-leaved Snapdragon Total | | | B | | | | | 0 plants | 0 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 4 | 5/5/2010 | 35.349610 | -120.042740 | 1 | 10 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 5 | 5/28/2010 | 35.337580 | -120.066010 | 250 | 2,500 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 5 | 5/28/2010 | 35.347310 | -120.070560 | 1 | 100 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.358180 | -120.057170 | 100 | 750 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | Out | 33 | 6/11/2010 | 35.351756 | -120.043260 | 3 | 100 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | Out | 33 | 6/11/2010 | 35.353317 | -120.043699 | 30 | 1,000 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.356080 | -120.054810 | 35 | 100 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.356450 | -120.055140 | 25 | 100 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.356910 | -120.055400 | 3 | 100 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.357480 | -120.055930 | 25 | 800 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.358530 | -120.056810 | 4 | 100 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.358830 | -120.057040 | 40 | 3,000 |

| Common Name | Scientific Name | Status | Topaz Solar Farm Project Option | USGS Land Section | Date Observed | Latitude (WGS 84) | Longitude (WGS 84) | Approx. Number of Plants | Size of Occurrence (sq. ft.) (Minimum size 10 sq. ft.) |
|---|---|---|---|---|---|---|---|---|---|
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.364480 | -120.056430 | 5 | 100 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A/B | 15 | 6/15/2010 | 35.399550 | -120.040250 | 130 | 5,600 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A/B | 16 | 6/15/2010 | 35.409810 | -120.043700 | 9 | 225 |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | Out | 4 | 6/30/10 | 35.351593 | -120.042540 | 25 | 34,948 (0.8 acre) |
| Salinas Milk-vetch | *Astragalus macrodon* | CNPS List 4.3 | A | 5 | 7/5/2010 | 35.351010 | -120.056980 | 13 | 1000 |
| Salinas Milk-vetch Total | | | A | | | | | ~646 plants | 14,485 (0.33 acre) |
| Salinas Milk-vetch Total | | | B | | | | | ~139 plants | 5,825 (0.1 acre) |
| Round-leaved Filaree | *California macrophylla* | CNPS List 1B.1 | A | 5 | 4/16/2010 | 35.349620 | -120.070400 | 100 | 1,500 |
| Round-leaved Filaree | *California macrophylla* | CNPS List 1B.1 | A | 33 | 4/16/2010<br>4/27/2010<br>5/24/2010 | 35.352310 | -120.049460 | 100 | 58,161 (1.3 acre) |
| Round-leaved Filaree Total | | | A | | | | | ~200 plants | 59,661 (1.4 acre) |
| Round-leaved Filaree Total | | | B | | | | | 0 plants | 0 |
| Spiny-sepaled Button Celery | *Eryngium spinosepalum* | CNPS List 1B.2 | A | 4 | 4/23/2010 | 35.347670 | -120.047520 | 5 | 100 |
| Spiny-sepaled Button Celery Total | | | A | | | | | 5 plants | 100 |
| Spiny-sepaled Button Celery Total | | | B | | | | | 0 plants | 0 |

| Common Name | Scientific Name | Status | Topaz Solar Farm Project Option | USGS Land Section | Date Observed | Latitude (WGS 84) | Longitude (WGS 84) | Approx. Number of Plants | Size of Occurrence (sq. ft.) (Minimum size 10 sq. ft.) |
|---|---|---|---|---|---|---|---|---|---|
| Diamond-petaled California Poppy | *Eschscholzia rhombipetala* | CNPS List 1B.1 | Out | 5 | 3/19/2010 4/27/2010 | 35.339780 | -120.067210 | 34 | 500 |
| Diamond-petaled California Poppy Total | | | A | | | | | 0 plants | 0 |
| Diamond-petaled California Poppy Total | | | B | | | | | 0 plants | 0 |
| Santa Lucia Dwarf Rush | *Juncus luciensis* | CNPS List 1B.2 | A | 4 | 4/27/2010 | 35.347670 | -120.047520 | 500 | 1,000 |
| Santa Lucia Dwarf Rush | *Juncus luciensis* | CNPS List 1B.2 | A | 4 | 4/27/2010 | 35.346144 | -120.045636 | 500 | 1,000 |
| Santa Lucia Dwarf Rush Total | | | A | | | | | ~1,000 plants | 2,000 |
| Santa Lucia Dwarf Rush Total | | | B | | | | | 0 plants | 0 |
| Ferris' Goldfields | *Lasthenia ferrisiae* | CNPS List 4.2 | A/B | 28 | 3/18/2010 | 35.372228 | -120.046375 | 1 | 10 |
| Ferris' Goldfields | *Lasthenia ferrisiae* | CNPS List 4.2 | A/B | 28 | 3/18/2010 | 35.377983 | -120.051327 | 1 | 10 |
| Ferris' Goldfields | *Lasthenia ferrisiae* | CNPS List 4.2 | A | 33 | 3/22/2010 | 35.356633 | -120.048619 | 1 | 10 |
| Ferris' Goldfields | *Lasthenia ferrisiae* | CNPS List 4.2 | A | 5 | 4/16/2010 | 35.349460 | -120.070370 | 1 | 10 |
| Ferris' Goldfields Total | | | A | | | | | 4 plants | 40 |
| Ferris' Goldfields Total | | | B | | | | | 2 plants | 20 |

| Common Name | Scientific Name | Status | Topaz Solar Farm Project Option | USGS Land Section | Date Observed | Latitude (WGS 84) | Longitude (WGS 84) | Approx. Number of Plants | Size of Occurrence (sq. ft.) (Minimum size 10 sq. ft.) |
|---|---|---|---|---|---|---|---|---|---|
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A (Occurrence extends outside project area) | 4 | 4/23/2010 | 35.348990 | -120.043600 | 200 | 102,517 (2.4 acres) (area within Option A) |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 5 | 3/19/2010 | 35.341164 | -120.061276 | 250 | 841,206 (19.3 acres) |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 5 | 3/19/2010 | 35.348400 | -120.070500 | 100 | 789,108 (18.1 acres) |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 5 | 4/23/2010 | 35.339600 | -120.066700 | 5 | 100 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 5 | 4/23/2010 | 35.340630 | -120.068590 | 50 | 31,002 (0.7 acres) |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 26 | 3/25/2010 | 35.366230 | -120.016830 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 26 | 3/25/2010 | 35.366300 | -120.020600 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 26 | 3/25/2010 | 35.368640 | -120.020200 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A/B | 28 | 3/18/2010 | 35.370370 | -120.051560 | 10 | 100 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A/B | 28 | 4/26/2010 | 35.366970 | -120.058550 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 32 | 3/22/2010 | 35.353200 | -120.060850 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 32 | 3/22/2010 | 35.352250 | -120.063930 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 32 | 4/2/2010 | 35.352840 | -120.077030 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 32 | 4/2/2010 | 35.352900 | -120.076810 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A/B | 33 | 3/22/2010 | 35.364450 | -120.049120 | 1 | 10 |

| Common Name | Scientific Name | Status | Topaz Solar Farm Project Option | USGS Land Section | Date Observed | Latitude (WGS 84) | Longitude (WGS 84) | Approx. Number of Plants | Size of Occurrence (sq. ft.) (Minimum size 10 sq. ft.) |
|---|---|---|---|---|---|---|---|---|---|
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 33 | 3/22/2010 | 35.360550 | -120.051670 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 33 | 4/16/2010 | 35.358610 | -120.056410 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 33 | 4/16/2010 | 35.351970 | -120.053260 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 34 | 4/16/2010 | 35.354090 | -120.037480 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 34 | 4/16/2010 | 35.355650 | -120.037840 | 1 | 10 |
| Munz's Tidy-tips | *Layia munzii* | CNPS List 1B.2 | A | 35 | 4/15/2010 | 35.364050 | -120.007710 | 1 | 10 |
| Munz's Tidy-tips Total | | | A | | | | | ~630 plants | 1,733,181 (39.8 acres) |
| Munz's Tidy-tips Total | | | B | | | | | ~12 plants | 120 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 4 | 5/25/2010 | 35.337520 | -120.045920 | 3 | 100 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 4 | 5/25/2010 | 35.338210 | -120.046300 | 4 | 100 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 4 | 5/28/2010 | 35.339050 | -120.046350 | 1 | 10 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 4 | 5/28/2010 | 35.344280 | -120.049560 | 10 | 100 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 4 | 5/28/2010 | 35.341840 | -120.052550 | 800 | 17,250 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 5 | 5/28/2010 | 35.351070 | -120.070860 | 25 | 100 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 5 | 6/30/2010 | 35.338570 | -120.057360 | 250 | 400 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A/B | 28 | 6/2/2010 | 35.371580 | -120.050480 | 500 | 600 |

| Common Name | Scientific Name | Status | Topaz Solar Farm Project Option | USGS Land Section | Date Observed | Latitude (WGS 84) | Longitude (WGS 84) | Approx. Number of Plants | Size of Occurrence (sq. ft.) (Minimum size 10 sq. ft.) |
|---|---|---|---|---|---|---|---|---|---|
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A/B | 28 | 6/11/2010 | 35.373220 | -120.053200 | 500 | 900 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 32 | 6/29/2010 | 35.352921 | -120.077005 | 50 | 100 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 33 | 6/11/2010 | 35.358782 | -120.051137 | 700 | 3000 |
| Paso Robles Navarretia | *Navarretia jaredii* | CNPS List 4.3 | A | 34 | 4/15/2010 | 35.365310 | -120.024380 | 75 | 400 |
| Paso Robles Navarretia Total | | | A | | | | | ~2,918plants | 23,060 (0.5 acre) |
| Paso Robles Navarretia Total | | | B | | | | | ~1,000 plants | 1,500 |
| Shining Navarretia | *Navarretia nigelliformis* ssp. *radians* | CNPS List 1B.2 | A | 5 | 6/29/2010 | 35.337449 | -120.061354 | 100 | 800 |
| Shining Navarretia Total | | | A | | | | | ~100 plants | 800 |
| Shining Navarretia Total | | | B | | | | | 0 plants | 0 |

# 7.0 Wildlife Inventory

## 7.1 Specialized Wildlife Surveys Conducted for the Topaz Solar Farm

Specialized wildlife surveys were conducted within the PSA for Blunt-nosed leopard lizard, small mammals, fairy shrimp, San Joaquin kit fox, Kern primrose sphinx moth, and golden eagle. Most of the specialized wildlife surveys are complete (Section 7.1.1); however the 2010 blunt-nosed leopard lizard protocol survey will continue until September 2010.

### *7.1.1 Completed specialized wildlife surveys*

**Blunt-nosed Leopard Lizard**

- 2007 Partial Protocol BNLL Survey; Sections 28 and north half 33 (URS 2008a, included in Technical Appendix, Volume 3)
- 2008 Protocol BNLL Survey; Sections 28 and 33 (URS 2008a, included in Technical Appendix, Volume 3)
- 2008 Protocol BNLL Survey; Sections 1 and 6 (not part of current PSA), 8, 15, 16, 21, 22, 29 (Althouse and Meade, Inc. 2009a, included in Technical Appendix, Volume 1)
- 2009 Protocol BNLL Survey; Sections 19, 21, 22 and 27 (Althouse and Meade, Inc. 2010c, included in Technical Appendix, Volume 1)
- 2010 Protocol BNLL Survey, Adult Period; all or portions of Sections 4, 5, 26, 32, 34 and 35 (Althouse and Meade, Inc. 2010, included in this report, Section 7.3.7)

**Small Mammal Trapping**

- 2008 Small Mammal Trapping Survey, Sections 28 and north half 33 (URS 2008b, included in Technical Appendix, Volume 3)
- 2008 Small Mammal Trapping Survey, Sections 1, 6, 8, 15, 16, and 23 (Vanherweg 2008, included in Technical Appendix, Volume 3)
- 2009 Small Mammal Trapping Survey, Sections 19, 21, 22, and 27 (Collins 2009, included in Technical Appendix, Volume 3)
- 2010 Small Mammal Trapping Survey, Sections 4, 5, 15, 26, 28, and 32-35 (Collins 2010, included in Technical Appendix, Volume 3)

**Giant Kangaroo Rat**

- 2010 Giant Kangaroo Rat Burrow and Scat Measurement Study (Althouse and Meade, Inc. with Paul Collins and Tom Olson, included in this report, Section 7.3.3)

**Fairy Shrimp**

- 2008 Dry Season Protocol Fairy Shrimp Survey (Helm 2008, included in Technical Appendix, Volume 2)
- 2009 Dry Season Protocol Fairy Shrimp Survey (Helm 2009, included in Technical Appendix, Volume 2)
- 2009 Wet Season Protocol Fairy Shrimp Survey (AEC 2009, included in Technical Appendix, Volume 2)
- 2010 Wet Season Protocol Fairy Shrimp Survey (AEC 2010, included in Technical Appendix, Volume 2)
- 2010 Dry Season Protocol Fairy Shrimp Survey (Helm 2010, included in this report, Appendix A)

**San Joaquin Kit Fox**

- 2009 Scat Detection Dog Surveys for San Joaquin Kit Fox (Smith 2010, included in Technical Appendix, Volume 1)
- 2010 San Joaquin Kit Fox Genetic Study (Henry and Maldonado 2010)[4]
- 2010 San Joaquin Kit Fox Natal Den Location Survey (Althouse and Meade, Inc., included in this report, Section 7.3.1)

**Golden Eagle**

- 2010 Aerial Protocol Survey for Golden Eagles (Latta 2010, included in Technical Appendix, Volume 2)

**Kern Primrose Sphinx Moth**

- 2010 Habitat Assessment and Limited Presence-Absence Survey (Arnold 2010, included in Technical Appendix, Volume 3)

**Pronghorn Antelope and Tule Elk**

- 2010 Movement and Fence Crossing Survey (Althouse and Meade, Inc., included in this report, Section 7.3.9 and BR Map 13 in Section 13.0)

### *7.1.2 On-going specialized wildlife surveys*

**Blunt-nosed Leopard Lizard**

- 2010 Protocol BNLL Survey, Juvenile Period; Sections 4, 5, 26, 32, 34 and 35 (Althouse and Meade, Inc., expected completion in September 2010)

[4] The kit fox genetic study report was not completed at the time this biological report was submitted. The final kit fox genetic report will be distributed in September 2010 within the Biological Report Technical Appendix, Volume 4.

## 7.2 Wildlife Survey Methods

Documentation of wildlife within the PSA utilized general observation data in combination with highly specialized sampling techniques for detecting and determining the identification of difficult to locate or rare taxa. Wildlife surveys conducted within the PSA were designed by experts to be scientifically valid methods of detection and identification, and simultaneously were conducted according to rigors of published survey protocols (CDFG May 1994, USFWS 1996a, Pagel 2010) and standard survey methodologies.

Wildlife documentation included direct observations of animal presence, nests, tracks, and other wildlife sign. Additionally we used motion-detecting cameras (Cuddeback® Digital Expert 2006) installed at various locations within the PSA to detect animal movements. Observations of wildlife were recorded during field surveys in all areas of the PSA. Birds were identified by sight, using 10 power binoculars, or by vocalizations. Reptiles and amphibians were identified by sight, often using binoculars, and by hand-captures or dip-net surveys; traps were not used. Mammals recorded at the site were identified by sight, tracks, motion-detecting cameras, and Sherman live traps. Most mammal species recorded were observed alive while utilizing habitats within the PSA. Carcasses, skulls, and bones were also examined.

Biologists conducting surveys within the PSA maintained daily wildlife data sheets on which all species observed were recorded. Coordinates and notes for special status species detections or other observations of interest were also recorded. Biological resource maps indicating the locations of special status species within the PSA are provided in Section 13.0. Many of the specialized wildlife surveys conducted within the PSA were published as independent reports. All independent reports completed as of June 2010 were bound in a three volume technical appendix that supports this final biological report (Althouse and Meade, Inc. 2010b).

### *7.2.1 San Joaquin kit fox survey methods*

Kit fox surveys on the Topaz Solar Farm PSA were designed and conducted to achieve two primary goals:

1) Determine how many kit foxes utilize habitats within the PSA
2) Determine locations of all natal dens within the PSA

In order to determine how many kit foxes utilize habitats within the PSA, we conducted a genetic analysis of kit fox scats collected on the site. Scat detection dog surveys were conducted by Deborah A. Smith, Ph.D. and Alice Whitelaw of Working Dogs for Conservation Foundation (Smith 2010). All fresh scats detected were collected for genetic analysis. A detailed methodology of this study is included in Smith 2010 (appended in the Biological Report Technical Addendum, Volume 1). Fresh scats collected were sent to the genetics laboratory at the Smithsonian Institution/National Zoological Park in Washington D.C. for analysis by Dr. Jesus Maldonado. Genetic analysis determined the number of individual foxes represented by the scat collection, sex, and familial relationship (Henry and Maldonado 2010).

Daytime visual surveys were conducted concurrently with other biological surveys, and primarily consisted of gathering information on recent signs of kit fox activity. Occupied

dens or dens showing sign of recent activity were mapped in the field using hand-held Garmin GPS units. Data gathered on areas of kit fox use during other biological surveys were used to direct focused surveys for natal dens. Kit fox dens identified in the field were categorized as either "Known Den" or "Natal Den". Known dens are defined as those where a kit fox was observed at the den, or the kit fox sign at the den was distinct and fresh, suggesting the den was occupied at the time of observation. Natal dens are defined as those dens used specifically for the purpose of raising puppies. In one instance we identified a natal den, then found the fox family at another den, which was subsequently labeled a "Post-natal Den". Where our observations of the foxes were insufficient to determine natal versus post-natal, we identify it as a natal den. All kit fox known dens and natal dens are indicated on the biological resource map (BR Map 14, Section 13.0).

### *7.2.2 Kern primrose sphinx moth*

A habitat assessment and limited presence-absence survey for the Kern primrose sphinx moth, a federally listed threatened species, was conducted on April 2, 2010 by Richard A. Arnold, Ph.D. of Entomological Consulting Services, Ltd. (Arnold 2010, in the Biological Report Technical Addendum, Volume 3). Althouse and Meade, Inc. mapped 45 locations of *Camissonia strigulosa*, a potential larval food plant for the sphinx moth, within the PSA during botanical transect surveys in April 2010. Dr. Arnold reviewed the *Camissonia strigulosa* locations and Natural Resource Conservation Service (NRCS) soil maps prior to conducting the April 2 site visit to determine which locations were situated on soils potentially suitable to the sphinx moth larval life stage. Dr. Daniel E. Meade from Althouse and Meade, Inc. accompanied Dr. Arnold on the April 2 site visit. Each location was surveyed for larvae and signs of larval feeding damage.

### *7.2.3 Small mammal survey methods*

Small mammal taxa in the PSA were inventoried during four trapping studies (URS 2008, Vanherweg 2008, Collins 2009, and Collins 2010, in the Biological Report Technical Addendum, Volume 3), three visual detection transect surveys (Althouse and Meade, Inc. 2009a, 2010b), a barn owl pellet analysis (Collins 2009), a kangaroo rat burrow and scat measurement study, and during focused wildlife surveys of the PSA. The trapping studies each focused on different areas of the PSA, resulting in a comprehensive sample of small mammals (primarily nocturnal) occurring across the 10,000 acre PSA.

Visual detection transect surveys were conducted for the Nelson's antelope squirrel concurrently with surveys for BNLL in 2008, 2009 and 2010. Specific methods for each survey are provided in the original reports.

Thirty barn owl pellets were collected and the bone contents were identified to species by Paul Collins, Curator of Vertebrate Zoology at the Santa Barbara Museum of natural History (Collins 2009).

Giant kangaroo rat focused visual detection surveys were conducted in suitable habitats within the PSA in 2008 and 2009 (Althouse and Meade, Inc. 2009b) and in 2010 concurrently with the 12 BNLL full-coverage passes for the adult period. These surveys were preceded by visits to known reference sites in the Carrizo Plain National Monument (Panorama Road). Additionally, all 2010 BNLL surveyors attended a giant kangaroo rat field training on May 14, 2010 given by Paul Collins.

Biologists conducting focused surveys for giant kangaroo rat walked transects through suitable habitat looking for kangaroo rat precincts. All precincts identified were mapped and carefully examined for the diagnostic sign of the giant kangaroo rat (vegetation clearing, haystacks, pit caches, etc.). On June 18, 2010, Paul Collins and Tom Olson (Thomas E. Olson Biological Consulting) conducted a kangaroo rat burrow and scat measurement study within the PSA. Althouse and Meade, Inc. biologist Jason Dart assisted with the survey. Each potential kangaroo rat precinct was surveyed for horizontal and vertical burrows, and other diagnostic sign. Where rodent burrows and sign were positively identified as that of a kangaroo rat, vertical and horizontal measurements were taken of all burrows, and scat was collected where available for later evaluation in the lab (Table 18). Burrow and scat morphometrics were compared to those presented in the published literature (Williams 1992).

### *7.2.4 Fairy shrimp survey methods*

Protocol surveys for listed vernal pool branchiopods began in the 2008 dry season (Helm Biological Consulting, LLC December 2008). Wet season surveys were conducted during the 2008-2009 wet season by Advantage Environmental Consultants, LLC (AEC August 2009). A second dry season survey conducted in 2009 covered additional lands added to the PSA since the 2008 survey (Helm Biological Consulting, LLC August 2009). An additional wet season survey was conducted in 2009-2010 by Advantage Environmental Consultants, and a 2010 dry season survey was conducted by Helm Biological Consulting, LLC. Specific methods for each survey are provided in the original reports, which are included in the 2010 Biological Report Technical Appendix, Volume 2 (Althouse and Meade, Inc. 2010b) and Appendix A of this report.

### *7.2.5 Special status bird survey methods*

Winter bird surveys conducted November 2009 through January 2010 utilized a focused survey method in which surveyors walked representative habitat types, and also inspected homesteads, powerlines, and fencelines within the PSA.

Winter bird surveys conducted in February 2010 utilized a non-random transect survey method in which biologists covered parallel belts of land in north-south orientation across all 3,769 acres of annual grasslands and approximately 3,500 acres of croplands within the PSA. Each transect belt was 800 feet wide and up to 5,280 feet long (one mile). Transect spacing was set at 660 feet (one-eighth mile) so that transects overlapped each other for greater than 100 percent visual cover. Each one mile long transect belt was covered in approximately 50 minutes, including three five minute stationary observation points. Each transect was surveyed twice between February 11 and February 25. Surveyors walked the center line of the transect belt, but could meander throughout the transect belt to make positive identifications of bird species. Surveyors tallied the number of each species observed during each transect, and the resulting data provided a count of species (species richness) per transect and a total bird abundance per transect.

Prior to initiating the surveys, tests were done in the field to determine a suitable transect width. With vegetation in most areas less than four inches in height during the winter period, we were able to identify horned larks and savannah sparrows (small ground-dwelling species) at a distance of 400 feet.

To aid in our surveys, transect lines were overlaid on a high resolution aerial photograph for use in the field, and flagging was set out along fence lines to indicate the boundaries. All surveyors used 10 power binoculars, and carried a Garmin GPS to record coordinates for special status species observations. For burrowing owls, coordinates were taken for all den sites showing signs of recent use (pellets, feathers, prey remains and urea).

Nesting bird surveys conducted in 2010 utilized a focused survey method in which surveyors targeted special status birds expected to nest within the PSA. Burrowing owls are the most sensitive nesting species at the site, and consequently a focused burrowing owl nesting survey was conducted by J. Dart and Peter Gaede on June 2 and 3, 2010. The surveyors searched for burrowing owls and visited all den sites previously observed in use by burrowing owls or that were documented as exhibiting burrowing owl sign during previous wildlife surveys. The condition of each den was noted, and locations of burrowing owls and new dens were mapped. When burrowing owls were located, they were observed from a distance to determine their breeding status.

### *7.2.6 Golden eagle aerial nest survey methods*

An aerial survey for golden eagle nests was conducted by Brian Latta, Executive Director, The Bird Group (Latta 2010). Methods of the survey conform to the newly published Interim Golden Eagle Technical Guidance (Pagel 2010). In one location, the Beartrap Condor critical habitat area, aerial survey is not permitted and nest searches were conducted on foot. The golden eagle nest survey included coverage for both the proposed Topaz Solar Farm and the proposed California Valley Solar Ranch. The survey area included a ten mile radius area around both the project sites, totaling approximately 448,647 acres. Detailed methods are provided in the original report, included in the 2010 Biological Report Technical Appendix, Volume 2 (Althouse and Meade, Inc. 2010b).

### *7.2.7 Reptile and amphibian survey methods*

Protocol surveys for the blunt-nosed leopard lizard (BNLL) were conducted throughout the PSA (URS 2007, URS 2008, Althouse and Meade, Inc. 2009a, Althouse and Meade, Inc. 2010a). One additional full protocol survey for 2010 is in progress. The 12 full-coverage passes for the adult period were completed by July 15, with no detections of BNLL, which suggests greater than 95 percent certainty that BNLL do not occur in the survey area (Germano 2009). Five full-coverage passes will be completed between August 1 and September 15 for the juvenile period. Methods of the BNLL protocol surveys were consistent with published protocol (CDFG 1994).

Western spadefoot toad breeding pools were documented by Advantage Environmental Consultants concurrently with protocol surveys for listed fairy shrimp, and by Althouse and Meade, Inc. We visually confirmed presence of tadpole larvae in ephemeral pools without use of dip-nets or other invasive sampling techniques (refer to Photo Collection 5, Section 14.0. Aquatic amphibian dip-net surveys were conducted in two agricultural reservoirs, one in Section 20 and one in Section 28.

### *7.2.8 Bat roost survey methods*

Abandoned buildings within the PSA were surveyed for roosting bats in 2010 during the winter and spring by Althouse and Meade, Inc. biologists. Paul Collins examined the

buildings in Section 33. The exterior of each building was examined for potential openings which could be used by bats to access roosting sites. Any potential opening was further examined for signs of bat entry, such as wear marks and feces. Surveyors used flashlights and binoculars where needed. Interior visual surveys were conducted at most of the barns and abandoned homes. Interior surveys examined attics and other potential roost locations for bats or their sign. Occupied residences in Sections 16 and 18 were not surveyed.

## 7.3 Final Wildlife Survey Results

One hundred forty-four (144) animal species are listed that could potentially occur within the PSA (Table 15). These include at least 6 aquatic arthropods, 3 amphibians, 17 reptiles, 78 birds, and 36 mammals. Numerous invertebrates are known or expected to occur, but are not included. We provide this list as a guide to the wildlife observed on the PSA and to the species that could potentially be present at least seasonally. Other species could occur as transients, particularly avian fauna. A large number of migrant bird species are known to move through the Carrizo Plain region seasonally. We include some migrants in the list that were observed or are expected. Wildlife detected on the site includes 6 aquatic invertebrates, 3 amphibians, 5 reptiles, 58 birds, and 21 mammals.

Motion-detecting cameras (Cuddeback® Expert) were installed at various locations within the PSA to identify and document wildlife. Eleven cameras were placed at 33 locations within the PSA in 2009 and 2010. Cameras were active from April 2 to July 20, 2009. Cameras for the 2010 season were installed on January 15 and were in place through July 8. Motion-detecting cameras captured images of nineteen wildlife species within the PSA including American badger, burrowing owl, golden eagle, tule elk, pronghorn, and San Joaquin kit fox. Badgers were photographed three times at three locations. Burrowing owl and golden eagle were both photographed once. Tule elk were photographed thirty-five times at six locations and pronghorn were photographed one hundred-eight times at fifteen locations. The primary target was San Joaquin kit fox, which was photographed twenty-three times, with detections at six locations. Other wildlife species captured on the motion-detecting cameras include American kestrel, Brewer's blackbird, horned lark, Western meadowlark, raven, red-tailed hawk, red-winged blackbird, savanna sparrow, cottontail rabbit, black-tailed jackrabbit, coyote, California ground squirrel, and wild boar.

TABLE 15. FINAL WILDLIFE LIST. At least 144 animal species have the potential to occur within the PSA. The Special Status column indicates listing status of the organism under the Federal Endangered Species Act, the California Endangered Species Act, or by CDFG (see Appendix A for status definitions). Species observed at the site during our surveys are designated by the check symbol (✓) in the fourth column.

| Common Name | Scientific Name | Special Status | Observed Within PSA? | General Habitat Preference |
|---|---|---|---|---|
| **Aquatic Invertebrates– 6 species** | | | | |
| Versatile Fairy Shrimp | *Branchinecta lindahli* | None | ✓ | Ephemeral pools in a variety of habitat types |
| Longhorn Fairy Shrimp | *Branchinecta longiantenna* | FE[5] | ✓ | Seasonally astatic grassland vernal pools |
| Vernal Pool Fairy Shrimp | *Branchinecta lynchi* | FT[6] | ✓ | Vernal pools, ephemeral wetlands with no flow |
| Water Flea | Order *Cladocera* | None | ✓ | Aquatic |
| Water Boatmen | Order *Corixidae* | None | ✓ | Aquatic |
| Seed Shrimp | Class *Ostracoda* | None | ✓ | Aquatic |
| **Amphibians – 3 species** | | | | |
| California (Western) Toad | *Bufo boreas halophilus* | None | ✓ | Grassland, woodland |
| Pacific Chorus Frog | *Pseudacris regilla* | None | ✓ | Many habitats near water |
| Western Spadefoot Toad | *Spea hammondii* | SSC[7] | ✓ | Grassland habitat with seasonal pools |
| **Reptiles – 17 species** | | | | |
| California Glossy Snake | *Arizona elegans occidentalis* | None | | Arid scrub, rocky areas, grasslands, chaparral |
| California Whiptail | *Aspidoscelis tigris munda* | None | | Dry, rocky areas |
| Western Yellow-bellied Racer | *Coluber constrictor mormon* | None | | Grasslands, open areas |
| Northern Pacific Rattlesnake | *Crotalus oreganus oreganus* | None | ✓ | Dry, rocky habitats |
| California Alligator Lizard | *Elgaria multicarinata multicarinata* | None | | Open grassland, woodland, chaparral |
| Blunt-nosed Leopard Lizard | *Gambelia sila* | FE | | Alkali and desert scrub habitats |
| California Nightsnake | *Hypsiglena ochrorhyncha nuchalata* | None | | Chaparral, grassland |
| California Kingsnake | *Lampropeltis getula californiae* | None | | Woodland, grassland, streams |

[5]FE = Federally listed Endangered

[6] FT = Federally listed Threatened

[7] SSC = CDFG designation for Species of Special Concern

| Common Name | Scientific Name | Special Status | Observed Within PSA? | General Habitat Preference |
|---|---|---|---|---|
| San Joaquin Whipsnake | *Masticophis flagellum ruducki* | SSC | ✓ | Open, dry habitats with no trees. Needs burrows. |
| Blainville's (Coast) Horned Lizard | *Phrynosoma blainvillii* | SSC | | Dune scrub, alkali scrub, chaparral, grasslands |
| Pacific Gopher Snake | *Pituophis catenifer catenifer* | None | ✓ | Woodland, grassland, rural |
| Western Red-tailed [=Gilbert's] Skink | *Plestiodon [=Eumeces] gilberti rubricaudatus* | None | | Woodland, grassland, chaparral; inland areas |
| Skilton's [=Western] Skink | *Plestiodon [=Eumeces] skiltonianus skiltonianus* | None | | Woodland, grassland, chaparral, inland and coastal |
| Long-nosed Snake | *Rhinocheilus lecontei* | None | ✓ | Arid and semi-arid deserts, grasslands, shrublands |
| Coast Range Fence Lizard | *Sceloporus occidentalis bocourtii* | None | | Wide range |
| Valley Garter Snake | *Thamnophis sirtalis fitchii* | None | | Many habitats near water |
| Side-blotched Lizard | *Uta stansburiana* | None | ✓ | Dry habitats |
| **Birds – 83 species** | | | | |
| Cooper's Hawk | *Accipiter cooperii* | Special Animal[8] | ✓ | Oak, riparian woodland |
| Sharp-shinned Hawk | *Accipiter striatus* | Special Animal | ✓ | Oak, riparian woodland |
| White-throated Swift | *Aeronautes saxatilis* | None | | Nests in cliffs |
| Red-winged Blackbird | *Agelaius phoeniceus* | None | ✓ | Marshes, fields |
| Tricolored Blackbird | *Agelaius tricolor* | SSC (Nesting Colony) | ✓ (not nesting) | Marshes, fields |
| Grasshopper Sparrow | *Ammodramus savannarum* | SSC (Nesting) | ✓ | Grassland hillsides |
| American Pipit | *Anthus rubescens* | None | ✓ | Fields, beaches, etc. |
| Western Scrub Jay | *Aphelocoma californica* | None | | Oak, riparian woodlands |
| Golden Eagle | *Aquila chrysaetos* | Fully Protected[9] BGEPA | ✓ | Open or mountainous areas |
| Great Egret | *Ardea alba* | SSC (Rookery Site) | | Water habitats, grasslands |

[8] Special Animal refers to all of the animal taxa inventoried by the CNDDB, regardless of their legal or protection status. Refer to discussion of Special Animals in Section 4.1.2.

[9] Refer to Section 4.1.2 for a discussion of Fully Protected species.

| Common Name | Scientific Name | Special Status | Observed Within PSA? | General Habitat Preference |
|---|---|---|---|---|
| Great Blue Heron | *Ardea herodias* | SSC (Rookery Site) | | Water habitats, grasslands |
| Short-eared Owl | *Asio flammeus* | SSC (Nesting) | | Swamp, lowland meadows |
| Long-eared Owl | *Asio otus* | SSC (Nesting) | | Riparian bottomlands with adjacent open lands |
| Burrowing Owl | *Athene cunicularia* | SSC | ✓ | Grasslands with ground squirrel burrows |
| Great Horned Owl | *Bubo virginianus* | None | | Woodland, grassland |
| Red-tailed Hawk | *Buteo jamaicensis* | None | ✓ | Open, semi-open country |
| Rough-legged Hawk | *Buteo lagopus* | None | | Variety of open habitats |
| Ferruginous Hawk | *Buteo regalis* | Special Animal (Wintering) | ✓ | Grasslands, open fields |
| Swainson's Hawk | *Buteo swainsoni* | ST[10] | ✓ | Grasslands or agricultural with trees, riparian |
| Anna's Hummingbird | *Calypte anna* | None | ✓ | Many habitats |
| Costa's Hummingbird | *Calypte costae* | SSC (Nesting) | ✓ | Desert riparian, scrub |
| Lesser Goldfinch | *Carduelis psaltria* | None | | Riparian, oak woodlands |
| American Goldfinch | *Carduelis tristis* | None | | Weedy fields, woodlands |
| Lawrence's Goldfinch | *Carduelis lawrencei* | Special Animal (Nesting) | ✓ | Oak woodlands, savanna |
| House Finch | *Carpodacus mexicanus* | None | ✓ | Riparian, grasslands, chaparral, and woodlands |
| Turkey Vulture | *Cathartes aura* | None | ✓ | Open country |
| Mountain Plover | *Charadrius montanus* | SSC (Wintering) | ✓ | Winters in grasslands, agricultural fields |
| Killdeer | *Charadrius vociferous* | None | ✓ | Mud flats, stream banks |
| Lark Sparrow | *Chondestes grammacus* | Special Animal (Nesting) | ✓ | Woodland edges, grasslands |
| Northern Harrier | *Circus cyaneus* | SSC (Nesting) | ✓ | Nest on ground in tall reeds or grasses |
| Northern Flicker | *Colaptes auratus* | None | | Woodlands |
| Band-tailed Pigeon | *Columba fasciata* | None | | Woodlands, urban trees |
| Rock Dove | *Columba livia* | None | ✓ | Urban areas |
| American Crow | *Corvus brachyrhynchos* | None | ✓ | Many habitats, esp. urban |
| Common Raven | *Corvus corax* | None | ✓ | Riparian, chaparral and woodlands |

[10] ST = State listed Threatened

| Common Name | Scientific Name | Special Status | Observed Within PSA? | General Habitat Preference |
|---|---|---|---|---|
| Yellow-rumped Warbler | *Dendroica coronata* | None | ✓ | Woodlands, brush, open country |
| Black-throated Grey Warbler | *Dendroica nigrescens* | None | ✓ | Woodlands |
| White-tailed Kite | *Elanus leucurus* | Fully Protected | | Nests in dense live oaks |
| Horned Lark | *Eremophila alpestris* | None | ✓ | Grassland, oak savanna |
| Brewer's Blackbird | *Euphagus cyanocephalus* | None | ✓ | Open habitats |
| Merlin | *Falco columbarius* | Special Animal | ✓ | Open country with adjacent woodlands |
| Prairie Falcon | *Falco mexicanus* | Special Animal | ✓ | Open country, nests on cliffs |
| American Kestrel | *Falco sparverius* | None | ✓ | Open, semi-open country |
| Greater Roadrunner | *Geococcyx californianus* | None | | Open habitats |
| California Condor | *Gymnogyps californianus* | FE | | Large expanses of mountainous terrain |
| Bald Eagle | *Haliaeetus leucocephalus* | Delisted/ SE BGEPA | ✓ | Forested areas near water for breeding. Wintering in variety of habitats with suitable prey |
| Barn Swallow | *Hirundo rustica* | None | ✓ | Riparian, grasslands, lakes |
| Bullock's Oriole | *Icterus bullockii* | None | ✓ | Oak, riparian woodlands |
| Loggerhead Shrike | *Lanius ludovicianus* | SSC (Nesting) | ✓ | Nests in shrubs, trees near open areas |
| Northern Mockingbird | *Mimus polyglottos* | None | | Riparian, chaparral and woodlands. Also urban |
| Brown-headed Cowbird | *Molothrus ater* | None | | Rural areas, ranches |
| Ash-throated Flycatcher | *Myiarchus cinerascens* | None | ✓ | Open, arid habitats |
| Long-billed Curlew | *Numenius americanus* | Special Animal (Nesting) | ✓ (Wintering only) | Winters in meadows, fields |
| Whimbrel | *Numenius phaeopus* | None | | Winters in meadows, fields |
| MacGillivrays Warbler | *Oporornis tolmiei* | None | ✓ | Forests, woodlands |
| Western Screech Owl | *Otus kennicottii* | None | | Oak woodland |
| Osprey | *Pandion haliaetus* | Special Animal | ✓ | Aquatic areas |
| House Sparrow | *Passer domesticus* | None | ✓ | Urban |
| Savannah Sparrow | *Passerculus sandwichensis* | None | ✓ | Open habitats, marshes, grasslands |
| Cliff Swallow | *Petrochelidon pyrrhonota* | None | ✓ | Urban; open areas near water |
| Phainopepla | *Phainopepla nitens* | None | | Oak, riparian, scrub |

| Common Name | Scientific Name | Special Status | Observed Within PSA? | General Habitat Preference |
|---|---|---|---|---|
| Western Tanager | *Piranga ludoviciana* | None | ✓ | Woodlands |
| Oregon Vesper Sparrow | *Pooecetes gramineus affinis* | SSC (Wintering) | ✓ | Open habitats, often with scattered shrubs |
| Black Phoebe | *Sayornis nigricans* | None | | Near water |
| Say's Phoebe | *Sayornis saya* | None | ✓ | Open country, grassland |
| Mountain Bluebird | *Sialia currucoides* | None | ✓ | Open areas with scattered trees |
| Western Bluebird | *Sialia mexicana* | None | | Woodland near open areas |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | None | | Riparian, lakes, open areas |
| Eurasian Collared Dove | *Streptopelia decaocto* | None | ✓ | Urban areas |
| Western Meadowlark | *Sturnella neglecta* | None | ✓ | Open habitats, grasslands |
| European Starling | *Sturnus vulgaris* | None | ✓ | Agricultural, livestock areas |
| Tree Swallow | *Tachycineta bicolor* | None | ✓ | Oak, riparian woodlands, open areas near water |
| Violet-green Swallow | *Tachycineta thalassina* | None | ✓ | Oak, riparian woodlands, open areas near water |
| Bewick's Wren | *Thryomanes bewickii* | None | | Riparian woodland, scrub |
| House Wren | *Troglodytes aedon* | None | ✓ | Shrubby areas |
| American Robin | *Turdus migratorius* | None | ✓ | Streamsides, woodlands |
| Western Kingbird | *Tyrannus verticalis* | None | ✓ | Grasslands, savanna |
| Cassin's Kingbird | *Tyrannus vociferans* | None | ✓ | Grasslands, savanna |
| Barn Owl | *Tyto alba* | None | ✓ | Agricultural, woodlands |
| Warbling Vireo | *Vireo gilvus* | None | | Riparian, oak woodlands |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* | SSC (Nesting) | ✓ (Spring transient) | Freshwater emergent wetlands, winters in open habitats |
| Mourning Dove | *Zenaida macroura* | None | ✓ | Open and semi-open habitats |
| White-crowned Sparrow | *Zonotrichia leucophrys* | None | ✓ | Oak, riparian woodlands |
| **Mammals - 36 species** | | | | |
| Nelson's Antelope Squirrel | *Ammospermophilus nelsoni* | ST | | Arid habitats with scattered shrubs and washes |
| Pronghorn Antelope | *Antilocapra americana* | None | ✓ | Grasslands, prairie |
| Pallid Bat | *Antrozous pallidus* | SSC | | Structures, woodlands |
| Coyote | *Canus latrans* | None | ✓ | Open woodlands, prairies, brushy areas, wide ranging. |
| Tule Elk | *Cervus elaphus nannodes* | None | ✓ | Grasslands, woodlands |

| Common Name | Scientific Name | Special Status | Observed Within PSA? | General Habitat Preference |
|---|---|---|---|---|
| California Pocket Mouse | *Chaetodipus californicus ochrus* | None | ✓ | Chaparral, grassland edges |
| Townsend's Big-eared Bat | *Corynorhinus townsendii* | SSC | | Structures, caves, open areas |
| Heermann's Kangaroo Rat | *Dipodomys heermanni swarthi* | None | ✓ | Dry grasslands with few shrubs |
| Giant Kangaroo Rat | *Dipodomys ingens* | FE | | Arid habitats |
| Short-nosed Kangaroo Rat | *Dipodomys nitratoides brevinasus* | SSC | | Saltbush scrub and sink communities with friable soils. |
| Big Brown Bat | *Eptesicus fuscus* | None | | Structures, trees, caves |
| Feral Cat | *Felis catus* | None | ✓ | Varied |
| Black-tailed Jackrabbit | *Lepus californicus* | None | ✓ | Grasslands |
| Bobcat | *Lynx rufus* | None | ✓ | Chaparral and woodlands |
| Striped Skunk | *Mephitis mephitis* | None | ✓ | Mixed woods, brush, semi-open country |
| California Vole | *Microtus californicus* | None | | Grassland meadows |
| Long-tailed Weasel | *Mustela frenata* | None | | Grasslands |
| California Myotis | *Myotis californicus* | None | | Structures, trees, caves |
| Western Small-footed Myotis | *Myotis ciliolabrum* | Special Animal | | Structures, trees, caves |
| Long-eared Myotis | *Myotis evotis* | Special Animal | | Structures, trees, caves |
| Mule Deer | *Odocoileus hemionus* | None | | Many habitats |
| Tulare Grasshopper Mouse | *Onychomys torridus tularensis* | SSC | ✓ | Hot, arid, valleys and scrub deserts |
| McKittrick Pocket Mouse | *Perognathus inornatus neglectus* | Special Animal | ✓ | Annual grasslands, saltbush scrub, and oak savanna habitats |
| Deer Mouse | *Peromyscus maniculatus gambelii* | None | ✓ | All dry land habitats |
| Raccoon | *Procyon lotor* | None | | Streams, lakes, rock cliffs, dens in trees |
| Western Harvest Mouse | *Reithrodontomys megalotis* | None | ✓ | Grassland, dense vegetation near water |
| Broad-footed Mole | *Scapanus latimanus* | None | | Grasslands, agricultural, in moist soils |
| Ornate Shrew | *Sorex ornatus* | None | ✓ | Riparian, woodland, grassland, and shrubland |
| California Ground Squirrel | *Spermophilus beecheyi* | None | ✓ | Grasslands |
| Wild Boar | *Sus scrofa* | None | ✓ | Woodlands |

| Common Name | Scientific Name | Special Status | Observed Within PSA? | General Habitat Preference |
|---|---|---|---|---|
| Desert Cottontail | *Sylvilagus audubonii* | None | ✓ | Brushy habitats |
| Brazilian Free-tailed Bat | *Tadarida brasiliensis* | None | | Structures |
| American Badger | *Taxidea taxus* | SSC | ✓ | Open country |
| Valley Pocket Gopher | *Thomomys bottae* | None | ✓ | Variety of habitats |
| Red Fox | *Vulpes fulva* | None | ✓ | Forest and open country |
| San Joaquin Kit Fox | *Vulpes macrotis mutica* | FE | ✓ | Open grasslands, scrub |

### *7.3.1 San Joaquin kit fox survey results*

The federally endangered San Joaquin kit fox (SJKF) occurs within and adjacent to the PSA (Althouse and Meade, Inc. 2009; Smith 2010). SJKF were detected by direct observation, DNA analysis of scats, remote camera traps, and by tracks and other sign. Biological Resource Maps 2 and 5 in Section 13.0 indicate the locations of kit fox detections within the PSA.

Working Dogs for Conservation Foundation (Debbie Smith, Ph.D. and Alice Whitelaw) conducted scat detection surveys with trained scent dogs along 103.31 kilometers (64.5 linear miles) of non-random transects throughout the PSA during two survey periods in 2009. The transects were primarily along existing roads where kit fox, like other canines, frequently travel and defecate (Smith 2010). A total of four-hundred-fourteen (414) kit fox scats were detected. One hundred fifty-three (153) fresh scats (8 days old or less) were collected and sent to the genetics laboratory at the Smithsonian Institution/National Zoological Park in Washington D.C. for analysis (Henry and Maldonado 2010). Because only fresh scats were collected for DNA analysis, this study provides an accurate number of individual kit foxes that were using the PSA during the August to November 2009 period.

Genetic analysis of scats collected by D. Smith in 2009 successfully and confidently identified 19 individual kit foxes. Eighteen of these foxes were represented by at least two scat samples. The one individual identified by a single scat sample was confidently identified as a distinct individual based on its unique microsatellite genotype and a new mitochondrial DNA (mtDNA) haplotype[11] not detected in other scat samples and not previously identified in Carrizo Plain kit fox populations. This individual was still highly related to other individuals in the survey area. The 19 kit foxes are represented by ten males and nine females (Henry and Maldonado 2010).

Of the 19 kit foxes detected, 18 were detected by scat collections from within the currently defined PSA. Of these 18 kit foxes, 7 are represented by 1 to 4 scat detections, eight kit foxes are represented by 5 to 9 scat detections, and 3 kit foxes are represented by

[11]Haplotype is a genetics term that means a combination of alleles (for different genes) that are located closely together on the same chromosome and that tend to be inherited together (Princeton University 2010).

10 or more scat detections (Table 16). Kit foxes represented by higher number of scat detections presumably spend more time within the PSA.

TABLE 16. KIT FOX SCAT DETECTIONS. Kit fox detections are divided into three categories of different scat detection ranges that indicate the general level of presence within the PSA.

| Scat Detections | Number of Individual Kit Foxes (18) |
|---|---|
| 1-4 | 7 foxes |
| 5-9 | 8 foxes |
| 10+ | 3 foxes |

Kit fox scats were collected in August and November 2009, which would result in a high detection of young foxes born in the spring that had not yet dispersed, and may also detect young from the previous year that remain in their parents territory as "helpers". The genetic work also may have detected visitors from adjacent home ranges (B. Cypher, pers. comm.).

We plotted the location of all fresh scat collections on an aerial photograph of the PSA using Arc GIS software, and overlaid a color-coded symbology representing confirmed locations of each of the 19 individual kit foxes (BR Map 2, Section 13.0). This map indicates approximate territory areas within and near the PSA for each of the foxes.

Genetic analysis found that all 19 foxes were significantly related to other foxes in the Option. The genetic analysis allows potential family groups to be described. A potential family group was found centered near Section 22 that consisted of eight individuals (two parents and six offspring). We observed this family during the spring and summer surveys, and observed at least three pups with parents in 2009. Local residents said there were four pups with this family in 2009, although we observed only three. Kit fox can have up to nine pups in a litter, however, the additional individuals could have been previous year pups, including a helper offspring that is still part of the family group assisting with pups. A second family group was detected in the southern portion of the property. This group has nine related individuals with two different matings by one male fox. Three of these individuals are also strongly related to the first family group. One mother was detected in Section 26, and another mother in Section 5. Offspring are likely from the same father, who was detected in Section 4. Another group of four individuals was related to the second family group through a male fox. The high degree of relatedness suggests that the number of foxes detected in the PSA includes offspring prior to dispersal.

Natal den territories were identified in three areas of the PSA during surveys in 2009 and 2010 (Refer to BR-14, Section 13.0). One territory was located in spring 2009, within Section 22, an area that occurs along the east boundary of the current Option A and Option B layouts. Two dens were identified within this territory that were determined to be used for raising puppies. One den was the primary natal den, and the three (possibly four) puppies were later moved to a post-natal den one-third of a mile to the south. Natal

dens were not identified in the northern and western regions of Option B, which is consistent with the lack of data gathered from remote camera, scat detection, and other wildlife surveys.

Option A contains two additional kit fox natal den territories. These two territories were the only natal den territories identified in Option A in 2010 (active natal den territories were not identified in Option B in 2010). One territory is located near the boundary of Sections 4 and 5 in the far south end of Option A. Here, a cluster of den complexes were observed throughout the 2010 spring season in proximity to a significant Heermann's kangaroo rat precinct. Presence of recent kit fox puppy scat verified one of the dens as the 2010 natal den. Surrounding this are other dens mapped as "known dens" where either a kit fox was observed at the den or kit fox sign at the den was distinct and recent. A post-natal den was identified for this territory in the northeast corner of Section 4, approximately one mile from the natal den, where a young kit fox puppy was observed at the mouth of the den on June 25. The second kit fox territory in Option A is located in the northeast corner of Section 35. This area was documented by remote camera, scat survey, den survey, and visual detection of foxes and fresh tracks to be consistently used by kit fox from August 2009 into summer 2010. The natal den is surrounded by numerous known dens, one in which an adult kit fox was observed. A remote camera trap nearby captured foxes on several occasions, including one photograph on June 16 of a kit fox puppy.

Other known kit fox dens were detected in Options A and B, Sections 4, 5, 21, 26, 33, 34 and 35 that were determined not to be natal dens. These findings are consistent with occasional detection of kit fox scat and tracks within non-natal den territory areas of the PSA, as well as the habitat of kit fox to utilize a large number of dens throughout their range. Kit fox sign was observed frequently during our surveys in 2010. In 2008 and 2009, the PSA included only the more northerly parcels, and kit fox sign was observed less frequently. The PSA includes lands that are of varying quality for San Joaquin kit fox. Kit fox detections were lowest in active agricultural fields (croplands), and highest in annual grasslands that had not been cropped in over 20 years. All or portions of Sections 7, 8, 17, 18, 19, 20, and 21 in the northwest portion of the PSA are actively cropped; very few kit fox detections were made in these areas. Where kit foxes were detected occasionally or regularly in cropland habitats such as in Sections 4, 5, 27, 32, the lands were fallow for at least two years, had kangaroo rat and other small mammal populations, or were positioned between an occupied kit fox den and adjacent grassland foraging areas.

The grassland habitats in Option A, Sections 4, 5, 34, and 35, have been in the Conservation Reserve Program for at least 20 years. Cattle are grazed every three years on the parcels, but the land is not farmed or tilled. Kit fox were detected frequently in these Sections. Based on the results of the 2010 small mammal trapping study the prey base in these areas consists of ground squirrels, a low abundance of Heermann's kangaroo rats, and low abundance of several species of mice (refer to Section 7.3.6). The low abundance of small mammals in all of these grassland areas suggests each kit fox pair would utilize a larger territory to find adequate prey.

### *7.3.2 Kern primrose sphinx moth results*

All but one of the previously identified 45 locations of *Camissonia strigulosa* were determined by Dr. Richard Arnold to be situated on clay or loam soils which are not suitable for the pupal stage of the Kern primrose sphinx moth. One location in a sandy wash at the south end of Section 4 was determined to be potentially suitable. No sphinx moth adults or larvae were detected, and no evidence of larval feeding on the *Camissonia strigulosa* plants was observed.

### *7.3.3 Small mammal survey results*

A small mammal inventory was compiled from data collected during small mammal trapping surveys, visual detection transect surveys, focused wildlife surveys, and an analysis of barn owl pellet contents. Refer to Table 15 for a complete list of small mammals detected within the PSA. No federally listed small mammals have been detected within the PSA. Special status small mammals detected within the PSA are indicated on BR Map 5 in Section 13.0.

## A. Trapping Surveys

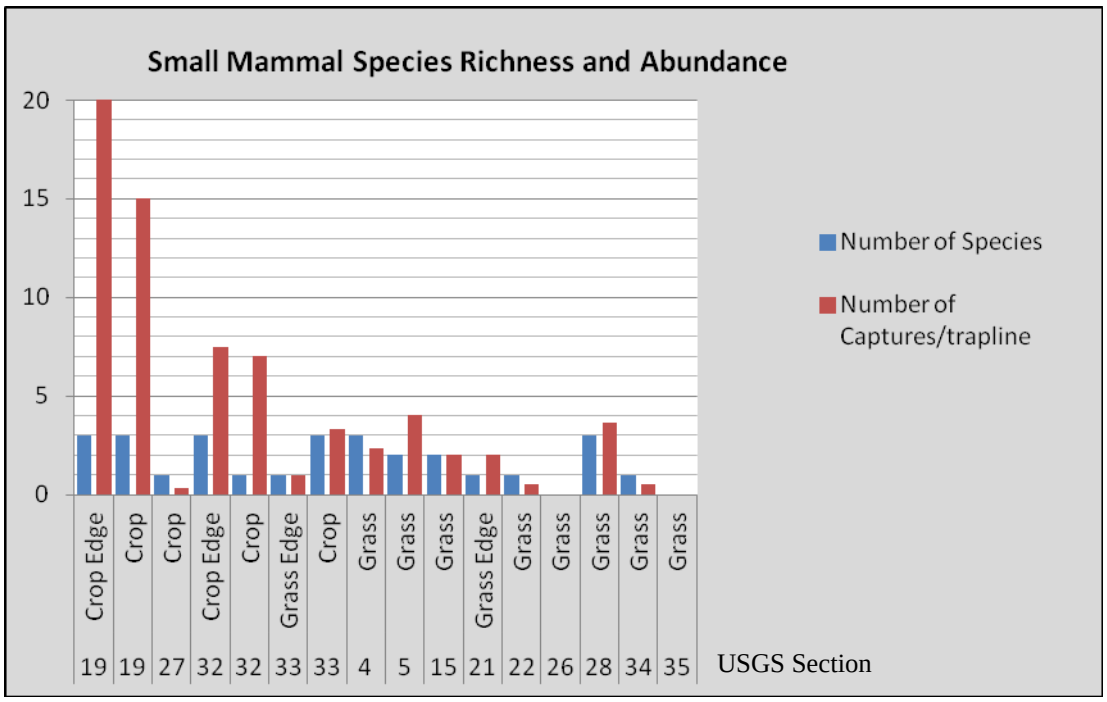
Small mammal trapping surveys conducted throughout the PSA utilized 8,940 trap-nights of effort, and resulted in captures of seven small mammal species. Federally listed small mammals were not detected during any of the four trapping studies. Two special status species were detected: Tulare grasshopper mouse (*Onychomys torridus tularensis*), a Species of Special Concern, and McKittrick pocket mouse (*Perognathus inornatus neglectus*), a Special Animal (refer to Table 17 below, and BR Map 5 in Section 13.0). One Tulare grasshopper mouse was captured during a small mammal trapping study conducted within the PSA in August 2008 by Bill Vanherweg. The location of the capture was at the southern end of Section 29, adjacent to off-site annual grassland habitat. Tulare grasshopper mouse was not captured during subsequent small mammal trapping studies conducted in 2009 and 2010. McKittrick pocket mice were captured 67 times in numerous areas of the PSA during all four trapping studies.

Trapping data collected in the PSA provides information on species richness (number of species in a given area, or species diversity) and on the relative abundance of small mammals within the PSA. All small mammal species were detected with low capture rates, indicating low population numbers (Collins 2009, 2010). In 2009 a total of 72 small mammals were captured during 720 trap nights, with an average trap success of 11.78 percent. In 2010, with 1,220 trap nights of effort only 60 captures were made, with an average trap success of 5.56 percent. Both trapping surveys targeted grassland, cropland, and edge habitats.

We cross-referenced the species richness (diversity) and relative abundance data from Collins 2009 and Collins 2010 with habitat data for each trapline location to understand general trends of small mammal diversity and abundance in various areas of the PSA (Graph 1, below). The 2010 trapping survey targeted, in part, annual grasslands that are in the Conservation Reserve Program and had not been tilled in over 20 years (Sections 4, 5, 26, 34, and 35). These grasslands had a diverse herb component with native and introduced annual grasses. Although not tilled, cattle grazed in the grasslands through spring and summer of most years, often until almost

no vegetation remained. Small mammal diversity and abundance in these grasslands was extremely poor. It is likely that poor cover (plant height) and lack of food (seed abundance) resulted in low abundance and diversity of small mammals.

Active croplands generally had low diversity (except along habitat edges with untilled land), but often abundance was moderate. This is attributed to the fact that the deer mouse tolerates agricultural disturbance, and the abundant seed from the grain crops provides a sufficient food source for multiple annual recruitments. The highest number of captures per trapline was in Section 19 at a cropland edge habitat adjacent to untilled annual grassland.




GRAPH 1. SMALL MAMMAL SPECIES RICHNESS AND ABUNDANCE. Trapping data are provided for each of the 13 land Sections trapped by Collins in 2009 and 2010. The Section number is provided on the horizontal axis with the habitat type labeled above.

The primary reason for the low abundance of small mammal taxa in the PSA is habitat degradation from farming activities and intensive grazing that eliminates stratified vegetative cover and seed crops. Agricultural activities severely reduce local populations of most small mammal species through direct mortality and elimination of habitat. The rotational farming system results in an ever-changing patchwork of different land use areas each year that makes it difficult for small mammal populations to persist. The deer mouse, however, is relatively common in cropland areas where its abundance likely cycles with the rotational farming system. Where grain is planted, deer mouse abundance increases with the availability of food, then decreases when the land is tilled. Cattle grazing maintains short grass habitat conditions, and depending upon the severity of the grazing, eliminates seed crops essential for small mammal populations. The California pocket mouse, McKittrick pocket mouse, Tulare grasshopper mouse, and Heermann's kangaroo rat were found

to be most common along fence lines where the ground is not plowed and their burrow systems persist from year to year.

### B. Visual Detection Transect Surveys

Visual detection surveys for the federally threatened Nelson's antelope squirrel (*Ammospermophilus nelsoni*) conducted concurrently with the 2008, 2009 and 2010 BNLL protocol surveys determined this species does not occur in those portions of the PSA. Nelson's antelope squirrel was not observed during the 12 full coverage surveys for the 2010 adult BNLL survey period. Refer to BR Map 6 in Section 13.0 for survey areas covered from 2008 to 2010.

### C. Focused Small Mammal Surveys

The giant kangaroo rat (*Dipodomys ingens*) has not been detected within the PSA. Focused wildlife surveys have not detected any special status small mammal species not previously detected by other method. Visual detection surveys conducted during the 2010 BNLL adult survey period identified potential kangaroo rat precincts, which were later evaluated by Paul Collins and Tom Olson (Table 19).

Ten kangaroo rat precincts were positively identified during the burrow and scat measurement study. Three known kangaroo rat precincts were included in the burrow and scat measurement study that were determined to be occupied by Heermann's kangaroo rat (*Dipodomys heermanni*) by body morphometrics obtained during live trapping surveys in 2009 and 2010. These three locations provided a baseline for on-site Heermann's kangaroo rat burrow and scat morphometrics. Average burrow and scat measurements collected from the Topaz Solar Farm Project Option were compared with published literature for giant kangaroo rat (Table 19).

The kangaroo rat burrow and scat measurement study conducted in June 2010 determined all kangaroo rat precincts within the PSA were created and inhabited by the common and widespread Heermann's kangaroo rat (*Dipodomys heermanni*). The federally listed endangered giant kangaroo rat does not occur within the PSA. Table 18 provides the kangaroo rat burrow and scat morphometric data collected by Collins and Olson.

One small mammal species that is extremely rare in the Carrizo Plain but common elsewhere in the state is the ornate shrew (*Sorex ornatus*), which was collected by Jason Dart (SCP 10611) in 2010 along the south boundary of the PSA in Section 4. A single specimen was found recently dead at the base of a fence post where it may have been dropped by a raptor. The specimen was collected and preserved, and presently represents the only voucher specimen ever collected in the Carrizo Plain region (personal communications by email with Daniel F. Williams and Paul Collins May 2010). An ornate shrew captured in 1989 during a trapping study on the Elkhorn Plain Ecological Reserve is the only other record for this species in the Carrizo Plain (Williams 2001). Shrews are typically associated with wetland habitats, and a population in the Carrizo Plain region is unusual in that it is such an arid landscape. The shrew collected within the PSA is presumed to be *Sorex ornatus ornatus*, a common species with no special status listing.

## D. Barn Owl Pellet Analysis

An analysis of thirty barn owl pellets collected from within the PSA resulted in the identification of 125 individual animals of eight species (Collins 2009). No federally listed small mammals were detected by the owl pellet analysis. Two common rodent species identified in the pellets, *Reithrodontomys megalotis* and *Neotoma lepida*, had not previously been documented within the PSA. *R. megalotis*, the common harvest mouse, could be present in low numbers within the PSA. *N. lepida*, the desert woodrat, prefers rocky or brushy habitats which do not occur within the PSA but are present in the vicinity. We expect this occurrence is due to an owl which foraged off the PSA and returned to roost on site.

TABLE 17. SMALL MAMMAL TRAPPING RESULTS. No federally listed small mammals were detected within the PSA. The results of small mammal trapping surveys conducted within the PSA are provided.

| Survey | Locations | Trap nights | PeMa | ChCa | PeIn | OnTo | DiHe | DiIn | DiNiNi | DiNiBr | SpBe | SyAu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| URS 2008 | Section 28, north half Section 33 | 5,400 | 2 | 14 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Vanherweg 2008 | Sections 6, 8, 16, 29 | 1,600 | 2 | 48 | 23 | 1 | 11 | 0 | 0 | 0 | 0 | 0 |
| Collins 2009 | Sections 19, 21, 22, 27 | 720 | 50 | 6 | 3 | 0 | 13 | 0 | 0 | 0 | 0 | 0 |
| Collins 2010 | Sections 4, 5, 15, 26, 28, 32, 33, 34, 35 | 1,220 | 33 | 7 | 14 | 0 | 5 | 0 | 0 | 0 | 1 | 0 |
| | **Totals** | **8,940** | **87** | **75** | **67** | **1** | **29** | **0** | **0** | **0** | **1** | **1** |

| Abbreviations | Special Status |
|---|---|
| PeMa: *Peromyscus maniculatus gambelii* | None |
| ChCa: *Chaetodipus californicus ochrus* | None |
| PeIn: *Perognathus inornatus neglectus* | Special Animal |
| OnTo: *Onychomys torridus tularensis* | Species of Special Concern |
| DiHe: *Dipodomys heermanii swarthi* | None |
| DiIn: *Dipodomys ingens* | Federal and State Endangered |
| DiNiNi: *Dipodomys nitratoides nitratoides* | Federal and State Endangered |
| DiNiBr: *Dipodomys nitratoides brevinasus* | Special Animal |
| SpBe: *Spermophilus beecheyi* | None |
| SyAu: *Sylvilagus audubonii* | None |

TABLE 18. TOPAZ KANGAROO RAT MORPHOMETRIC DATA. Measurements are provided for average burrow and scat size at kangaroo rat precincts detected within the Topaz Solar Farm Project Option. Asterisks indicate locations where live trapping previously identified *Dipodomys heermanni*. Scat was not present at seven localities.

| | | | | Horizontal Burrow Dimensions | | Vertical Burrow Dimensions | | Scat Dimensions | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **USGS Section** | **Site ID No.** | **Project Option** | **Coordinates (WGS 84)** | **Width** | **Height** | **Width** | **Height** | **Length** | **Width** | **Species ID** |
| 4 | 4-1 | B | N35.340735 W120.043557 | 59.2 | 54.6 | 40.0 | 40.0 | 5.2 | 2.6 | *Dipodomys heermanni* |
| 4 | 4-2 | B | N35.337729 W120.046208 | 55.0 | 47.2 | 41.7 | 40.0 | -- | -- | *Dipodomys heermanni* |
| 4 | 4-3* | B | N35.338143 W120.058108 | 53.3 | 48.5 | -- | -- | 4.9 | 1.9 | *Dipodomys heermanni* |
| 19 | 19-1* | A/B | N35.388397 W120.090951 | 52.5 | 43.8 | 35.0 | 30.0 | -- | -- | *Dipodomys heermanni* |
| 22 | 22-1 | A/B | N35.382057 W120.040852 | 48.3 | 43.3 | 40.0 | 40.0 | -- | -- | *Dipodomys heermanni* |
| 27 | 27-1 | A/B | N35.380662 W120.040201 | 49.3 | 43.4 | 44.0 | 39.5 | -- | -- | *Dipodomys heermanni* |
| 27 | 27-2 | A/B | N35.38094 W120.03379 | 47.0 | 42.0 | -- | -- | -- | -- | *Dipodomys heermanni* |
| 28 | 28-1A | A/B | N35.373451 W120.050753 | 55.5 | 50.0 | 40.5 | 35.8 | -- | -- | *Dipodomys heermanni* |
| 28 | 28-1B* | A/B | N35.380886 W120.041034 | 55.0 | 45.0 | 40.0 | 37.5 | -- | -- | *Dipodomys heermanni* |
| 33 | 33-1 | A | N35.358079 W120.049719 | 70.0 | 75.0 | -- | -- | 6.1 | 2.4 | *Dipodomys heermanni* (based on scat dimensions) |

TABLE 19. WILLIAMS GIKR BURROW AND SCAT MORPHOMETRICS. Morphometric ranges for burrow and scat measurements of the giant kangaroo rat are provided from Williams 1992.

| Species | Horizontal Burrows | | Vertical Burrows | Scat Length (mm) | Scat Width (mm) |
|---|---|---|---|---|---|
| | Width (mm) | Height (mm) | Width (mm) | | |
| *Dipodomys ingens* | 88.4 (60-120) | 77.7 (50-120) | 57.9 (45-75) | 6.9 (3.1-9.9) | 3.3 (2.5-5.2) |
| *Dipodomys heermanni* | 48.6 (35-63) | 47.9 (31-79) | 36.7 (27-48) | 5.2 (4.0-6.6) | 2.3 (1.9-2.9) |

### *7.3.4 Fairy shrimp results*

Protocol level surveys conducted within the PSA determined that three species of fairy shrimp are present: *Branchinecta lindahli*, *B. lynchi*, and *B. longiantenna* (AEC 2009; AEC 2010). The versatile fairy shrimp (*Branchinecta lindahli*) is a common and widespread species with no listing status. *B. lindahli* was detected in 28 pools in the southern and middle regions of the PSA. It occurs in natural vernal pools as well as road ruts and other anthropogenic non-wetland pools. *B. lindahli* is not a species of conservation concern.

The vernal pool fairy shrimp (*Branchinecta lynchi*) is a federally listed threatened species that was detected in 11 pools within the PSA. Within the PSA it only occurs in true vernal pools. All of the eleven *B. lynchi* pools are located in Option A, Section 4, in the extreme south end of the PSA. Four of the vernal pools in Section 4 contained both *B. lynchi* and *B. lindahli*.

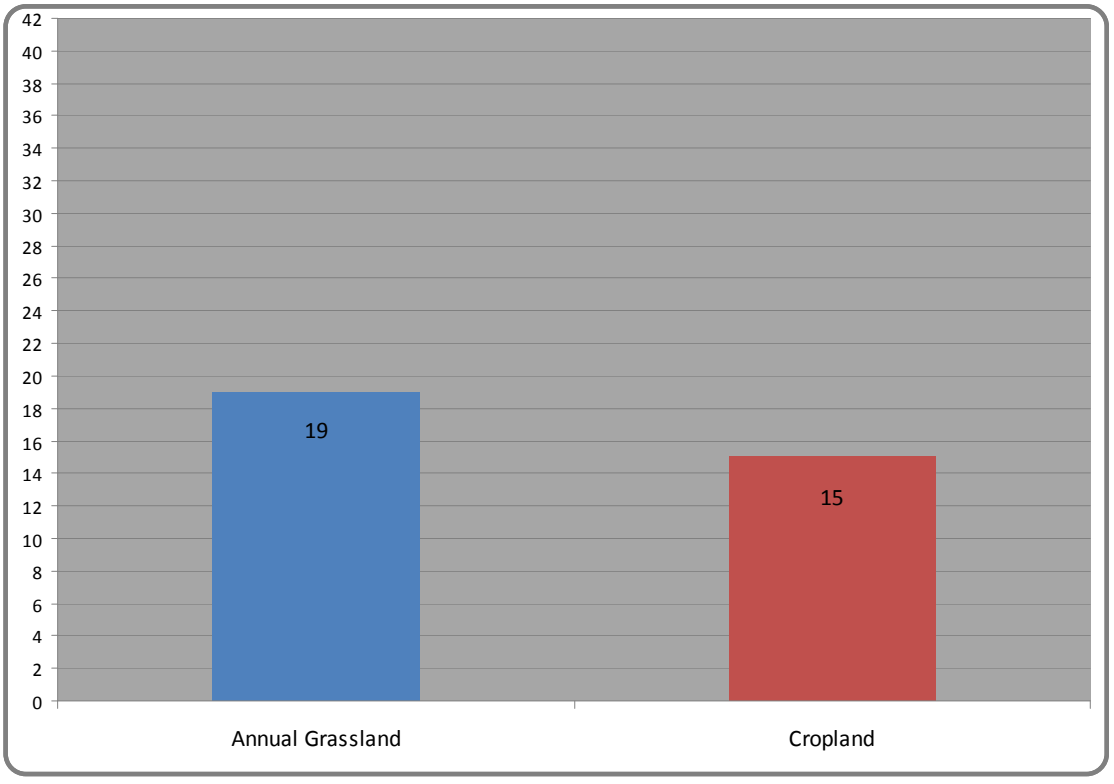
The longhorn fairy shrimp (*Branchinecta longiantenna*) is a federally listed endangered species that was detected in two pools within the PSA. The pools are both located in the south half of Section 20, a farm field in active cultivation with dry-farmed grain that is included in both project Options. Section 20 was included in the 2008-2009 protocol survey area. Ephemeral pools in the active farm field were not detected in 2008-2009 due to the low rainfall year that resulted in no inundation. Also, the pools were plowed and the ground was left bare through the season which effectively made the pools undetectable. In March 2010 while conducting other biological surveys, Althouse and Meade, Inc. biologists found several pool complexes with standing water in the south half of Section 20. A new barley crop was approximately 6 inches tall around the margins of the pools. Unidentified fairy shrimp were visually detected in three pools. AEC sampled the pools on March 23, 2010. Two of the pools contained *B. longiantenna* and the third pool was dry. This pool is situated between the two *B. longiantenna* pools and is mapped as potential habitat for listed fairy shrimp (refer to BR Map 10 in Section 13.0). Because two pools in Section 20 and one in Section 19 were found late in the wet season the protocol was not fully implemented and presence or absence of listed fairy shrimp was not verified. These pools are all mapped as potential habitat.

The 2010 protocol dry season survey conducted by Helm Biological Consulting sampled all 56 pools that were either not sampled or were found not to contain fairy shrimp during the 2010 wet season survey conducted by Advantage Environmental Consultants, LLC. *Branchinecta* cysts were detected in 31 pools. Dry season sampling identifies cysts to genus, not to species; therefore it is unknown if the fairy shrimp in the 31 pools identified during the 2010 dry season survey are common or listed species. BR Map 10 in Section 13.0 indicates the locations of all 31 pools with unidentified fairy shrimp, and provides a 250-foot buffer around each pool that is consistent with USFWS standard listed fairy shrimp pool setbacks.

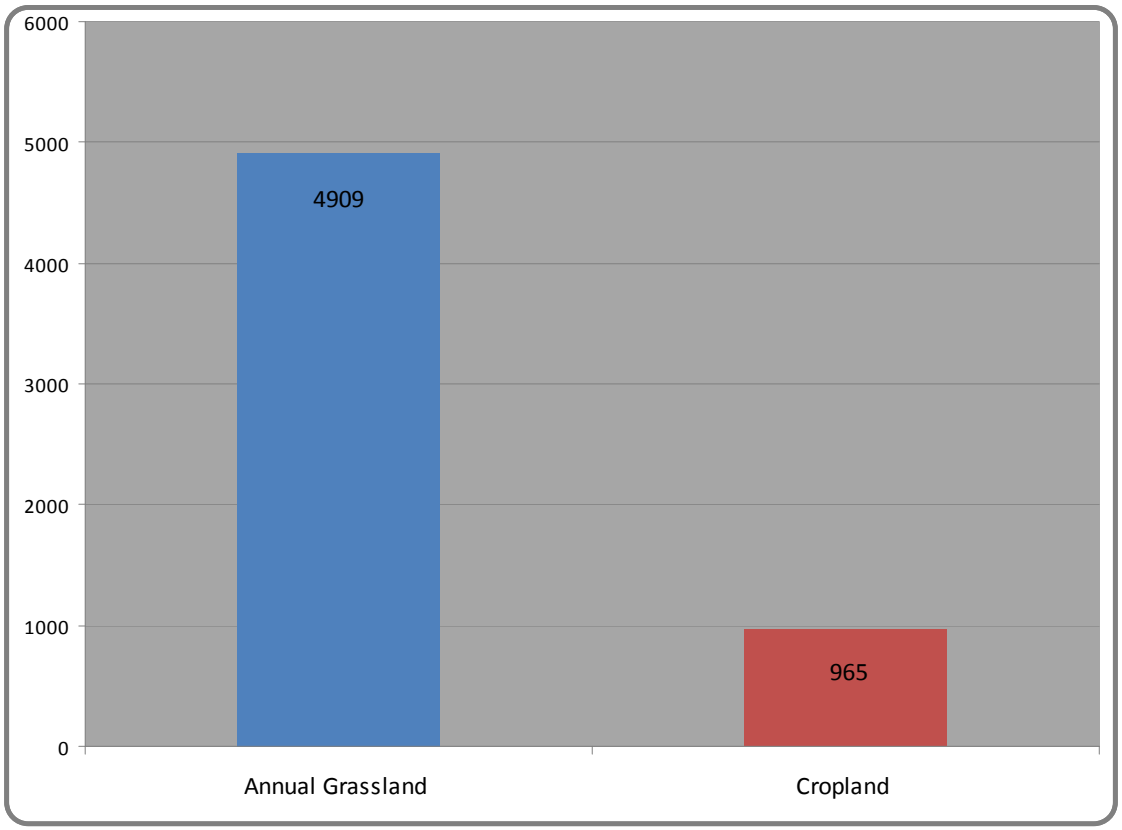
### *7.3.5 Special status bird survey results*

Focused winter bird surveys detected twenty-two species of birds, eight of which are special status species including burrowing owl, ferruginous hawk, golden eagle, long-billed curlew, prairie falcon, tri-colored blackbird, loggerhead shrike, and mountain plover. Winter transect surveys detected twenty-three species of birds, seven of which are special status species including burrowing owl, ferruginous hawk, golden eagle, long-billed curlew, merlin, prairie falcon, and tri-colored blackbird (refer to BR Map 8 in Section 13.0).

Species richness in grassland and cropland habitats were compared graphically using the winter bird survey transect data. Nineteen bird species were detected in grassland habitats and fifteen bird species were detected in croplands (Graph 2). In addition, total bird abundance was compared for grassland and cropland habitats using the winter bird survey transect data. An abundance of 4,909 birds were detected in grassland habitats and 965 birds in croplands within the PSA during a one-day winter transect survey. Approximately 80% more birds were detected in grassland habitat than in cropland habitat (Graph 3).




GRAPH 2. BIRD SPECIES RICHNESS. Data from winter bird transect surveys is graphed to indicate species richness within grassland and cropland habitats. The number of bird species is labeled on the vertical axis and habitat type on the horizontal axis.




GRAPH 3. TOTAL BIRD ABUNDANCE. Data from winter bird transect surveys is graphed to indicate total bird abundance within grassland and cropland habitats. The number of birds detected is on the vertical axis and habitat type on the horizontal axis.

Habitats within the Topaz Solar Farm Project Option (PSA) were found to support breeding activities for twenty-one species of birds (Table 20). Four species (European starling, Eurasian collared dove, rock dove and house sparrow) are not native to the United States. Four species (grasshopper sparrow, lark sparrow, loggerhead shrike and burrowing owl) are special status species. In 2010 we documented one singing male grasshopper sparrow, fledgling lark sparrows, two active loggerhead shrike nests, and seven active burrowing owl nests.

Grasshopper sparrows nest on the ground or in low shrubs in grassland habitat. They were observed occasionally within the PSA during spring migration, however only one singing male was detected in spring 2010. Although nesting was not confirmed, we expect grasshopper sparrows nest in very low numbers in taller grass habitats within both project Options.

Lark sparrows nest on the ground or in low shrubs in grassland or shrubland habitat. They were observed to be uncommon throughout the PSA. Breeding behaviors were observed in Section 8 at the north end of Option B in 2009, and fledglings were observed along the west boundary of Option A in 2010.

Loggerhead shrikes nest in dense shrubs. Two active nests were documented in spring 2010 in ornamental plantings associated with residential compounds in Section 18

(Option B) and Section 33 (Option A). We expect shrikes will nest at both of these locations annually.

Burrowing owls nest in abandoned mammal burrows in grassland habitat. They show a high site fidelity, often returning to nest in the same burrow complex or nearest suitable burrow year after year. We mapped winter burrows, nesting burrows, and satellite burrows (refer to BR Map 9, Section 13.0). Grassland habitat within Option A and Option B supports wintering and nesting burrowing owls. In 2010 a total of seven active nests were documented. Three of the seven active nests were located immediately adjacent to and outside of the PSA. Option A contained four active nests, and Option B contained two active nests. Option A presently contains approximately 3,356 acres of grassland habitat suitable for burrowing owls. Option B presently contains approximately 1,689 acres of grassland habitat suitable for burrowing owls.

Birds are common in all areas of the PSA, however species diversity is generally low. The limited amount of vegetative cover reduces the suitability for most bird species that require shrubs and trees for cover and nesting sites. Only a few species, such as common raven and horned lark, are true residents in the PSA. These species breed on site and live on and near the site throughout the year. Most birds observed in the PSA are migratory or utilize habitat at the site only seasonally. Winter bird surveys identified migrants such as ferruginous hawk and long-billed curlew that come to forage on site during winter months. Spring bird surveys identified spring residents such as lark sparrow and Western kingbird that come to nest within the PSA but leave before the onset of winter. In addition, spring migrants such as Western tanager, MacGillivray's warbler, black-throated gray warbler, and Anna's hummingbird utilize vegetated areas of the PSA during migration.

TABLE 20. NESTING BIRDS. Twenty-one species of birds were documented nesting, or are presumed to be nesting, within the Topaz Solar Farm Project Option.

| | Common Name *Scientific Name* | Special Status | Origin | Nesting Location | Option | Abundance Notes |
|---|---|---|---|---|---|---|
| 1. | Grasshopper Sparrow *Ammodramus savannarum* | SSC | Native | NW corner of Section 16 | B | One singing male in 2010 |
| 2. | Burrowing Owl *Athene cunicularia* | SSC | Native | In Sections 4, 16, 22, 26, 28 and 35 | A/B | 7 nesting pairs in 2010. Probably fluctuates year to year. |
| 3. | Red-tailed Hawk *Buteo jamaicensis* | None | Native | Power line towers between Sections 22 and 27 | A/B | One pair annually |
| 4. | Anna's Hummingbird *Calypte anna* | None | Native | Residential compound in Sections 4 and 18. Nesting not confirmed. | A/B | Limited to landscaped residential compound |
| 5. | House Finch *Carpodacus mexicanus* | None | Native | Residential compounds in throughout PSA | A/B | Common only in residential areas |
| 6. | Lark Sparrow *Chondestes grammacus* | Special Animal | Native | Grassland in Section 8, possibly north of PSA. Olive grove west of Option A. | A/B | Uncommon; no nests found. |
| 7. | Rock Dove *Columba livia* | None | Introduced | Structures in Sections 21, 22, 27, 28 and 33 | A/B | Common |
| 8. | Common Raven *Corvus corax* | None | Native | Residential compounds and other structures in Sections 4, 15, 18, 21, 28 and 33 | A/B | Very common |
| 9. | Horned Lark *Eremophila alpestris* | None | Native | In grassland habitats throughout the PSA | A/B | Very common |
| 10. | Brewer's Blackbird *Euphagus cyanocephalus* | None | Native | Presumed in residential compounds throughout PSA | A/B | Common but not abundant |
| 11. | Red-winged Blackbird *Agelaius phoeniceus* | None | Native | Section 28 west half, likely in local areas of grain fields throughout PSA | A/B | Uncommon |
| 12. | Loggerhead Shrike *Lanius ludovicianus* | SSC | Native | Residential compounds in Sections 18 and 33 | A/B | 2 active nests in 2010. |
| 13. | House Sparrow *Passer domesticus* | None | Introduced | Residential compounds throughout PSA | A/B | Common but not abundant |

| | Common Name<br>*Scientific Name* | Special Status | Origin | Nesting Location | Option | Abundance Notes |
|---|---|---|---|---|---|---|
| 14. | Say's Phoebe<br>*Sayornis saya* | None | Native | Residential compounds throughout PSA | A/B | Uncommon |
| 15. | Eurasian Collared Dove<br>*Streptopelia decaocto* | None | Introduced | Residential compounds throughout PSA | A/B | Common but not abundant |
| 16. | Western Meadowlark<br>*Sturnella neglecta* | None | Native | In grassland habitats throughout PSA | A/B | Common |
| 17. | European Starling<br>*Sturnus vulgaris* | None | Introduced | Residential compounds throughout PSA | A/B | Common |
| 18. | Western Kingbird<br>*Tyrannus verticalis* | None | Native | Residential compounds throughout PSA | A/B | Very common |
| 19. | Cassin's Kingbird<br>*Tyrannus vociferans* | None | Native | Confirmed in Section 4 residential landscape. Presumed in Sections 18 and 28 residential areas | A/B | Uncommon |
| 20. | Barn Owl<br>*Tyto alba* | None | Native | Abandoned building in Section 27. Nesting unconfirmed but likely in Section 28 | A/B | Uncommon |
| 21. | Mourning Dove<br>*Zenaida macroura* | None | Native | Residential compounds in Sections 4, 16, 18, 22, 27, 28 and 33 | A/B | Common |

### *7.3.6 Final golden eagle survey results*

Golden eagles forage within the PSA year-round. The number of eagles varies seasonally, with a general increase in winter when the local resident population is bolstered by migrants. In winter, we observed adult and sub-adult golden eagles regularly utilizing habitats within the PSA for hunting, loafing, and night roosting. By late winter and through spring, adult golden eagles are seldom observed. Presumably, they move into mountainous areas where there is better nesting habitat. Un-mated sub-adult golden eagles are present in and near the PSA through the spring, where they hunt ground squirrels, feed on carrion, and occasionally utilize trees in abandoned ranch compounds as night roosts.

Aerial nest surveys conducted by helicopter covered approximately 448,647 acres of land in the Carrizo Plain (Latta 2010). The survey area was based on a 10-mile radius around the Topaz Solar Farm PSA and the proposed California Valley Solar Ranch project. Final results from two complete aerial survey passes determined 12 golden eagle territories are located within the survey area (refer to BR Map 11 in Section 13.0). The survey did not determine how many eagles were present at the time of the survey, however observations of at least one adult on two of the three non-active territories suggest 11 to 12 pairs were present. Twenty-two golden eagle stick nests were located, nine of which were active and contained chicks. Two nests showed signs of recent activity but were not active. The remaining 11 nests are likely alternate nests not used this year. Seven of the 12 golden eagle territories contained nests within ten miles of the Topaz PSA. Four of these territories contained active golden eagle nests that are located within 10 miles of the PSA. No golden eagle nests are located within the PSA.

### *7.3.7 Reptile and amphibian results*

Five reptile species were documented within the PSA (refer to Table 15). Reptiles occur in very low abundance, likely due to historical land use practices. Despite thousands of hours of field work conducted for the BNLL protocol surveys, no special status reptiles were observed, although moderately suitable habitat is present in untilled grassland areas of the PSA. In June 2010 a San Joaquin whipsnake was positively identified by Paul Collins from a snake skin found in the northeast corner of Section 28.

The BNLL has not been detected within the PSA, and is not expected to occur. The BNLL is the only federally listed reptile with a potential to occur within the PSA. Protocol surveys conducted on portions of the PSA in 2008 and 2009 did not detect BNLL. The 2010 BNLL protocol survey, being conducted on 2,010 acres of grassland not previously surveyed, completed 12 full coverage passes for the adult period by July 15 without detecting BNLL (refer to BR Map 6, Section 13.0).

Three species of amphibian were documented within the PSA (refer to Table 15). No federally listed amphibians occur within the PSA, and none are expected to be present. One species, the Western spadefoot toad, is a Species of Special Concern. Western spadefoot toads or larvae were not observed at the Topaz site in 2008 or 2009 during seasonally appropriate surveys. In the spring of 2010, spadefoot toad tadpoles were observed in agricultural reservoirs in Sections 20 and 28, plunge pools in an ephemeral drainage in Section 33, ephemeral pools in Section 18, and in vernal pools in Section 4

(refer to BR Map 7 in Section 13.0). A total of 14 pools were identified that contained spadefoot toad larvae. Of these, only three pools contained water long enough for successful metamorphosis in 2010.

### *7.3.8 Bat roost survey results*

Potential roosting habitat is present for bats in occupied and abandoned structures in Sections 16, 18, 22, 27, 28, and 33. Occupied residences were not surveyed. Abandoned structures were visually inspected for potential entry points and other sign of bat use, including guano and scratch marks at entry points. We found no evidence of temporary or permanent use of abandoned structures within the PSA by roosting bats.

### *7.3.9 Tule elk and pronghorn antelope results*

The summer range of the local (north of Highway 58) tule elk herd includes agricultural lands at the north end of the PSA, although some elk may be present on the site during any month of the year (refer to BR Map 3 in Section 13.0). We observed groups of cows (female elk) averaging approximately 20 to 30 animals grazing and resting within the PSA in May and June 2008. Smaller groups of young males were occasionally observed within the PSA. In June 2009, we observed a large group of approximately 80 elk in Section 18, with several adult males and at least 12 calves. Elk were observed uncommonly in the PSA between December 2009 and April 2010. By June 2010, the large herd of approximately 80 elk had moved back into cropland areas in Sections 17 and 18, and other areas north of the PSA. This large herd was observed in this area through July 2010. It consisted of about a dozen adult and subadult males with a large group of mixed age females. A high count of 11 calves was tallied on June 15, 2010.

Elk do not move through the PSA to access foraging areas. The amount of barbed-wire fencing that is present is a deterrent, and the elk primarily forage and move through the foothills of the Temblor Range just east of the PSA. Access to the cropland areas in Sections 7, 8, 17, and 18 is from the north. Essentially, current elk movements pass north and south through rangelands east of the PSA, then enter into the PSA through a low fence in the southeast corner of Section 8. At times they may also enter the PSA from the north straight through Sections 6 and 7. Elk have only been detected within Sections 7, 8, 17, and 18 of the PSA. All elk observations are within Option B. What may have been an elk footprint was observed in Section 4 in 2010, but no elk sighting confirmed presence in this area.

Pronghorn antelope utilize grassland and cropland habitats throughout the PSA (refer to BR Map 4 in Section 13.0). The pronghorn antelope group observed within the PSA consisted of a maximum of 19 animals, usually one or two adult males with several adult females and several subadult animals. Two fawns were observed in May 2008, six fawns were observed in May 2009, and five fawns were observed in June 2010. The largest group observed in spring 2010 primarily foraged in Sections 4, 5, and 32 in the southwest portion of Option A. This northern California Valley group was present within the PSA consistently during spring months, and consisted of 17-19 individuals at any one time. Adult males were occasionally observed on the site during late winter months. A male was observed along Bitterwater Road in the Bitterwater Valley over five miles north of the PSA in late May 2008. Seasonal movements of pronghorn antelope are expected,

with animals moving between the Carrizo Plain National Monument, California Valley, and Cholame Valley groups (CDFG 2008a). CDFG records indicate antelope are present over a distance of approximately 85 miles from the Cholame Valley in the north to the Cuyama Valley in the south.

Pronghorn movements through the PSA are determined by fence location (refer to BR Map 14, Section 13.0). They make regular movements through permanent fence openings, and take advantage of gates that are left open. In order to pass through a fence where no opening exists, pronghorn prefer to go under as opposed to over. Preferred passages are typically in swales where the distance between the ground and the bottom fence wire is 30 inches or greater. In the southwest corner of Option A we observed a group of 18 pronghorn struggle to pass beneath a fence gap that measured 25 inches in height, suggesting this would be approximately the minimum height required for pronghorn passage beneath a barrier. On one occasion we observed two adult female pronghorn jump a low fence section with a height of approximately 36 inches. These animals were making normal movements without being pressured by human encroachment. Even with the ability to go over or under fences, we found that the potentially suitable movement passages were few and far between with the existing fencelines.

## 8.0 Vegetation Tests

First Solar commenced two vegetation tests on Topaz during Fall 2009 and Winter 2010. One test investigated site preparation methods for construction, and the second is an on-going test of vegetation response to solar arrays.

Test one was conducted by First Solar and Earth Systems, Inc. and directed by Earth Systems principal Craig Hill, P.E. (Earth Systems 2009). The goal of this site preparation test was to identify a site preparation technique that provides a safe and stable surface for construction workers during installation of the project while also allowing vegetation growth for small mammal habitat and erosion control. This site preparation test occurred in the southeast corner of Section 18. The test commenced shortly after early fall rains that produced 0.8 inch precipitation. The test was delayed for several days due to slippery site conditions, and too much moisture for surface compaction. On October 18, test strips (24, each 15 feet wide by 230 feet long) were laid out in a disked barley field last harvested in the summer of 2009. Site preparation methods included mowing or disking plus compaction with a steel drum or a rubber tired vehicle. All strips were harrowed after mowing or disking, prior to compaction. Strips were seeded with soft-chess brome (*Bromus hordeaceus*), a naturalized grass common in the area, before or after compaction, depending on treatment.

The second vegetation test commenced January 2010, prior to heavy winter rains, in the northeast corner of Section 29. The second test is an on-going study conducted by First Solar with Althouse and Meade, Inc. principal LynneDee Althouse, M.S. and with University of California Cooperative Extension agent Royce Larsen, Ph.D. The goal of this vegetation test is to identify a ground treatment that will provide the appropriate vegetative ground cover within the project site. Appropriate ground cover on the project site will provide habitat for kit fox and their small mammal prey, will protect the soil

from wind and water erosion, and will encourage stormwater infiltration while not shading the PV modules or creating a fire hazard. A fallow field was disked and harrowed prior to laying out test plots in four replicated Latin squares (44 feet by 44 feet) surrounded by a 25-foot buffer that was harrowed and rolled. Three treatments and a control were replicated four times within each Latin square. Treatments included (1) naturalized grasses (soft-chess brome and rat-tail fescue, *Vulpia myuros*); (2) grasses and wildflowers; (3) grasses later treated with a dicot herbicide; and (4) no treatment. The buffer was seeded by a combination of treatment 1 grasses and a cover crop mix recommended by Royce Larsen. In June and July 2010, First Solar installed PV modules (not electrified) over replicate test sites, each with 6 module tables within an area 80 feet by 80 feet. (Photo Collection 6). The vegetation test will continue through 2011.

In January 2010, a faux module table, 8 feet wide by 4 feet tall, was installed in a buffer zone of the second vegetation test site. The faux module site was instrumented with light meters that sample photosynthetic light spectrum radiation, temperature meters, and soil moisture meters. A duplicate set of instruments were placed away from the faux modules for comparison. In August 2010, instruments placed under the faux module will be moved to the vegetation test site where they will collect data under modules of the same material, design, and layout as proposed for the Topaz Solar Farm project.

We evaluated both test sites during late spring and early summer 2010. Soft-chess brome, wild oats (*Avena* spp.) and barley (*Hordeum vulgare*) dominated the site preparation test site, standing 28 to 48 inches tall, with 10 to 30 percent bare ground, and over 5,000 pounds per acre above-ground biomass. Rat-tail fescue, soft-chess brome, rip-gut brome (*B. diandrus*), and Mediterranean grass (*Schismus arabicus*) dominated the second vegetation test site along with pineapple weed (*Chamomilla suaveolens*), mustard (*Hirschfeldia incana*), and fireweed (*Amsinckia menziesii*). Vegetation height at the second site in locations not covered by modules was 10 to 18 inches tall with about 50 percent bare ground, and about 2,500 pounds per acre above-ground biomass.

By comparison, vegetation in a nearby field that had not been plowed for over 20 years (Sections 34 and 35) was dominated by dicots (forbs), not by grasses, particularly filaree (*Erodium cicutarium*). Vegetation height averaged less than 10 inches tall, generally 10 to 20 percent bare ground, and about 1,400 pounds per acre above-ground biomass. This was significantly shorter vegetation than in the vegetation test sites. This finding indicates that some areas may require little or no site preparation, depending on existing vegetative cover and site stability.

Vegetation under the faux module was dominated by rat-tail fescue, soft-chess brome, red-top brome *(Bromus madritensis),* and rip-gut brome. Vegetation height under the modules averaged 16 inches tall, about 55 percent bare ground, and about 1,800 pounds per acre above-ground biomass. Young bunchgrass *(Nassella* sp.*)* was only observed under the faux module, and was still green in early July. The small bunches were five inches tall. There was no other difference in species composition between the module treatment and out in the open.

TABLE 21. VEGETATION TESTS. Vegetation height, percent bare ground, and above-ground biomass production at four locations. The vegetation test sites produced more biomass per acre than observed a nearby field not plowed for over 20 years.

| Location | Land Use History | Vegetation Height (inches) | Bare Ground (percent) | Biomass (pounds per acre) |
|---|---|---|---|---|
| Compaction test | Recently farmed, planted in fall | >30 | 20 | >5,000 |
| Panel test (before installation) | Fallow field, planted in winter | <18 | 50 | 2,500 |
| Under faux panel | Fallow field, planted in winter | <18 | 55 | 1,800 |
| Sections 34 and 35 | Field last plowed over 20 years ago | <10 | <20 | 1,400 |

Preliminary review of light, air temperature, and soil temperature data between May 25 and July 7 indicate that light between modules generates peak photosynthetic available radiation (PAR) between 500 and 2000 uE (microEinsteins), and average daytime PAR between 100 and 300 uE, compared to peak PAR away from the modules at 2000 uE. Air temperatures under the faux modules were consistently below those in the open. Under the modules, temperatures generally peaked around 85 degrees Fahrenheit (F) compared with 90 to over 100 degrees F in the open. Soil temperature 12 inches below the surface under the modules started around 58 degrees F on May 25 and reached 75 degrees F by July 7, 2010. In the open, soil temperatures at 12 inches started around 75 degrees in May and rose to over 90 degrees F by July 7. Daily soil temperature fluctuations under the module at 12 inches below the ground surface were much less (about 3 degrees per day) under the modules compared to out in the open where temperatures 12 inches below the surface varied 6 degrees per day.

Weedy species did not increase under the faux module, and are not likely to increase under Topaz PV modules. Botanical surveys conducted within the Topaz project area between 2008 and 2010 identified a number of weedy species that occur in the region, and are considered here regarding their potential to increase after module installation. Yellow starthistle *(Centaurea solstitialis)* is a noxious weed (California C-list) that occurs in disturbed patches within the PSA. Yellow starthistle is adversely affected by shade. Puncture vine *(Tribulus terrestris)* is also a noxious weed (California C-list), but is unlikely to increase under modules because it is generally associated with disturbed sandy soils. Modules are not proposed on sandy soils. White horsenettle *(Solanum elaeagnifolium)* is a California B-list noxious weed that occurs uncommonly along Highway 58 near Section 34. It grows best on disturbed sandy well-drained soils that have summer irrigation, such as cotton fields (DiTomaso and Healy 2007). White horsenettle is unlikely to become established within the PSA. Field bindweed *(Convolvulus arvensis)* is a California List-C noxious weed that is abundant in the PSA. Field bindweed thrives in open disturbed farmland. It may grow under modules but is generally found in disturbed areas. Rush skeletonweed *(Chondrilla juncea)* is a California List-A noxious weed and barbed oatgrass *(Aegilops triuncialis)* is a California

List-B noxious weed. The skeletonweed and barbed oatgrass grow in disturbed areas, and are unlikely to increase in undisturbed soils under PV modules.

In summary, the tallest and densest vegetation grew on the recently farmed barley field prepared for seeding just after the first rains. The shortest vegetation occurs in fields that have not been plowed for over 20 years. The proportion of bare ground showing was highest in the field prepared for seeding during the winter, and lowest in the fields that have not been plowed for over 20 years.

Based on preliminary vegetation test data, unplowed and untreated fields can produce sufficient biomass to protect the soil from erosion. There is sufficient light under modules to support ample biomass that can protect the soil from sheet flow and wind erosion. In addition, vegetation is likely to experience a longer growing season under the modules than out in the open due to lower soil and air temperatures. Shading may benefit perennial bunchgrass species, such as nodding needlegrass *(Nassella cernua).* Nodding needlegrass is a native bunchgrass that occurs along the edge of Highway 58 between Bitterwater Road and Simmler-Soda Lake Road. Roadsides accumulate moisture that drains off the roadway, creating more mesic, or moderate, microsite conditions than adjacent fields in the Carrizo Plain. PV modules ameliorate extreme soil temperatures and allow grasses to grow longer due to an improved moisture regime under the panels compared to open fields.

In conclusion, recommended site preparation methods on actively farmed ground include mowing, harrowing, and light seeding prior to surface compaction. Fallow fields may not need to be mowed. Stable fields that have not been plowed in many years may only require microsite preparation to provide a safe and stable surface for construction workers. First Solar is currently investigating natural compaction levels in stable fields in order to minimize site preparation operations while maintaining worker safety. First Solar plans to prepare actively farmed fields with traditional farming methods plus minimal surface compaction (to 80 percent), as needed. The proposed methods will provide for worker safety while maintaining habitat for kit fox and their prey.

The vegetation test site will continue to be monitored to identify the appropriate ground treatment and seed mix that should be implemented during project site preparation.

# 9.0 Project Overview

## 9.1 General Discussion of PSA Site Conditions

The PSA contains numerous parcels that have been in periodic agricultural production for over 70 years. All habitats within the PSA are heavily influenced by past farming and ranching operations. Land management practices have removed all shrub vegetation from the PSA, and converted natural grassland systems to rangeland and farmland dominated by introduced species. Rangeland, described here as California annual grassland, varies in species composition. Areas that have been untilled the longest, some over 20 years as part of the Conservation Reserve Program, typically contain higher diversity and abundance of native plants than areas that have only been untilled for 5 years (Figure 5 in Section 12.0).

Lack of shrub development limits the amount of shade and cover available to many animal species. Species that are locally common in saltbush scrub habitats in the Carrizo Plain National Monument, such as the sage sparrow and Nelson's antelope squirrel, have not been detected within the PSA. Species present within the PSA are those that prefer wide-open habitats and are adaptable to variable habitat conditions, including frequent disturbance. Small mammal and reptile fauna such as mice, kangaroo rats, gophers, lizards and snakes, are present in low abundance. We attribute this condition primarily to detrimental effects of farming activities. Medium sized mammals such as badger, coyote and kit fox occur within the PSA and are also affected by farming activities.

Large mammals such as tule elk and pronghorn antelope forage seasonally within the PSA. The primary reason elk and antelope are attracted to the PSA is farming. Forage is provided by land owners in the form of planted grain in the spring and naturalized bindweed in the summer and fall. Existing fences make movement difficult for large mammals. Elk and antelope move in regular patterns through fence openings or other easy passageways through the PSA.

## 9.2 Applicant Proposed Measures to Reduce Environmental Impacts

The Topaz Solar Farm project incorporates wildlife-friendly design elements. A goal of project design and construction methodology is to avoid or minimize potential impacts to kit fox and other sensitive biological resources when practicable. The following Applicant Proposed Measures (APM's) would be incorporated into the project design:

- Perimeter fencing with kit fox passages every 100 yards so foxes can move through and potentially inhabit the TSF facility. No new interior fencing. Remove existing cross-fencing.
- Kit fox artificial escape dens located both inside and outside the solar array perimeter fence.
- Artificial dens capable of supporting kit fox pairs and pups located in every Section within the fenced facility.

- Construction activities adjusted to avoid active kit fox and badger dens, nesting birds and other seasonally sensitive resources.
- Vegetate the ground within the PSA facility to promote a natural habitat to support potential kit fox prey. Vegetation managed with grazing or other methods (subject to further testing to confirm feasibility).
- Avoid construction within estimated 100-year flood boundary to create wildlife movement corridors through the TSF facility.
- In addition to fencing removal within solar array areas, cross-fencing and wildlife wire fencing would be removed from 100-year flood boundary movement corridors within the PSA to promote wildlife passage through the TSF Project.
- Avoid ephemeral wetland depressions. Establish a 25-foot setback to protect wetland hydrologic regimes and allow seasonal wildlife access to the pools.
- Avoid vernal pools. Establish a 50-foot setback to protect vernal pool hydrologic regimes and allow seasonal wildlife access to the pools.
- Avoid federally listed fairy shrimp pools. Establish a 250-foot setback to protect vernal pool hydrologic regimes and provide approximately 4.5 acres of protected upland wildlife habitat.

## 9.3 Regulatory Framework

### *9.3.1 CEQA guidance*

The California Environmental Quality Act (CEQA) requires the lead agency to evaluate potential environmental effects of the project. The lead agency must also identify other State and local agencies (known as responsible agencies) that will be issuing a discretionary approval subject to CEQA for an activity that is part of the project. The following section of the State CEQA Guidelines provides general direction for the evaluation of biological resource impacts as a part of the environmental review of proposed projects.

CEQA Guidelines Section 15065 states that a Lead Agency shall find that a project may have a significant effect on the environment and thereby require an Environmental Impact Report (EIR) be prepared for the project where "there is substantial evidence, in light of the whole record," that the project, among other things, has the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of an endangered, rare or threatened species.

A significant effect may also be identified by considerable cumulative environmental effects, even if the individual effect is limited. The following definition of a significant effect is defined in Section 15382 of the CEQA Guidelines:

> *"Significant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance.*

All of the plants constituting CNPS List 1B meet the definitions of Section 1901, Chapter 10 of the California Native Plant Protection Act (CNPPA) in the California Fish and Game Code or Secs. 2062 and 2067 (California Endangered Species Act) of the California Fish and Game Code, and are eligible for State listing.

### *9.3.2 Federal and state resource protections*

The agencies that administer the Federal Endangered Species Act (FESA) and California Endangered Species Act (CESA) formally list plant and animal species determined to be Threatened or Endangered, and they have adopted regulations to implement these laws to protect such species.

Other federal statutes that provide protection for species and/or their habitats include, but are not limited to, the National Environmental Policy Act (NEPA), the Clean Water Act (for protection of federal wetlands), Bald and Golden Eagle Protection Act (BGEPA), Migratory Bird Treaty Act (MBTA), Executive Order 11990 (wetlands protection), and California Fish and Game Code sections 1601, 1602, and 1603 (Streambed Alteration Agreements).

*Wetlands*:

In conjunction with adopting a wetlands policy on March 9, 1987 the California Fish and Game Commission assigned the CDFG the task of recommending a wetlands definition. CDFG found the USFWS wetland definition and classification system to be the most biologically valid. The CDFG staff use this definition as a guide in identifying wetlands while conducting on-site inspections for the implementation of its Commission's wetlands policy. The California State Water Resources Control Board is in the process of adopting a uniform state wetlands definition based on the Section 404 standards used by the U.S. Army Corps of Engineers in administering Section 404 of the Clean Water Act.

Ephemeral drainage channels with a hydrologic connection to Soda Lake are believed to be jurisdictional under Section 404. Impacts to jurisdictional drainages (Section 404, Clean Water Act) resulting from road crossings are therefore expected to require permits or other authorizations from the USACE, RWQCB, and potentially from CDFG (Fish and Game Code, Sections 1600, *et seq*.).

*Flora and fauna*:

Listed plants and animals under the Federal Endangered Species Act (FESA) have certain protections as specified therein (refer to Section 4.0). The United States Fish and Wildlife Service is the agency that regulates activities affecting terrestrial-based, Federally-listed species.

Certain species of nesting birds are protected from disturbance by The Migratory Bird Treaty Act of 1918, (as regulated by the United States Fish and Wildlife Service) and by sections 3503, 3503.5, and 3800 of the California Department of Fish and Game Code. Special protections for bald and golden eagles are also contained in the federal Bald and Golden Eagle Protection Act.

# 10.0 Potential Impacts to Biological Resources

Construction of the proposed Topaz Solar Farm (TSF) project potentially could affect common and special status animal species, nesting birds, and annual grassland, cropland, anthropogenic and ephemeral aquatic habitats. The perimeter of the array areas within the TSF Project site would be fenced. The TSF Project fenced area is expected to cover approximately 4,104 acres (Option A) or 4,007 acres (Option B) of the 9,700-acre PSA. The majority of the site would not need to be graded as part of the construction process, however the ground may be harrowed or plowed, and rolled to create an even surface for placement of the solar arrays. Grading may occur to construct access roadways, the lay-down area/staging areas, the substation and other structures, and to reduce slopes where needed for PV panel installation. Trenching would be required for installation of underground cables.

## 10.1 Potential Habitat Impacts

Potential impacts to habitats within the PSA are addressed below. For reference, all habitat types mapped within the PSA and discussed in this section are overlaid on a high-resolution aerial photograph provided as BR Map 1 in Section 13.0. Tables 22 and 23 provide acreages and impact types for habitats within Options A and B.

All areas within the final TSF Project fencing could be "temporarily disturbed" by construction activities, except for sensitive pool habitats which require setbacks (refer to APM's outlined in Section 9.2). For areas that would be "permanently removed", such as anthropogenic habitat and agricultural reservoirs, the acreage of temporary impact is zero. Additionally, croplands would be permanently converted to project uses or managed as annual grassland habitat, so no temporary disturbance calculations are indicated for this habitat type. Special status species that could be temporarily affected during construction in croplands are addressed separately, in Section 10.4. Natural non-wetland pools and anthropogenic non-wetland pools are considered here for their value to wildlife. However since they were not found to support sensitive wildlife and are not under the jurisdiction of the USACE, the TSF Project would not avoid these habitat types and would result in temporary and permanent impacts, as indicated in the tables. As a conservative calculation, all acreage of annual grassland habitat that occurs within the fenced areas of the TSF Project could be temporarily disturbed during project construction. Temporary disturbance could consist of vegetation management activities, vehicle and equipment driving across the habitat and/or staging within the habitat, and other minor affects from various construction activities. Also included in the temporary disturbance calculation are areas that would be graded to reduce slopes as required for PV panel array installations. These areas are listed as temporary impacts because they would be revegetated with annual grassland species. Approximately 640 acres of Option A would require grading, and approximately 1,638 acres of Option B would require grading.

The "permanently removed" category includes habitat areas which would be covered by TSF Project gravel roads, the substation and other structures, and the area of fence posts and piles that would be driven into the ground.

The "area with PV arrays" category includes all habitat areas that would be situated beneath PV arrays. The acreage within this category does not exclude the open areas between panel rows and aisles: rather, it is calculated conservatively as the total area of PV arrays. For example, the total PV array area of Option A is 3,339 acres, within which only 1,353 acres would have PV modules (panels) that partially shade the ground (amount shaded would vary with the angle of the sun throughout the day). Therefore, the inter-panel open space within the 3,339 acre PV arrays would be approximately 1,986 acres.

TABLE 22. HABITAT IMPACTS-OPTION A. Approximate areas of impact for Option A are provided for temporarily disturbed areas, permanently removed areas, and areas with arrays. Note: All acreages are approximate.

| **Habitat Type** | **Total Acres Within Option A** | **Temporarily Disturbed (acres)** (All areas within project fencing) | **Permanently Removed (acres)** (Piles, fence posts, substation and structures, gravel roads) | **Area With PV Arrays (acres)** |
|---|---|---|---|---|
| Cropland | 4,380 | 0 | 49 | 1,911 |
| California Annual Grassland | 3,356 | 1,719 | 13 | 1,428 |
| Vernal Pool | 2.2 | 0 | 0 | 0 |
| Ephemeral Wetland Depression | 0.6 | 0 | 0 | 0 |
| Natural Non-wetland Pool | 1.0 | ~2,640 sq. ft. | 0 | ~2,640 sq. ft. |
| Anthropogenic Non-wetland Pool | 0.7 | ~17,230 sq. ft. | ~1,000 sq. ft. | ~3,600 sq. ft. |
| Agricultural Reservoir | 1,742 sq. ft. (0.04 acres) | 0 | 1,742 sq. ft. (0.04 acres) | 0 |
| Anthropogenic | 23 | 0 | 7 | 0 |

TABLE 23. HABITAT IMPACTS-OPTION B. Approximate areas of impact for Option B are provided for temporarily disturbed areas, permanently removed areas, and permanently shaded areas. Note: All acreages are approximate.

| **Habitat Type** | **Total Acres Within Option B** | **Temporarily Disturbed (acres)** (All areas within project fencing) | **Permanently Removed (acres)** (Piles, fence posts, substation and structures, gravel roads) | **Area With PV Arrays (acres)** |
|---|---|---|---|---|
| Cropland | 4,712 | 0 | 68 | 2,402 |
| California Annual Grassland | 1,689 | 1,124 | 17 | 937 |
| Vernal Pool | 0.1 | 0 | 0 | 0 |
| Ephemeral Wetland Depression | 0.6 | 0 | 0 | 0 |
| Natural Non-wetland Pool | 0.2 | ~4,500 sq. ft. | 0 | ~4,500 sq. ft. |
| Anthropogenic Non-wetland Pool | 0.1 | ~570 sq. ft. | ~3,300 sq. ft. | ~170 sq. ft. |
| Agricultural Reservoir | 1,742 sq. ft. (0.04 acres) | 0 | 1,742 sq. ft. | 0 |
| Anthropogenic | 25 | 0 | 5 | 0 |

### *10.1.1 Cropland*

The proposed TSF Project would convert cropland habitat to various project facilities. The TSF Project site and surrounding lands within the PSA would no longer be used for agriculture. Approximately 4,380 acres of cropland would be removed from production within Option A, and approximately 4,712 acres of cropland would be removed from production in Option B. These areas are expected to be converted to annual grasslands, with approximately 1,911 acres that would be within TSF Project PV arrays in Option A and approxiamtely 2,402 acres that would be within TSF Project PV arrays in Option B (Tables 22 and 23). Option A would permanently convert approximately 49 acres of cropland habitat to project facilities such as piles, fence posts, structures and gravel roads. Option B would permanently convert approximately 68 acres of cropland habitat to project facilities such as piles, fence posts, structures and gravel roads.

Soils, weather conditions, and the fact that there is very limited water availability at the site means that it is poorly suited to economically viable farming. The solar farm would allow establishment of annual grassland species within the Project, and may result in a net increase in annual grassland habitat and associated wildlife species by converting active croplands to passive solar uses.

Cropland habitats within the PSA presently act as an undesirable "biological sink" for many small to medium sized animals, which move into the croplands from adjacent habitats and succumb to farming activities such as plowing. These impacts are particularly detrimental for sensitive reptiles and amphibians such as horned lizard, San Joaquin whipsnake, and Western spadefoot toad, as well as endangered species such as fairy shrimp and kit fox.

Croplands within the PSA are habitat for pronghorn antelope and tule elk, especially as summer foraging and fawning habitat. Potential adverse affects to these and other species from loss of cropland habitat are addressed in Section 11.4.

### *10.1.2 California annual grassland*

The proposed TSF Project would result in adverse effects to California annual grassland habitat within the PSA. Approximately 3,463 acres of California annual grassland habitat is located within the PSA. Option A could temporarily adversely affect up to 1,719 acres of annual grassland habitat (all existing grassland within Project perimeter fence), with 13 acres estimated to be permanently removed for project facilities, such as piles, fence posts, structures and gravel roads. Areas with PV arrays would affect up to 1,428 acres of grassland habitat. Option B could temporarily adversely affect up to 937 acres of annual grassland habitat, with 17 acres estimated to be permanently removed for project facilities, such as piles, fence posts, structures and gravel roads. Areas with PV arrays would affect up to 937 acres of grassland.

Adverse effects to non-native annual grassland habitat do not usually require mitigation in San Luis Obispo County unless special status species are adversely affected. Potential adverse effects to special status species and their habitat are addressed in Section 10.4.

Project installation on existing croplands may result in an increase in California annual grassland habitat through elimination of seasonal tilling and subsequent long-term management for grassland species. Vegetation between and beneath panels is likely to recover after installation and be dominated by annual grasses. In addition, all existing cropland within the Option study area that is selected but is outside the TSF Facility perimeter fencing would be removed from production and managed as annual grassland habitat and protected in perpetuity.

Examination of current habitat types within the PSA and associated land use history provides important insight regarding habitat recovery post-farming. The vegetative condition of areas such as Sections 16 and 28 indicate that within approximately five years after farming is eliminated, the land reverts to a low-diversity annual grassland habitat (refer to Land Use Descriptions in Section 3.2). Areas of the PSA that have been untilled for 20 or more years show a significant increase in plant species diversity, and abundance of native wildflowers. We expect that conversion of croplands within the PSA to passive solar facilities would initiate land conversion to annual grassland habitat, and that by the time the solar facility is decommissioned the land would support higher diversity and abundance of native plants than the present baseline.

### *10.1.3 Vernal pool*

Forty-seven vernal pools are located within the PSA, with a total area of approximately 2.2 acres. Option A contains all 47 vernal pools and Option B contains 2 vernal pools. Vernal pools are sensitive habitat types that support unique associations of plants and wildlife. Many of the vernal pools within the PSA support federally listed fairy shrimp (refer to Section 10.4 for discussion of special status species).

Without proper precautions, construction of a solar facility could result in modification of the hydrological regime critical to prolonged vernal pool inundation. The applicant proposes to implement permanent setbacks around vernal pools that would protect hydrologic function (refer to Section 9.2). Vernal pools within the final Project layout would be protected by a minimum 50-foot buffer, which would be increased to 250 feet in locations where federally listed fairy shrimp are present. The 250-foot setback would also be implemented around vernal pools in which fairy shrimp were detected but not identified to species sufficient to determine listing status under the FESA(refer to Sections 10.4.5 and 11.4.5). Construction of the proposed TSF Project therefore would not result in adverse impacts to vernal pool habitat.

Seven vernal pools located in Sections 4, 19, 20, and 32 of the PSA are situated in cropland habitat, and are severely degraded by the current farming operation. Despite seasonal impacts from tilling, unique plants and animals are present, including federally listed fairy shrimp and breeding Western spadefoot toads. Vernal pools in cropland habitats that are included in the final TSF Project layout would no longer be subjected to adverse farming effects and would be protected from Project-related activities with applicant-proposed buffers. The TSF Project could, therefore, result in a beneficial effect to vernal pool habitat that is within the final Project layout. Construction of Option A would result in a beneficial effect to all seven of these vernal pools that are presently within active cropland habitat. Construction of Option B would result in a beneficial effect to two of these vernal pools.

### *10.1.4 Ephemeral wetland depression*

Eight small ephemeral wetland depressions are located within the PSA, with a total area of approximately 0.7 acres. Ephemeral wetland depressions are isolated seasonal pools that are potential habitat for fairy shrimp, spadefoot toads and other wildlife, are dominated by hydrophytic plants, and have hydric soil indicators. The applicant proposes to implement permanent setbacks around ephemeral wetland depressions (refer to Section 9.2). Ephemeral wetland depressions within the final Project layout would be protected by a 25-foot buffer. Construction of the proposed TSF Project would not result in adverse impacts to ephemeral wetland depressions.

Two of these ephemeral wetland depressions within Section 18 of the PSA (Option B) are located in cropland habitat, and are severely degraded by the current farming operation. Despite seasonal impacts from tilling, vernal pool plants and animals are present, including non-listed fairy shrimp and breeding Western spadefoot toads. Ephemeral wetland depressions in cropland habitat that are included in the final TSF Project layout would no longer be subjected to adverse farming effects and would not be affected by the

proposed TSF Project. The TSF Project is expected, therefore, to result in a beneficial effect to ephemeral wetland depression habitat that is within the Option B layout.

Cattle graze the remaining six ephemeral wetland depressions within the PSA seasonally, which generally results in degraded habitat quality for sensitive vegetation and wildlife. Conversion of the grazing lands to passive solar uses would result in a beneficial effect on ephemeral wetland depressions in both Option A and Option B.

### *10.1.5 Natural non-wetland pool*

Nine natural non-wetland pools are located within the PSA, with a total area of approximately 1.1 acres. Natural non-wetland pools are similar in form to ephemeral wetland depressions, however they do not remain inundated long enough to become dominated by hydrophytic plants and do not have hydric soils. In a hierarchical context, we consider this habitat type to be generally less biologically important than ephemeral wetland depression (except where listed fairy shrimp are present).

One natural non-wetland pool, located in Section 20, contains listed fairy shrimp and would therefore be protected by the 250-foot APM setback (refer to Sections 9.2 and 10.4.5). Two natural non-wetland pools in Section 20 (one on the boundary with Section 29) and two pools in Section 4 are mapped as potential habitat for listed fairy shrimp due to their proximity to known listed fairy shrimp pools, positive identification of Branchinecta cysts during 2010 dry season fairy shrimp surveys, and lack of positive species identification during previous protocol wet season surveys, and therefore would also be protected by the 250-foot APM setback (refer to BR Map 10, Section 13.0).

The remaining four natural non-wetland pools are widely scattered across the PSA, in both TSF Project Options, in both annual grassland and cropland habitats. Option A would permanently shade two natural non-wetland pools. Option B would permanently shade one natural non-wetland pool. Trenching, grading and installation of solar panel mounting posts could adversely affect other natural non-wetland pools. Because natural non-wetland pools with listed fairy shrimp would be avoided, we anticipate the proposed TSF Project would have a negligible adverse effect on the remaining natural non-wetland pools within the PSA because they do not support sensitive plants or wildlife.

Natural non-wetland pools within the PSA that are located in cropland habitat are severely degraded by the current farming operation. Natural non-wetland pools in cropland habitat that are included in the final TSF Project layout would no longer be subjected to adverse farming effects. The TSF Project could, therefore, result in a beneficial effect to natural non-wetland pool habitat that is within the final project layout.

### *10.1.6 Anthropogenic non-wetland pool*

Anthropogenic non-wetland pools are man-made pools and ruts located in dirt roads throughout the PSA. Vehicles regularly disturb most of these pools. They do not contain hydrophytic plants or have hydric soils, but they can be low quality potential habitat for fairy shrimp and Western spadefoot toads. Except where special status species could be affected, the TSF Project may result in filling of anthropogenic non-wetland pools during road improvement and maintenance activities. Filling of anthropogenic non-wetland pools that do not contain special status species would not cause adverse effects to biological resources.

### *10.1.7 Agricultural reservoir*

Two agricultural reservoirs are located within the PSA that support standing water during the rainy season, one in Section 20 and one in Section 28. Both reservoirs support breeding Western spadefoot toads and other common amphibian species. Two additional reservoirs are located within the PSA that do not hold any water during the rainy season, one in Section 28 and one in Section 29.

Agricultural reservoirs that end up within the final TSF Project layout may be used for water detention during construction, and would ultimately be removed if they fall within proposed solar arrays. Removal of the two reservoirs that do not hold water would not result in adverse impacts to ephemeral aquatic habitat or special status species. Utilization of the two reservoirs that do support standing water and breeding amphibians potentially could result in adverse effects to Western spadefoot toads. Adverse impacts could occur during pumping or other construction-related activities associated with use of the reservoirs as temporary detention basins, or during demolition of the reservoirs. Loss of breeding habitat could occur if the reservoirs are replaced by Project facilities. Potential Project effects on Western spadefoot toads are addressed in detail in Section 10.4.

### *10.1.8 Anthropogenic*

Anthropogenic areas within the TSF Project site could be converted to Project facilities. No mitigation is required for conversion of anthropogenic habitat.

Conversion of anthropogenic habitat to solar facilities may result in removal of landscape trees and shrubs, abandoned homes and outbuildings, and various farm equipment and materials. This is expected to occur in Section 28, which is within both project Options. The abandoned residential compound in Section 33 would not be removed by either Project Option. Conversion of anthropogenic habitat within the PSA to solar facilities would not affect special status plants. Anthropogenic habitat within the PSA is suitable for use by nesting birds, including special status species such as the loggerhead shrike and raptors such as the red-tailed hawk and golden eagle. If appropriate avoidance and mitigation measures are not implemented, conversion of anthropogenic habitat within the PSA to solar facilities could result in adverse effects on nesting and roosting birds. The potential for the TSF Project to adversely affect nesting and roosting birds in anthropogenic habitat can be reduced (refer to Section 11.4.2).

## 10.2 Potential Impacts to Ephemeral Drainages

We anticipate that the United States Army Corps of Engineers (USACE) will take jurisdiction over certain ephemeral drainages within the PSA. A wetland delineation report was prepared for the Project which is currently under review by USACE (Althouse and Meade, Inc. 2010b). Solar arrays would not be located within federal jurisdictional drainages. Up to five permanent at-grade crossings would be constructed for the TSF Project.

Impacts to jurisdictional ephemeral drainages, such as crossings, would be mitigated (refer to Section 11.2).

## 10.3 Potential Impacts to Nesting Birds

Vegetation removal or other construction and maintenance activities associated with the installation and long-term management of a solar facility within the PSA could result in adverse impacts to nesting birds if conducted during nesting season (March 15 through August 15). The potential for the TSF Project to adversely affect nesting birds can be reduced (refer to section 11.4.2).

## 10.4 Potential Impacts to Special Status Species

We identified 10 special status plants and thirty-one special status animals within or immediately adjacent to the PSA. Three federally listed animals, the San Joaquin kit fox, vernal pool fairy shrimp, and longhorn fairy shrimp, are present within the PSA. Two of these species occur within Option B and all three occur within Option A. Construction of the proposed TSF Project potentially could result in adverse effects on special status species. Also covered in this Section are potential effects of the TSF Project on pronghorn antelope and tule elk.

### *10.4.1 Special status plants*

Nine special status plants were identified within the PSA: round-leaved filaree (*California macrophylla*, CNPS List 1B.1), spiny-sepaled button celery (*Eryngium spinosepalum*, CNPS List 1B.2), Santa Lucia dwarf rush (*Juncus luciensis*, CNPS List 1B.2), shining navarretia (*Navarretia nigelliformis* ssp. *radians*, CNPS List 1B.2), Munz's tidy-tips (*Layia munzii*, CNPS List 1B.2), oval-leaved snapdragon (*Antirrhinum ovatum*, CNPS List 4.2), Ferris' goldfields (*Lasthenia ferrisiae*, CNPS List 4.2), Salinas milk-vetch (*Astragalus macrodon*, CNPS List 4.3), and Paso Robles navarretia (*Navarretia jaredii*, CNPS List 4.3).

One additional species, the diamond-petaled California poppy (*Eschscholzia rhombipetala*, CNPS List 1B.1) was mapped just outside the PSA boundary. No plant species listed under the federal Endangered Species Act or the California Endangered Species Act occur within the PSA.

The PSA is within the range of, and contains suitable habitat and soil features for, a broad variety of special status plants, including but not limited to those species identified on the site between 2008 and 2010. Based on our extensive field work we believe the single most significant limiting factor for special status plant occurrence within the PSA is consistent vegetation and soil disturbance related to farming practices. Termination of farming within the PSA and implementation of land management practices designed toward increasing grassland habitat suitable for kit fox would result in a beneficial effect to all special status plant populations presently occurring within the PSA, and potentially to other species occurring in the region. The TSF Project would, therefore, result in a strong overall beneficial effect on special status plants. Option A would permanently convert an estimated 4,380 acres of cropland habitat to annual grassland habitat that would be potentially suitable for special status plant establishment. Option B would permanently convert an estimated 4,712 acres of cropland habitat to annual grassland habitat that would be potentially suitable for special status plant establishment (Tables 24 and 25).

Construction activities associated with project build-out would likely result in some temporary adverse effects to special status plants if the activities overlap the bloom periods, if perennial species are removed, or if significant soil disturbance occurs. Tables 24 and 25 provide an overview of the anticipated temporary and permanent adverse effects, and overall effects of the project, on special status plants. Detailed accounts of potential project effects on each special status plant species are provided following the tables. Recommended minimization and protection measures for special status plants are provided in Section 11.4.1.

TABLE. 24. SPECIAL STATUS PLANT IMPACTS-OPTION A. Potential temporary and permanent adverse impacts to special status plants within Option A are provided, as well as an account of the overall effect of the TSF Project on special status plants. Locations of special status plants are indicated on BR Map 12.

| | **Common Name** *Scientific Name* **Listing Status** | **Project Option** | **Temporary Adverse Impact** | **Permanent Adverse Impact** | **Overall Effect of TSF Project** |
|---|---|---|---|---|---|
| 1. | **Round-leaved filaree** *California macrophylla* List 1B.1 | Option A | **None** Occurrences would be avoided during construction. | **None** No project facilities would be located in occurrence areas | **Beneficial** • Occurrences are within proposed open space • Conversion of 4,380 acres of annually plowed cropland to annual grassland open space suitable for establishment to new areas • On-site populations expected to increase after project construction due to elimination of annual tilling |
| 2. | **Spiny-sepaled Button Celery** *Eryngium spinosepalum* List 1B.2 | Option A | **None** Only occurs in one vernal pool, which would be avoided during construction | **None** No project facilities would be located in vernal pools | **Beneficial** • Occurrence is within proposed open space • Project would result in protection of onsite vernal pools in perpetuity • Lands containing this species are presently in the CRP program, but no permanent protection from future farming is provided if contract is not renewed |

| | **Common Name** ***Scientific Name*** **Listing Status** | **Project Option** | **Temporary Adverse Impact** | **Permanent Adverse Impact** | **Overall Effect of TSF Project** |
|---|---|---|---|---|---|
| 3. | **Santa Lucia Dwarf Rush** *Juncus luciensis* List 1B.2 | Option A | **None** Only occurs in one vernal pool, which would be avoided during construction | **None** No project facilities would be located in vernal pools. | **Beneficial** • Occurrences are within proposed open space • Project would result in protection of onsite vernal pools in perpetuity • Lands containing this species are presently in the CRP program, but no permanent protection from future farming is provided if contract is not renewed |
| 4. | **Shining Navarretia** *Navarretia nigelliformis* ssp. *radians* List 1B.2 | Option A | **None** Occurrence would be avoided during construction | **None** No project facilities would be located in occurrence areas | **Beneficial** • Project would convert 4,380 acres of annually plowed cropland to annual grassland |
| 5. | **Munz's Tidy-tips** *Layia munzii* List 1B.1 | Option A | **Negligible** Small number of plants could be affected during construction (up to 16 individuals, 2.5% of PSA population, per 2010 survey results) | **None** Significant permanent occurrence areas (as indicated by polygons on BR Map 12) would be avoided by TSF Project layout | **Beneficial** • Project would convert 4,380 acres of annually plowed cropland to annual grassland • Permanent population could become established in newly created grassland in Sections 32 and 33 • Occurrences in southwest corner of Section 5 could expand into lands that are currently farmed • Sufficient room would be present within the Project for periodic and possibly permanent establishment |

| | **Common Name** ***Scientific Name*** **Listing Status** | **Project Option** | **Temporary Adverse Impact** | **Permanent Adverse Impact** | **Overall Effect of TSF Project** |
|---|---|---|---|---|---|
| 6. | **Oval-leaved Snapdragon** *Antirrhinum ovatum* CNPS List 4.2 | Option A | **Negligible** Up to 35plants could be affected during construction (100% of PSA population, per 2010 survey results) | **None** Impacted occurrence is currently within cropland, and is expected to be present after Project installation | **Beneficial** • Project would convert 4,380 acres of annually plowed cropland to annual grassland • Occurrence is in active cropland. High potential for expansion of existing onsite population after elimination of tilling |
| 7. | **Ferris' Goldfields** *Lasthenia ferrisiae* List 4.2 | Option A | **Negligible** Small number of plants could be affected during construction (up to 2 individuals, 50% of PSA population, per 2010 survey results) | **None** No significant permanent occurrence areas are present | **Beneficial** • Project would convert 4,380 acres of annually plowed cropland to annual grassland • Suitable conditions would be present within the Project for periodic and possibly permanent establishment |
| 8. | **Salinas Milk-vetch** *Astragalus macrodon* List 4.3 | Option A | **Negligible** Small number of plants could be affected during construction (up to 13 individuals, 1.9% of PSA population, per 2010 survey results) | **None** Impacted occurrences are expected to become re-established after construction | **Beneficial** • Project would convert 4,380 acres of annually plowed cropland to annual grassland • This perennial species was observed to recruit to croplands in Sections 4, 5, 32, and 33, but was eliminated by fall tilling • Suitable conditions would be present within the Project for permanent establishment |

| | **Common Name** ***Scientific Name*** **Listing Status** | **Project Option** | **Temporary Adverse Impact** | **Permanent Adverse Impact** | **Overall Effect of TSF Project** |
|---|---|---|---|---|---|
| 9. | **Paso Robles Navarretia** *Navarretia jaredii* List 4.3 | Option A | **Negligible** 1,004 plants could be affected (35% of PSA population, per 2010 survey results) | **None** Impacted occurrences are expected to become re-established after construction | **Beneficial** • Project would convert 4,380 acres of annually plowed cropland to annual grassland • High potential for expansion of existing onsite population |
| 10. | **Diamond-petaled California Poppy** *Eschscholzia rhombipetala* List 1B.1 | Outside Option A | **None** Occurrence is outside Project area and would be protected by a construction buffer | **None** No project facilities would be located in the occurrence area | **Beneficial** • Elimination of annual tilling of the occurrence may benefit this species |

TABLE. 25. SPECIAL STATUS PLANT IMPACTS-OPTION B. Potential temporary and permanent adverse impacts to special status plants within Option B are provided, as well as an account of the overall effect of the TSF Project on special status plants.

| | **Common Name** ***Scientific Name*** **Listing Status** | **Project Option** | **Temporary Adverse Impact** | **Permanent Adverse Impact** | **Overall Effect of TSF Project** |
|---|---|---|---|---|---|
| 1. | **Munz's Tidy-tips** *Layia munzii* List 1B.1 | Option B | **Negligible** Small number of plants could be affected during construction (up to 12 individuals, 2% of PSA population, per 2010 survey results) | **None** No significant permanent occurrence areas are present | **Beneficial** • Project would convert 4,712 acres of annually plowed cropland to annual grassland • Sections 27 and 28 could support a permanent population after project construction |

| | **Common Name** ***Scientific Name*** **Listing Status** | **Project Option** | **Temporary Adverse Impact** | **Permanent Adverse Impact** | **Overall Effect of TSF Project** |
|---|---|---|---|---|---|
| 2. | **Salinas Milk-vetch** *Astragalus macrodon* List 4.3 | Option B | **None** All plants would be avoided during construction | **None** No project facilities would be located in occurrence areas | **Beneficial** • Project would convert 4,712 acres of annually plowed cropland to annual grassland • High potential for expansion of existing onsite population |
| 3. | **Ferris' Goldfields** *Lasthenia ferrisiae* List 4.2 | Option B | **Negligible** Small number of plants could be affected during construction (up to 2 individuals, 50% of PSA population, per 2010 survey results) | **None** No significant permanent occurrence areas are present | **Beneficial** • Project would convert 4,712 acres of annually plowed cropland to annual grassland • Suitable conditions would be present within the Project for periodic and possibly permanent establishment |
| 4. | **Paso Robles Navarretia** *Navarretia jaredii* List 4.3 | Option B | **Negligible** 1,000 plants could be affected (35% of PSA population, per 2010 survey results) | **None** Impacted occurrences are expected to become re-established after construction | **Beneficial** • Project would convert 4,712 acres of annually plowed cropland to annual grassland • High potential for expansion of existing onsite population |

**A. Oval-leaved Snapdragon**: A colony of oval-leaved snapdragon occurs in Option A, Section 5. Approximately 35 plants were present in 2010, scattered over 0.8 acres of cropland habitat planted in barley. This species, restricted to heavy clay vertisols, is presently adversely affected by the existing farming operation. The occurrence may be larger than observed since adjacent cropland areas with clay soils were plowed bare. Oval-leaved snapdragon is an annual species which germinates from a dormant seed bank during years of good rainfall. Construction activities associated with Option A could adversely affect up to approximately 35 oval-leaved snapdragon plants if work was done during the bloom period from May to November during years when this species blooms (based on 2010 location and abundance data). The TSF Project Option A would convert approximately 4,380 acres of existing croplands to annual grasslands. Option A would likely provide an opportunity for oval-leaved snapdragon to become permanently established over a greater area than is currently occupied. Option A would likely have an overall beneficial effect on oval-leaved snapdragon.

The TSF Project Option B would convert approximately 4,712 acres of existing croplands to annual grasslands. Construction activities would not adversely affect any oval-leaved snapdragon plants (based on 2010 location and abundance data). Option B would likely provide an opportunity for oval-leaved snapdragon to become permanently established over a greater area than is currently occupied. Option B would have an overall beneficial effect on oval-leaved snapdragon.

**B. Salinas Milk-vetch**: Scattered throughout Option A and located in one area of Option B, Salinas milk-vetch would only be adversely affected by the Option A layout. This perennial species was observed in 2010 to be common in Option A fallow croplands where only seedlings were present. These new colonization events are short-lived due to seasonal plowing which kills the plants. The TSF Project Option A would convert approximately 4,380 acres of existing croplands to annual grasslands. Construction activities could adversely affect up to 13 Salinas milk-vetch plants if work was done during the bloom period from April to July (based on 2010 location and abundance data). Option A would likely provide an opportunity for Salinas milk-vetch to become permanently established over a greater area than is currently occupied. Option A would have an overall beneficial effect on Salinas milk-vetch.

The TSF Project Option B would convert approximately 4,712 acres of existing croplands to annual grasslands. Construction activities would not adversely affect any Salinas milk-vetch plants (based on 2010 location and abundance data). Option B would likely provide an opportunity for Salinas milk-vetch to become permanently established over a greater area than is currently occupied. Option B would have an overall beneficial effect on Salinas milk-vetch.

**C. Round-leaved Filaree**: Two small patches of round-leaved filaree occur within the PSA, one in Section 33 and one in Section 5, both within Option A. Each patch contains approximately 100 plants. Both patches are occasionally disturbed by seasonal tilling for the dry-farmed grain operation. Round-leaved filaree is an annual herb that has the potential to recruit to fallow farm fields where suitable soils are

present. The current TSF Project layouts indicate that both patches of round-leaved filaree are situated within protected areas and would not be adversely affected by construction or operation of the TSF Project. The plants in Section 5 are situated in a project boundary setback area, and the plants in Section 33 are situated within a 100-year flood boundary setback. The TSF Project would not result in adverse effects to round-leaved filaree. It is likely that the TSF Project would result in a beneficial effect to these populations by eliminating annual tilling associated with the farming operation (Tables 24 and 25).

**D. Spiny-sepaled Button Celery**: This obligate wetland plant occurs in one vernal pool in Option A, Section 4. Only five plants were documented in 2010. The one vernal pool that supports this occurrence also contains listed fairy shrimp and would be protected with an applicant proposed 250-foot setback (refer to Section 9.2). Construction and operation of either Option A or Option B of the TSF Project would not adversely affect spiny-sepaled button celery. Preservation of on-site vernal pools in perpetuity would be a beneficial effect to the species (Tables 24 and 25).

**E. Diamond-petaled California Poppy**: A small and highly sensitive population of diamond-petaled California poppy occurs outside the southwest boundary of Option A. The population is subjected to occasional disturbance by on-going farming activities. This is an annual species with poorly understood habitat requirements. It occurs in only one small area, despite more potentially suitable habitat in the vicinity. The close proximity of the diamond-petaled California poppy to the Option A boundary makes it potentially susceptible to disturbance during construction of perimeter fencing or other facility features. Installation of a construction barrier fence around this population would adequately reduce the potential for incidental adverse effects of the TSF Project (refer to Section 11.4.1).

**F. Santa Lucia Dwarf Rush**: This tiny obligate wetland plant is abundant in the understory of other vernal pool vegetation in several pools within Option A, Section 4. These pools contain listed fairy shrimp and each pool would be protected with an applicant proposed 250-foot setback (refer to Section 9.2). Construction and operation of either Option A or Option B of the TSF Project would not adversely affect Santa Lucia dwarf rush. Preservation of on-site vernal pools in perpetuity would be a beneficial effect to the species (Tables 24 and 25).

**G. Ferris' Goldfields**: All four detections of Ferris' goldfields within the PSA were of a single plant. A stable and consistent population of this species does not exist within the PSA; its presence is the result of accidental introduction. Construction and operation of Option A of the TSF Project would not adversely affect Ferris' goldfields, based on 2010 location and abundance data. Conversion of approximately 4,380 acres of cropland habitat to grassland habitat would be a beneficial effect to the species. Construction and operation of Option B of the TSF Project cold adversely affect Ferris' goldfields, based on 2010 location and abundance data. Construction activities could adversely affect up to two Ferris' goldfields plants if work was done during the bloom period from February through May (based on 2010 location and abundance data). Conversion of approximatley 4,712 acres of cropland habitat to grassland habitat would be a beneficial effect to the species. It is possible, through elimination of farming practices and subsequent increase in quality of grassland

habitat, that Ferris' goldfields could become permanently established within the TSF Project and surrounding preserved lands.

**H. Munz's Tidy-tips**: This annual wind-dispersed wildflower is abundant in localized areas of the Carrizo Plain National Monument and California Valley, and occurs in scattered localities within the PSA. Many of the occurrences are of single plants mingled with the similar but common *Layia platyglossa*. Munz's tidy-tips was widely distributed in the southern region of the PSA during spring 2010, primarily within Option A. Because this species is wind-dispersed, we expect Munz's tidy-tips could occur occasionally, with varying abundance and distribution, throughout the southern portions of the PSA where detected in 2010. Patches of Munz's layia, where it is likely stable and consistently present year to year, are only located in Option A. Munz's tidy-tips occurrences in Option B consisted of small isolated patches containing up to 10 plants.

The TSF Project Option A would avoid the significant occurrences of Munz's tidy-tips, and would convert approximately 4,380 acres of existing croplands to annual grasslands. Construction activities could adversely affect up to 16 Munz's tidy-tips plants if work was done during the bloom period in March and April (based on 2010 location and abundance data). Option A would likely provide an opportunity for Munz's tidy-tips to become permanently established over a greater area than is currently occupied. Option A would have an overall beneficial effect on Munz's tidy-tips.

The TSF Project Option B would not affect any significant occurrences of Munz's tidy-tips, and would convert approximately 4,712 acres of existing croplands to annual grasslands. Construction activities could adversely affect up to 12 Munz's tidy-tips plants if work was done during the bloom period in March and April (based on 2010 location and abundance data). Option B would likely provide an oportunity for Munz's tidy-tips to become permanently established over a greater area than is currently occupied. Option B would have an overall beneficial effect on Munz's tidy-tips (Tables 24 and 25).

**I. Paso Robles Navarretia**: An annual herb that prefers areas with little competition from introduced annual grasses, Paso Robles navarretia was identified in scattered locations within Options A and B of the TSF Project. The TSF Project Option A would convert approximately 4,380 acres of existing croplands to annual grasslands. Construction activities could adversely affect up to 1,004 Paso Robles navarretia plants if work was done during the bloom period from April to July (based on 2010 location and abundance data). We have observed this species colonizing road cuts and vineyards elsewhere in the region, and expect it would re-colonize suitable micro-habitat areas within the fenced project area. Option A would likely provide an opportunity for Paso Robles navarretia to become permanently established over a greater area than is currently occupied. Option A would have an overall beneficial effect on Paso Robles navarretia.

The TSF Project Option B would convert approximately 4,712 acres of existing croplands to annual grasslands. Construction activities could adversely affect up to 1,000 Paso Robles navarretia plants if work was done during the bloom period from

April to July (based on 2010 location and abundance data). We have observed this species colonizing road cuts and vineyards elsewhere in the region, and expect it would re-colonize suitable micro-habitat areas within the fenced project area. Option B would likely provide an opportunity for Paso Robles navarretia to become permanently established over a greater area than is currently occupied. Option B would have an overall beneficial effect on Paso Robles navarretia (Tables 24 and 25).

**J. Shining Navarretia**: One small local occurrence of shining navarretia occurs in Option A of the TSF Project; it does not occur in Option B. About 100 plants occur in an area estimated at 800 square feet in size. The location of the single occurrence of shining navarretia is outside proposed array layouts in Option A; therefore construction activities would not adversely affect shining navarretia. Option A would convert approximately 4,380 acres of existing croplands to annual grasslands. Option B would convert approximately 4,712 acres of existing croplands to annual grasslands. Options A and B would likely provide an opportunity for shining navarretia to become permanently established over a greater area than is currently occupied. Options A and B would have an overall beneficial effect on shining navarretia.

### *10.4.2 Special status birds*

The TSF Project would result in a net loss of potential nesting habitat for some bird species. Construction activities or post-construction vegetation maintenance could result in nest abandonment or loss of special status bird species if appropriate pre-construction surveys, setback requirements, and management practices are not implemented (refer to Section 11.4.2).

Both proposed project Options would affect known burrowing owl nesting and wintering burrows. Option A would potentially affect three nesting territories occupied in 2010. Option B would potentially affect two nesting territories occupied in 2010. Table 26 provides burrowing owl potential impact data for each proposed project Option.

Both proposed project Options for the TSF Project would result in loss of grassland habitat due to array placement that is potential nesting habitat for special status bird species. However, conversion of existing cropland habitat surrounding the TSF Facility to annual grassland would result in a net increase in potential grassland nesting habitat.

**A. Burrowing Owl**: The burrowing owl is a California Species of Special Concern. Much of the completed TSF Facility would not be suitable for burrowing owls due to the confined nature of the array configuration. There would be open spaces within the facility fences and it is plausible that a small number of burrowing owls could occupy the completed TSF Project site.

The TSF Project would result in a loss of burrowing owl nesting and wintering habitat where arrays would be constructed, specifically causing displacement of several breeding pairs of burrowing owls and several wintering territories (Table 26).

The TSF Project would, however, result in a net increase in the amount of grassland habitat suitable for use by burrowing owls. Cropland habitat within the PSA is not

presently suitable for breeding or wintering burrowing owls. Conversion of cropland habitat to annual grassland would be a beneficial effect for burrowing owls.

TABLE 26. POTENTIAL IMPACTS TO BURROWING OWLS. Burrowing owl data from 2010 is provided for each Option.

| Proposed Project Option | Number of Active Nests in 2010 | Number of Nest Sites Potentially Affected | Wintering Burrows Present? | Wintering Burrows Potentially Affected? |
|---|---|---|---|---|
| Option A | 4 | 3 | Yes | Yes |
| Option B | 2 | 2 | Yes | Yes |

**B. Lark Sparrow**: The lark sparrow is on the CDFG Special Animal list with no California or Federal ESA listing status. It nests infrequently in low shrubs in grassland areas of the PSA. The TSF Project would result in a net increase of potential nesting habitat for lark sparrows by converting existing croplands to annual grasslands. The net increase in available nesting habitat would be a long-term beneficial effect for lark sparrows. Construction activities could result in direct adverse effects to nesting lark sparrows if conducted during the nesting season. Implementation of minimization and mitigation measures can off-set potential direct adverse effects of the TSF Project on nesting lark sparrows.

**C. Grasshopper Sparrow:** The grasshopper sparrow is a California Species of Special Concern that likely nests within grassland areas of the PSA where taller grasses are present. Nesting was not confirmed within the PSA in 2010, however a singing male was detected in Section 16, an area shared by both project Options. The TSF Project could result in direct adverse effects to nesting grasshopper sparrows, but would likely result in long-term beneficial effect by converting existing croplands to annual grasslands.

Direct impacts to grasshopper sparrows, such as loss of individuals or occupied nests, can be reduced by implementing pre-construction surveys, monitoring, and nest setbacks.

**D. Loggerhead Shrike:** The loggerhead shrike is a Species of Special Concern that nests within the PSA. A nest with several fledglings was found in Section 15 in 2009 (an area no longer within the PSA), and in 2010 two shrike pairs nested within the PSA, one in Option A and one in Option B. All nests were located in landscape plantings in anthropogenic habitat areas. The TSF Project could result in loss of potential nesting habitat and direct impacts to nesting shrikes by removal of landscape plantings. Options A and B Project layouts would not affect landscape vegetation in the two areas where nests were detected in 2010.

Potential adverse impacts to individual birds or occupied nests can be avoided by implementing pre-construction surveys, monitoring, and nest setbacks.

**E. Golden Eagle**: Golden eagles forage within the PSA throughout the year. They hunt wherever prey is present, including both croplands and annual grasslands. There are no golden eagle nests, either active or inactive, within the PSA (Latta 2010). The TSF Project would result in a net loss of golden eagle foraging habitat for the life of the project. Loss of foraging habitat is the primary potential adverse effect of the TSF Project on golden eagles. We expect that most of the approximately 4,100-acre TSF Project facility would no longer be usable by golden eagles. It is possible that golden eagles could hunt effectively in larger open spaces within the facility such as proposed drainage setbacks. The approximately 4,100-acre TSF Project represents a very small fraction (less than 1%) of the over 500,000 acres of potential foraging habitat in the Carrizo Plain region. Displacement of the golden eagle from foraging habitat would have a negligible adverse effect on the few individual eagles that utilize the site for foraging.

There is no compelling reason to expect that Project construction activities might potentially result in take or disturbance of golden eagles under the Bald and Golden Eagle Protection Act. There is ample suitable foraging habitat and prey in the vicinity that golden eagles would be expected to simply move to other foraging areas when construction activities are in progress. Accordingly, the Project is not expected to cause injury to golden eagles or any nest abandonment or any substantial interference with breeding, feeding or sheltering behavior.

**F. California Condor**: The California condor is a federally-listed endangered species that is not presently known to inhabit the Carrizo Plain, but it could be an occasional visitor during travels from the Central Valley foothills, the Pinnacles, the Sespe Wilderness in Santa Barbara and Ventura Counties and the Ventana Wilderness in Monterey County. In California, the condor presently ranges over approximately 9,500 square miles of land extending in a wishbone shaped area from Los Angeles northwest through the Coast Ranges to Monterey and San Benito Counties, and northeast through the Tehachapi Mountains east of Bakersfield into southern Fresno County. Over 600,000 acres of land is designated as critical habitat. The 9,700-acre PSA, which is not within a designated critical habitat area, accounts for approximately one tenth of one percent of the total range of the California condor.

Construction and subsequent operation of the 4,100-acre TSF Project would be extremely unlikely to adversely affect the California condor. No carcasses would be present within the TSF Project perimeter fencing that would attract condors to the site. Condors are known to ingest small metal and plastic trash. The Project construction, operation and maintenance procedures include regular trash clean-up and removal of small metal objects such as nuts and bolts. Site clean-up protocols would eliminate small trash items in the very unlikely event that a condor would land within the TSF Project.

The TSF Project would have some medium-voltage collection system lines that would be designed with established avian protection measures so as to not present a danger for electrocution or collision by condors or raptors.

The Carrizo Plain is not presently occupied by any condors. The TSF Project is not within a designated critical habitat area for condors. The change of use on up to approximately 4,100 acres of farming and grazing land would be a discountable effect to California condor, particularly with approximately 250,000 acres of suitable habitat within the Carrizo Plain National Monument and another 12,570 acres of critical habitat located in the region.

**G. Mountain Plover**: Mountain plovers were observed within the PSA on three occasions in winter 2010, with a maximum of 17 birds observed at one time. Mountain plovers do not nest in the Carrizo Plain region. The TSF Project would remove potential winter foraging habitat for mountain plovers. The loss of potential winter foraging habitat would be a negligible adverse effect on the species that could be offset by preservation of suitable off-site habitat (refer to Section 11.4.2).

**H. Bald Eagle**: The bald eagle is a Fully Protected and California state-listed endangered species that is known to periodically forage in the Carrizo Plain, primarily during the winter (non-breeding) months. It is not a listed species under FESA, although it is protected by the BGEPA. An adult bald eagle was observed along Bitterwater Road adjacent to the PSA in February 2009, and a sub-adult bald eagle was observed feeding in cropland habitat within Section 33 in February 2010. There is no suitable breeding habitat in the region.

Bald eagles are becoming more common and widespread in San Luis Obispo County with the effective reintroduction program conducted by the Ventana Wildlife Society. In winter, bald eagles are regularly observed in San Luis Obispo County from the coastal beaches to inland valleys. The closest nesting location to the TSF Project is most likely at Santa Margarita Lake, approximately 25 miles west.

The PSA is low quality foraging habitat for bald eagles. The change of use on up to approximately 4,100 acres of farming and grazing land would have a negligible effect to the bald eagle. The TSF Project would have some medium-voltage collection system lines that would be designed to not present a danger for electrocution or collision by raptors. The Project also would not take or disturb bald eagles for the reasons set forth above for golden eagles.

**I. Other Special Status Birds**: The mountain plover, merlin, ferruginous hawk, northern harrier, Oregon vesper sparrow, tri-colored blackbird, and long-billed curlew are special status species that winter in the Carrizo Plain and were detected foraging within the PSA. Mountain plovers, ferruginous hawks, northern harriers, and long-billed curlews prefer wide-open spaces with short vegetation and are not expected to forage within the completed TSF Project. Vesper sparrows, which prefer open habitats with scattered shrubs, may find limited suitable wintering habitat within the TSF Project. The TSF Project would result in a net loss of wintering habitat for these species. Because of the large amount of remaining habitat in the region, displacement of wintering special status bird species would be a minor adverse impact.

### *10.4.3 Special status small mammals*

The PSA is potential habitat for six special status rodents known to be present in the Carrizo Plain region, including one federally-listed species and one state-listed species. Four small mammal trapping studies and intensive field surveys conducted within the PSA determined that no small mammals are present that are listed under FESA or CESA. Results of 2010 surveys for giant kangaroo rat and Nelson's antelope squirrel have been completed, and neither species is present. Two special status species, the Tulare grasshopper mouse and the McKittrick pocket mouse, were detected within the PSA.

Construction of the TSF Project and associated roads and infrastructure could result in minor adverse impacts to the Tulare grasshopper mouse and the McKittrick pocket mouse. Potential minor adverse impacts to Tulare grasshopper mouse and McKittrick pocket mouse would have a negligible effect on the local populations of these species (refer to Section 11.4.3).

Current farming practices of tilling and poisoning are detrimental to most small mammal populations within the PSA. Pocket mice and grasshopper mice persist in marginal areas of grassland habitat adjacent to open non-farmed areas. Conversion of croplands within the PSA to a passive solar facility, the TSF Project, could increase the habitat quality for special status small mammals, resulting in a positive effect to these species.

### *10.4.4 Special status reptiles and amphibians*

One special status reptile, the San Joaquin whipsnake, was detected within the PSA during our surveys. This snake was detected by its shed skin in the northeast corner of Section 28, an area shared by both project Options.

Results of the 2010 blunt-nosed leopard lizard protocol survey will be completed by September 2010; as of July 15 two full 17-pass protocol surveys (2008 and 2009) and a 12-pass adult survey in 2010 were negative for BNLL. Species of Special Concern such as the coast horned lizard are known from the region and could potentially enter the TSF Project site in the future but have not been found despite thousands of hours of field surveys.

The Western spadefoot toad is a Species of Special Concern that was detected at 14 breeding pools in 2010. Several of the breeding localities are surrounded by intensive dry-farmed agriculture that is very poor habitat for spadefoot toads during the dry season.

Construction of the TSF Project in areas potentially inhabited by aestivating spadefoot toads could result in loss of some individuals. The TSF Project could have a beneficial effect on the local population of Western spadefoot toads by eliminating farming and returning the uplands to untilled annual grassland habitat.

Current farming practices are detrimental to most reptile populations within the PSA. Very few of even the most common species, side-blotched lizard and gopher snake, were observed. Conversion of farmland to a passive solar facility may increase the habitat quality for special status reptiles, resulting in a positive effect to these species.

Construction activities associated with the TSF Project potentially could result in adverse impacts on special status reptiles and amphibians if appropriate pre-construction surveys are not implemented. Pre-construction surveys would reduce the potential for such

impacts. Where potential aquatic breeding habitat would be affected, replacement of habitat on-site would offset potential adverse effects (refer to Section 11.4.4).

### *10.4.5 Special status fairy shrimp*

Two species of fairy shrimp were identified in the PSA that are federally-listed: Longhorn fairy shrimp and vernal pool fairy shrimp. The TSF Project would avoid all occurrences of these federally listed fairy shrimp. Protection measures would be implemented as part of the APM's (refer to Section 9.2) to ensure TSF Project construction, operation and subsequent maintenance activities do not result in adverse impacts to listed fairy shrimp or their habitat (refer to Section 11.4.5). The TSF Project would not adversely affect listed fairy shrimp.

### *10.4.6 American badger*

The American badger, a California Species of Special Concern, is a resident within the PSA. We observed badgers at numerous locations within the PSA, including den sites and foraging areas. They are generally uncommon and wide-ranging, but due to their foraging behaviors we observed badger sign in many areas of the PSA.

Construction of the proposed TSF Project would permanently displace badgers from the up to approximately 4,100-acre Project site. Displacement of badgers from the project site would be mitigated concomitantly with kit fox mitigation land acquisition.

Loss of badgers could occur during construction phases. Implementation of appropriate pre-construction surveys would reduce the potential for loss during construction.

Significant adverse impacts to badgers after completion of Project construction would be very unlikely. Refer to Section 11.4.6 for recommendations and mitigations specific to the American badger.

### *10.4.7 San Joaquin kit fox*

The San Joaquin kit fox, a federally listed endangered species, occurs within the PSA. A separate document, the Topaz Solar Farm San Joaquin Kit Fox Mitigation and Monitoring Plan (Althouse and Meade, Inc. 2010c) specifically addresses potential project effects and mitigation strategies for this species.

### *10.4.8 Tule elk and pronghorn antelope*

**A. Effects of Displacement on Tule Elk and Pronghorn**

Certain tule elk and pronghorn antelope groups that are part of the greater Carrizo Plain region herds utilize habitats within the PSA. These herds are non-migratory, but some animals do make small seasonal movements to exploit regional food and water resources. The PSA is utilized by both pronghorn and elk, primarily as spring and summer foraging habitat where the land is plowed and left fallow encouraging growth of bindweed, a preferred late season forage plant.

Elk forage and calve in the northern parcels within the PSA (Sections 7, 8, 17 and 18), an area approximately 1,795 acres (refer to BR Map 3, Section 13.0). This area consists of 110 acres of annual grasslands and 1,685 acres of active croplands. Elk do

not utilize any other areas of the PSA, as documented by our field observations and CDFG radio-collar data. Elk are present within the PSA primarily during the spring and summer months, although they can be present at any time of the year. The local elk herd consists of approximately 80 individuals that are present in the late spring and summer during the calving season. At other times of the year, particularly winter months, elk observed within the PSA are within small groups (typically young males) consisting of approximately 8 to 15 individuals. Option A would not displace elk from their currently used foraging habitat within the PSA, as defined above. Option B would permanently displace approximately 80 elk from 1,215 acres of foraging habitat within the PSA. Displacement area is calculated as the acreage of the PSA that would have perimeter exclusion fencing within the identified elk range.

Pronghorn forage in all areas of the PSA except Sections 15, 16, 21 and 22, as documented by our field observations and CDFG aerial survey data (refer to BR Map 4, Section 13.0). The total area of foraging habitat within the PSA that we documented as being in use between 2008 and 2010 is approximately 8,085 acres. This area consists of approximately 1,900 acres of grasslands and 6,185 acres of croplands. The pronghorn that forage within the PSA are considered a single group, with multiple groups within the region that comprise the total population in the Carrizo Plain (CDFG 2008a). Our observations suggest this group is comprised of a maximum of 19 adult and subadult pronghorn. From May through July 2010 a single adult male was present in Sections 7 and 18 with up to six females and six fawns. Option A would permanently displace the local pronghorn group consisting of up to 19 individuals from approximately 3,672 acres of foraging habitat within the PSA. Option B would permanently displace the local pronghorn group consisting of up to 19 individuals from approximately 3,062 acres of foraging habitat within the PSA. Displacement area is calculated as the acreage of the PSA that would have perimeter exclusion fencing within the identified pronghorn range.

Displacement from foraging habitat could result in adverse effects on the local tule elk herd and a local pronghorn group. Recommendations to minimize potential adverse effects of the TSF Project on tule elk and pronghorn are provided in Section 11.4.8.

### B. Movement Patterns

A wildlife movement corridor is an area of land that primarily functions to connect significant habitat areas (Bond 2003). Although mammal populations in the Carrizo Plain region do not migrate, movement and connection to other populations is still important. Movement corridors are generally considered on a regional scale, whereby land managers designate and attempt to protect swaths of land potentially suitable for facilitating wildlife movements between core habitat areas. Designating and protecting wildlife movement corridors responds to habitat fragmentation in landscapes where wildlife movements are constrained by surrounding land uses.

The PSA is situated north of California Valley with the Temblor Range to the east and the San Juan Creek drainage and Caliente Range to the west. Historically, herds of pronghorn antelope and tule elk roamed throughout the region. These animals may have moved into, and out of, the Carrizo Plain to access seasonal foraging areas.

Their movements were largely unrestricted and were probably very opportunistic through suitable habitat patches.

Potential wildlife linkages to the San Joaquin Valley from north of Carrizo Plain, such as Antelope Valley and Bitterwater Valley, are still largely viable. Such movements are not undertaken by the reintroduced herds of tule elk and pronghorn antelope that are present in the Carrizo Plain region. However, elk and antelope may move north out of the Carrizo Plain, along the San Andreas Rift Zone in the Temblor Range as far north as Cholame Valley.

The northern California Valley tule elk herd roams foothills of the Temblor Range east of the PSA, utilizing croplands at the north end of the PSA seasonally (refer to BR Map 3 in Section 13.0). Tule elk do not move through the PSA to access core habitat areas, as evidenced by the lack of observations in the middle and southern areas of the PSA. The northern California Valley pronghorn group regularly moves through the PSA while foraging. Movements through the PSA, however, are negatively affected by current fencing locations and paved roads (refer to BR Map 14, Section 13.0).

The proposed project would reduce the amount of open land available to some wildlife species for long-range movements into and out of the northern Carrizo Plain. The project would affect up to approximately 4,100 acres of mostly flat bottomlands, which is the preferred movement area for pronghorn. However, applicant proposed measures would provide passage through the TSF Project for pronghorn and other species (refer to Section 9.2).

Pronghorn could still cross Bitterwater Road to access farm fields to the west, or utilize hilly terrain east of the PSA where pronghorn and elk commonly move through the area. Ungulates moving around or through the PSA could access the San Andreas Rift Zone to the east, the San Juan Creek watershed to the west, and the Bitterwater Valley area to the north.

The TSF Project proposes to incorporate broad wildlife movement corridors along primary ephemeral drainages and along the east side of Bitterwater Road that would facilitate ungulate movements through the Project to encourage regional dispersal between the Carrizo Plain National Monument and lands to the north.

The proposed TSF Project would have a negligible effect on the ability for tule elk to disperse north out of the Carrizo Plain because this species is able to move through foothill and mountain regions. Elk do not move south through the PSA to cross Highway 58, so long-range movements to the south would not be affected. Movement corridors through the proposed TSF Project, and other enhancements such as alteration or removal of existing fencing, could provide movement opportunities for pronghorn through and around the TSF Project. Recommendations to minimize potential adverse effects of the TSF Project on tule elk and pronghorn are provided in Section 11.4.8.

# 11.0 Recommendations and Mitigations

Sensitive biological resources are present within the PSA, including endangered species and their habitat. Applicant Proposed Measures (APM's) outlined in Section 9.2 are design features of the proposed TSF Project that would benefit biological resources, or reduce the effect of the Project on biological resources. This section provides additional recommendations and mitigations to reduce the effect of the Project on biological resources. Where potentially adverse impacts to biological resources could occur during construction and operation of the Project, or due to the presence of the Project, we provide biological resource (BR) mitigation measures designed to offset the effect.

## 11.1 Habitats

The proposed TSF Project would affect existing habitat types within the PSA. The TSF Project would primarily affect California annual grassland and cropland habitat types. Of these, California annual grassland has higher functions and values for wildlife. Croplands within the PSA have very low diversity of native species, and provide limited essential resources to most wildlife. In addition, the croplands are dangerous to most wildlife species due to heavy equipment activities and presence of poisons. Conversion of active croplands to untilled passive uses would likely increase native species diversity as well as potential functions and values for wildlife. We provide the following recommendations to avoid, minimize and/or mitigate potential Project effects on higher quality habitat within the PSA.

### *11.1.1 California annual grassland*

Loss of California annual grassland habitat usually does not require mitigation except where it affects special status species or important wildlife populations. Section 11.4 provides mitigation recommendations for potential impacts to special status species and important wildlife populations and their habitat.

Both Project Options would purchase and permanently conserve land surrounding the fenced array areas, resulting in a net increase of grassland habitat. Vegetation between and beneath panels is likely to recover after installation and be dominated by California annual grasses. Management strategies that maintain appropriate grass height and residual dry matter could result in usable habitat for a variety of species.

- We recommend development of a vegetation management plan that would specify grazing standards, residual vegetation quantities, and land management practices compatible with facility management and wildlife use.

### *11.1.2 Cropland*

The loss of cropland habitat within the PSA does not require mitigation, except where special status species are affected.

Cropland habitat within the PSA is habitat for tule elk and pronghorn antelope. Section 11.4.8 addresses mitigation recommendations for the loss of pronghorn antelope and tule elk habitat.

### *11.1.3 Vernal pool*

Applicant Proposed Measures to benefit biological resources at the proposed TSF Project site include avoidance of vernal pool habitat and establishment of a minimum 50-foot buffer around all vernal pools (refer to Section 9.2). We expect avoidance and establishment of the proposed buffer would protect vernal pools from potential adverse effects for the life of the TSF Project. Vernal pool management measures should be included in a vegetation management plan (refer to Section 10.1.1).

- We recommend vernal pools be protected during construction by installation of orange fencing placed at the setback boundary between the vernal pool and project areas. Note that the setback for vernal pools that contain listed fairy shrimp is 250 feet.

### *11.1.4 Ephemeral wetland depression*

The Project would avoid ephemeral wetland depressions; therefore, no mitigation is required.

The APM to establish a minimum 25-foot setback from ephemeral wetland depressions would sufficiently reduce the potential for the TSF Project to result in adverse impacts to ephemeral wetland depressions.

- We recommend ephemeral wetland depressions be protected during construction by installation of orange fencing placed at the setback boundary between the ephemeral wetland depression and project areas. Note that the setback for ephemeral wetland depressions that contain listed fairy shrimp is 250 feet.

### *11.1.5 Natural non-wetland pool*

Natural non-wetland pools within the PSA, in general, have a low biological significance. Natural non-wetland pools that contain listed fairy shrimp or are identified as potential habitat for listed fairy shrimp would be protected with a 250-foot setback (refer to Sections 9.2 and 10.1.5).

The TSF Project could have a negligible adverse impact on the remaining natural non-wetland pools within the PSA.

- We recommend ephemeral wetland depressions be protected during construction by installation of orange fencing placed at the setback boundary between the ephemeral wetland depression and project areas. Note that the setback for natural non-wetland pools that contain listed fairy shrimp is 250 feet.

### *11.1.6 Anthropogenic non-wetland pool*

Adverse effects to anthropogenic non-wetland pools within the PSA would have a negligible adverse impact to biological resources; no mitigation is required for impacts to anthropogenic non-wetland pools.

### *11.1.7 Agricultural reservoir*

Mitigation would not be required for the loss of man-made aquatic habitat in agricultural reservoirs within the PSA. However, two of the agricultural reservoirs support breeding Western spadefoot toads, a California Species of Special Concern. The loss of these

habitat areas would result in adverse effects on Western spadefoot toads. Mitigation recommendations are provided in Section 11.4.4 that specifically address potential adverse effects of the TSF Project on Western spadefoot toads.

### *11.1.8 Anthropogenic*

No mitigation is specifically required for the loss of anthropogenic habitat within the PSA.

Mitigation recommendations are provided in Section 11.4 that address potential adverse effects of habitat removal on special status species and nesting birds.

## 11.2 Ephemeral Drainages

Ephemeral drainages and swales that are not within the jurisdiction of the USACE, CDFG, or RWQCB do not require mitigation for adverse effects that could occur from the proposed TSF Project.

Project impacts to jurisdictional drainages will be addressed in a separate document prepared by Huffman-Broadway Group, Inc. that will conform to the current mitigation standards of the USACE.

## 11.3 Nesting Birds

Migratory non-game native bird species are protected by international treaty under the Federal Migratory Bird Treaty Act (MBTA) of 1918 (50 C.F.R. Section 10.13). Sections 3503, 3503.5 and 3513 of the California Fish and Game Code prohibit take (as defined therein) of all native birds and their active nests, including raptors and other migratory non-game birds (as listed under the Federal MBTA).

**BR-1.** Within one week of ground disturbance activities, if work occurs between March 15 and August 15, nesting bird survey**s** shall be conducted**.** If surveys do not locate nesting birds, construction activities may be conducted. If nesting birds are located, no construction activities shall occur within 100 feet of nests until chicks are fledged. A pre-construction survey report shall be submitted to the lead agency immediately upon completion of the survey. The report shall detail appropriate fencing or flagging of the buffer zone and make recommendations on additional monitoring requirements**.** A map of the Project site and nest locations shall be included with the report. The TSF Project biologist conducting the nesting survey shall have the authority to reduce or increase the recommended buffer depending upon site conditions.

## 11.4 Avoidance, Minimization, and Mitigation for Special Status Species

### *11.4.1 Special status plants*

The proposed TSF Project could result in negligible temporary adverse effects to special status plants within both Project Options during construction. We expect that the overall affect of Option A or Option B would be beneficial for special status plant populations that occur within and near the PSA. This is due to the net gain in annual grassland habitat by conversion of croplands to grasslands.

The following recommendations are provided to reduce potential direct adverse effects of the TSF Project on special status plants:

- Special status plant occurrences within 100 feet of proposed project facilities should be protected with orange construction fencing placed between the occurrence and construction activities.
- Temporary access roads required during construction should be planned to avoid special status plant occurrences.
- Construction should be timed to avoid occurrences of special status plants in bloom, where practicable.
- Where special status plants would likely be removed during construction, seeds should be collected for distribution after construction is complete.

*11.4.2 Special status birds*

**A. Lark Sparrow, grasshopper sparrow, and loggerhead shrike**: In order to reduce the potential for disturbance of nests of the lark sparrow, grasshopper sparrow, and loggerhead shrike, the applicant shall implement BR-1 one week prior to ground disturbance activities (refer to Section 11.3). If nests of these species are identified in the work area, the following additional mitigation measures shall be implemented:

**BR-2.** Occupied nests of special status bird species shall be mapped using GPS or survey equipment. Work shall not be allowed within the 100 foot buffer while the nest is in use. The buffer zone shall be delineated on the ground with orange construction fencing where it overlaps work areas

**BR-3.** Occupied nests of special status bird species that are within 100 feet of project work areas shall be monitored at least every two weeks through the nesting season to document nest success and check for project compliance with buffer zones. Once nests are deemed inactive and/or chicks have fledged and are no longer dependant on the nest, work may commence in these areas.

**B. Burrowing Owl**: Burrowing owl abundance and distribution within the PSA could vary from year to year. Option A would potentially affect three nesting territories occupied in 2010. Option B would potentially affect two nesting territories occupied in 2010.

Since kit fox and burrowing owl utilize similar habitat, lands designated for kit fox mitigation for the Project would likely be sufficient to offset potential adverse Project effects on burrowing owls. We recommend evaluating mitigation options for habitat loss for these species together.

In order to avoid adverse impacts to burrowing owls during construction of the TSF Project, BR-4 should be implemented. If burrowing owls are present in the work areas during the breeding season (February 1 through August 31), the burrows must be avoided and protected from impacts. Mitigation and protection procedures should incorporate recommendations outlined in the burrowing owl protocol survey

guidelines (California Burrowing Owl Consortium 1993). If burrowing owls are present during the non-breeding season, a passive relocation effort may be instituted.

**BR-4.** Pre-construction surveys for burrowing owls shall be conducted not more than 30 days prior to any work that affects previously undisturbed grassland habitat containing burrows. The pre-construction surveys shall be conducted in a manner sufficient to determine no burrowing owls are present in the work areas, including a 250 foot buffer surrounding the work areas. Pre-construction surveys shall be conducted throughout the year, when work is proposed, to account for breeding, wintering, and transient owls.

**C. California Condor**: Establishment of the Carrizo Plain National Monument in 2001 protected in perpetuity approximately 250,000 acres of land approximately six miles south of the PSA that is considered potential habitat for the California condor. Condors have not been observed at or near the PSA during our surveys of the site in 2008, 2009 and 2010. The loss of up to approximately 4,100 acres of potential foraging habitat is unlikely to adversely affect the species. No mitigation is recommended for loss of potential condor foraging habitat within the PSA.

*11.4.3 Special status small mammals*

Small mammal trapping studies and focused visual surveys conducted within the PSA determined that no federally-listed or state-listed small mammals are present. To reduce the potential for loss of other special status small mammal species, such as Tulare grasshopper mouse and McKittrick pocket mouse, the applicant should implement the following mitigation measure, as applicable:

**BR-5.** A biological monitor shall be present during construction activities in all areas identified as potential habitat for special status mammals that have not previously been disturbed by construction. The monitor shall be qualified to capture and relocate any special status species that are found during construction. The monitor shall have the authority to stop work, if special status species are encountered, for any duration necessary to capture and relocate the animals.

*11.4.4 Special status reptiles and amphibians*

San Joaquin whipsnake and coast horned lizard could potentially be present in project construction areas. Western spadefoot toads breed in several areas of the PSA, in Both Option A and Option B.

To protect Western spadefoot toad on the TSF Project site, we recommend avoidance of potential breeding habitat, monitoring ground disturbance activities near breeding pools to relocate disturbed spadefoot toads, and creation of breeding habitat if existing breeding habitat is removed.

The following mitigation measure shall be implemented to reduce potential direct adverse effects on special status reptiles and amphibians:

**BR-6.** Pre-construction surveys for the presence of San Joaquin whipsnake, coast horned lizard, and Western spadefoot toad shall be conducted, as applicable, prior to primary Project site preparation, grubbing and other construction activities that affect previously undisturbed grassland or ephemeral pool habitat. Walking visual surveys shall be conducted to locate and move special status reptile or amphibian species. . The surveys shall be conducted at appropriate times of day to locate the species, and shall be conducted as close as possible to the proposed start of work. If no special status species are found, construction activities may begin immediately. If special status species are found, a qualified biologist shall move them to the nearest safe location. At that time, the TSF Project biologist shall have the authority to recommend additional monitoring if it is determined that special status species could move onto the Project site during construction, or be forced out of underground burrows during grading. The TSF Project biologist shall have the authority to temporarily stop work if special status species are found in the Project areas during construction.

*11.4.5 Special status fairy shrimp*

Protocol level surveys for listed fairy shrimp are complete. Isolated populations of listed fairy shrimp occur within the PSA. The TSF Project would avoid all federally listed fairy shrimp occurrences by establishing 250-foot setbacks around pools in which the presence of listed fairy shrimp has been documented (refer to Section 9.2, and BR Map 10 in Section 13.0).

*11.4.6 American badger*

American badgers utilize habitats within the PSA. The TSF project would result in a net loss of badger habitat. Mitigation is not recommended for loss of badger habitat. To ensure that potential adverse impacts to live badgers does not occur, the following mitigation recommendation should be implemented:

**BR-7.** A pre-construction survey shall be conducted within thirty days of beginning construction work on a portion of the Project site to identify if badgers are present within the PSA. The results of the survey shall be sent to the Project manager and the lead agency.

If the pre-construction survey finds potential badger dens, they shall be inspected to determine whether they are occupied. The survey shall cover all Project areas included in the respective construction phase, and shall examine both old and new dens. If potential badger dens are too long to completely inspect from the entrance, a fiber optic scope shall be used to examine the den to the end. Inactive dens may be excavated by hand with a shovel to prevent re-use of dens during construction. If badgers are found in dens between February and July, nursing young may be present. To avoid disturbance and the possibility of direct loss of adults and nursing young, and to prevent badgers from becoming trapped in burrows during construction activity, no grading shall occur within 100 feet of active badger dens between February 1 and July 1. Between July 1 and February 1 all potential badger dens shall be inspected to determine if badgers are present. During the winter badgers do not truly

hibernate, but are inactive and asleep in their dens for several days at a time. Because they can be torpid during the winter, they are vulnerable to disturbances that may collapse their dens before they rouse and emerge. Therefore, surveys shall be conducted for badger dens throughout the year. If badger dens are found on the Project site during the pre-construction survey, and are not raising young, they may be encouraged to vacate the den by a qualified biologist. If measures such as partially blocking den entrances do not result in the badger moving, badgers may be live trapped and moved to safe locations.

### *11.4.7 San Joaquin kit fox*

The San Joaquin kit fox is known to occur within the PSA. Mitigation alternatives are discussed in detail in a separate document, the Topaz Solar Farm San Joaquin Kit Fox Mitigation and Monitoring Plan (Althouse and Meade, Inc. 2010c).

### *11.4.8 Tule elk and pronghorn antelope*

Tule elk and pronghorn antelope are managed by CDFG as game animals, and have been studied by local CDFG biologists. Herd population dynamics have been studied, as well as seasonal movement patterns. The CDFG considers the loss of summer forage and fawning habitat and any reduction of a movement corridor a significant adverse impact to tule elk and pronghorn antelope (CDFG 2008a).

Loss of cropland habitat within the PSA that is currently used by tule elk and pronghorn would have an adverse effect on these two species, but would be a habitat improvement for San Joaquin kit fox. Habitat improvements for endangered species should be given greater weight in decision making processes than benefits to game species. The following recommendations are provided as minimization measures to offset potential adverse effects of the TSF Project on tule elk and pronghorn.

- Wildlife movement corridors are proposed through the Project arrays. Proposed pathways are over one mile in width in places. Minimum pathway width is approximately 500 feet. Pronghorn and elk could move north and south through the pathways.
- Fencing at existing crossing sites along Highway 58 and fences within the pathways in the PSA would be eliminated or made antelope-friendly to facilitate passage. Movement pathways for this wide ranging and fleet species are also present east and west of the TSF Project site.
- If determined necessary, mitigation for loss of tule elk and pronghorn habitat would be accomplished through protection of land designated as mitigation for kit fox. Through this approach, if adopted, acreages of lands substantially greater than habitat used by pronghorn and elk within the proposed TSF Project areas could be protected as TSF Project mitigation for San Joaquin kit fox. Mitigation lands would provide beneficial habitat for both elk and pronghorn without reducing quality of habitat for kit fox.

# 12.0 PSA Figures

- **Figure 1. USGS Topographic Map**
- **Figure 2. Aerial Photograph**
- **Figure 3. USDA Soils Map**
- **Figure 4. CNDDB & FWS Critical Habitat Map**
- **Figure 5. Land Use History**

**Figure 1: USGS Topographic Map**

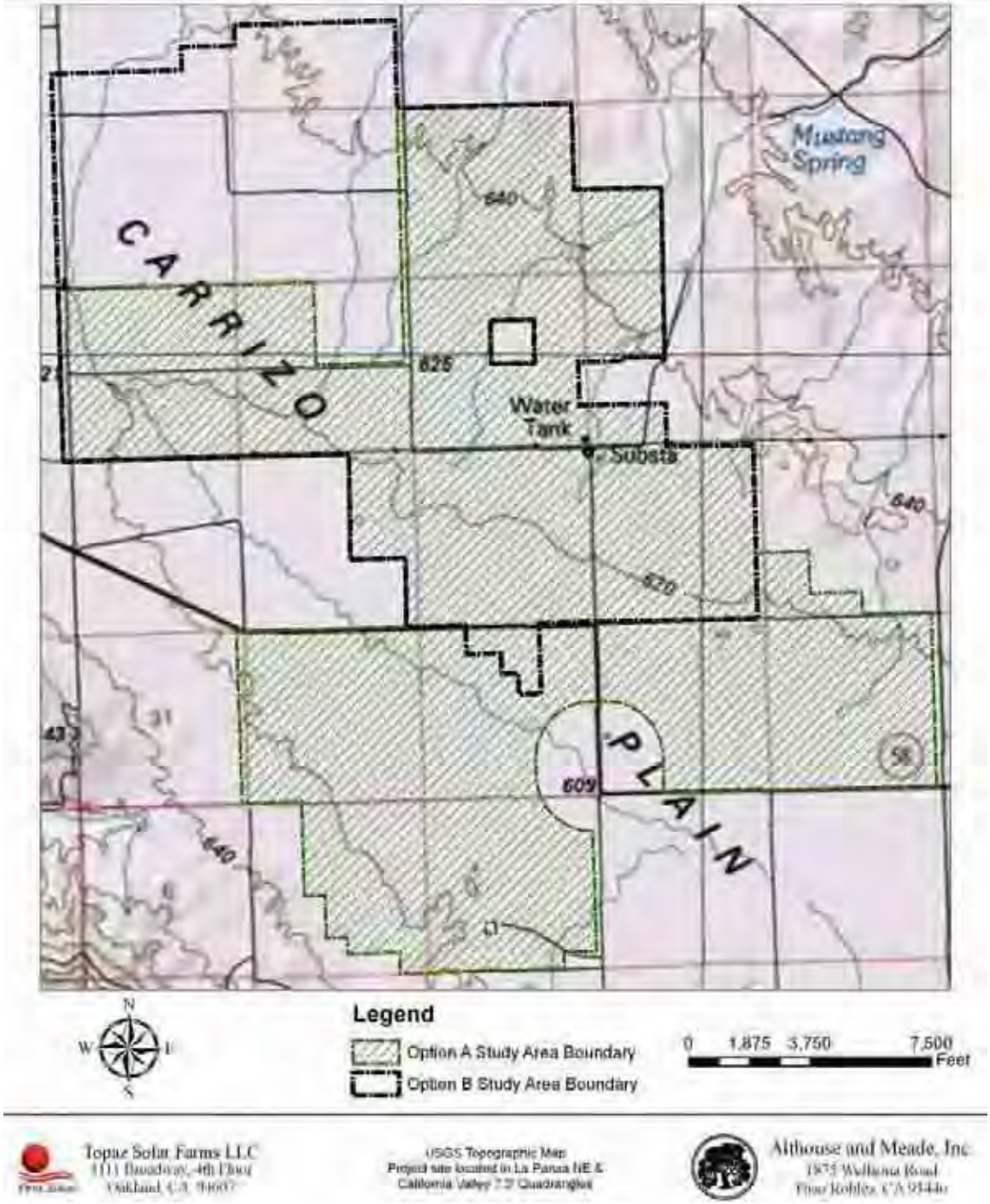



FIGURE 1. USGS TOPOGRAPHIC MAP. The approximately 9,700 acre PSA is located on all or portions of Township 29 South, Range 18 East, Sections 7, 8, 15, 16, 17, 18, 19, 20, 21, 22, 16, 27, 28, 29, 32, 33, 34, 35 and Sections 4 and 5 of Township 30 South, Range 18 East.

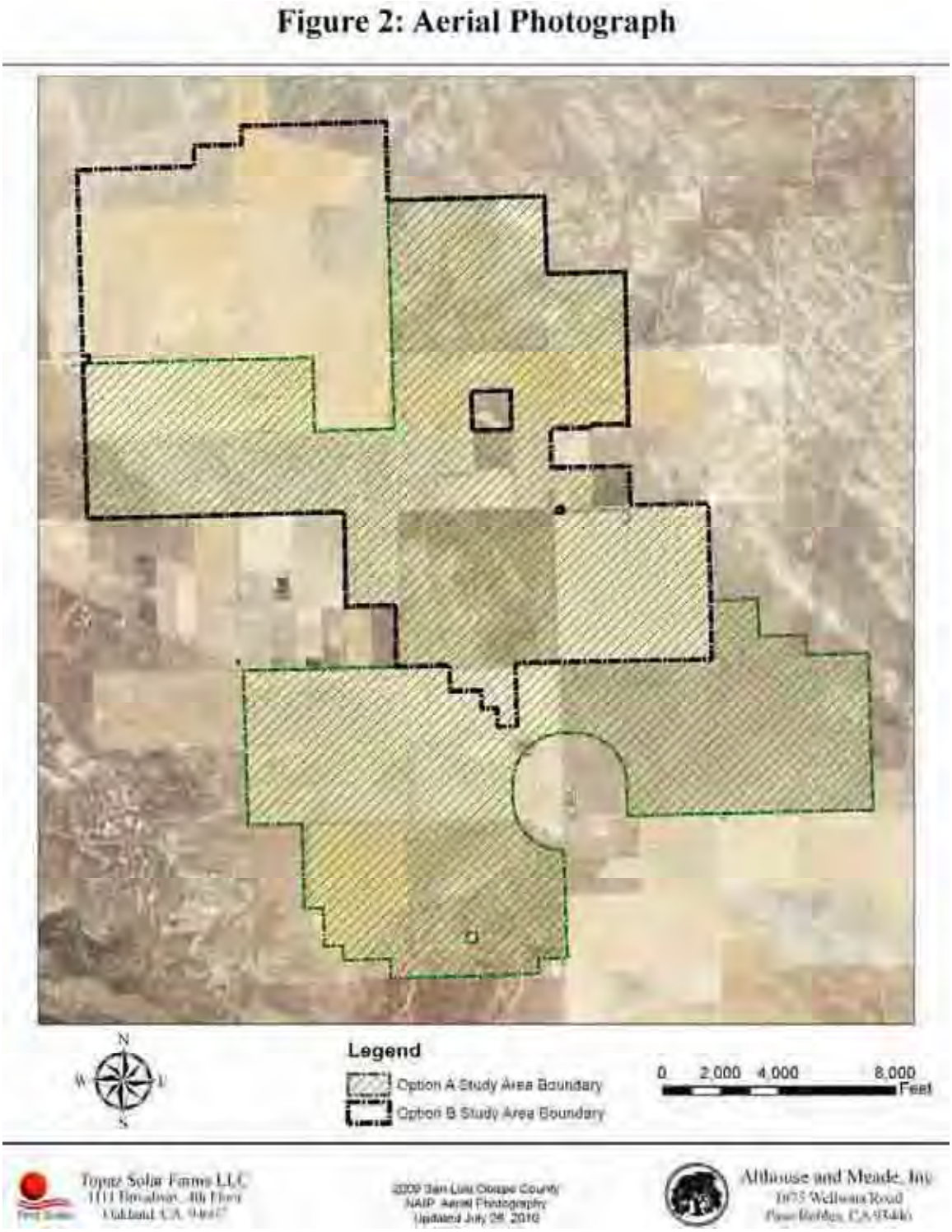



FIGURE 2. AERIAL PHOTOGRAPH. The approximate boundaries of the Option A Option and Option B are indicated on a 2009 aerial photograph.

**Figure 3: USDA Soils Map**

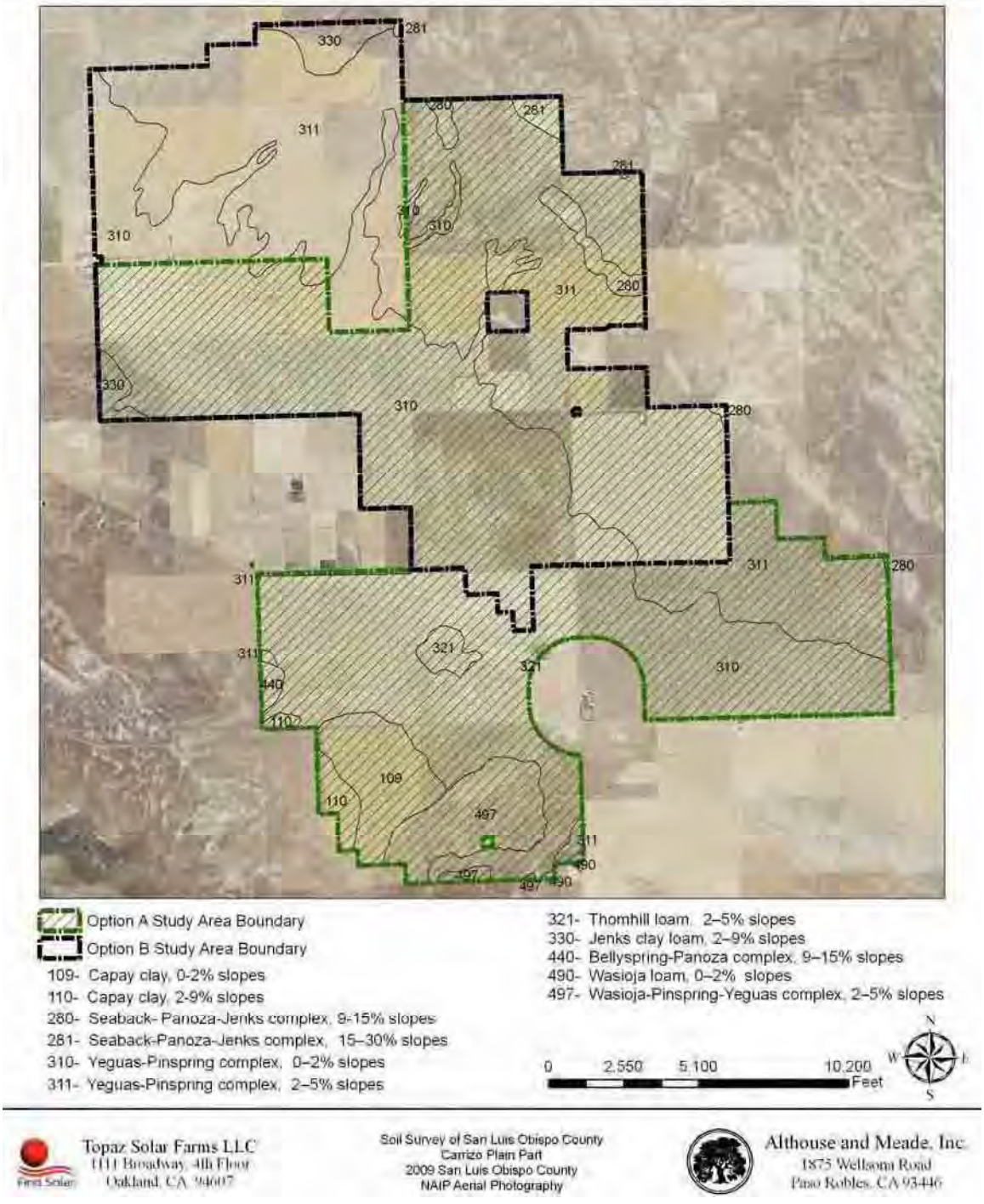



FIGURE 3. USDA SOILS MAP. The approximate boundaries of PSA are outlined in red on the USDA Soil Survey of San Luis Obispo County, California, Carrizo Plain Area (2003) map.

**Figure 4: CNDDB & FWS Critical Habitat Map**

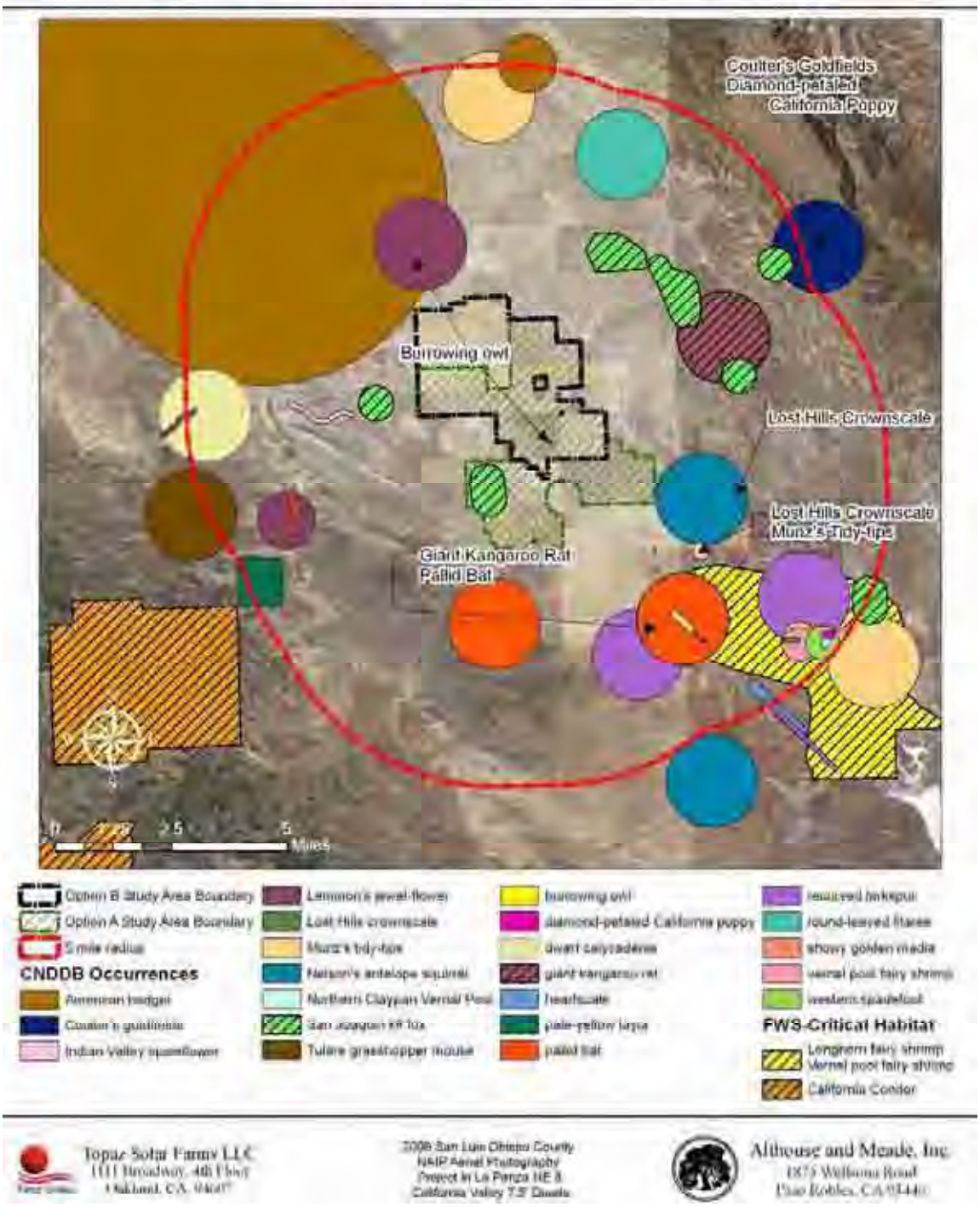



FIGURE 4. CNDDB/FWS GIS MAP. The current GIS data from the CNDDB for special status species mapped in the vicinity of PSA is depicted on a 2009 aerial photograph. The approximate boundaries of each Project Option are indicated, and a five-mile radius around the PSA perimeter is indicated by the dashed red line.

**Figure 5: Land Use History**

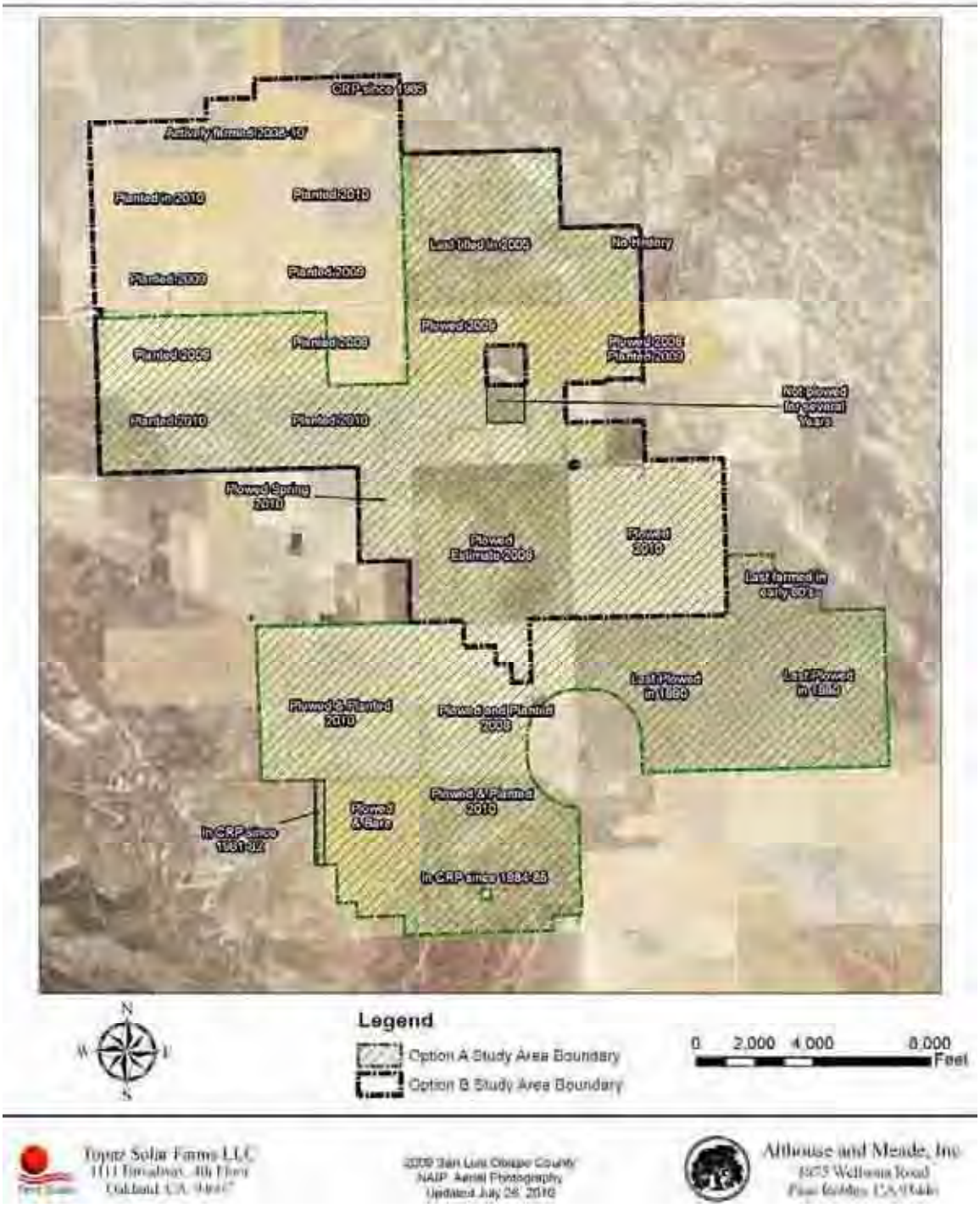
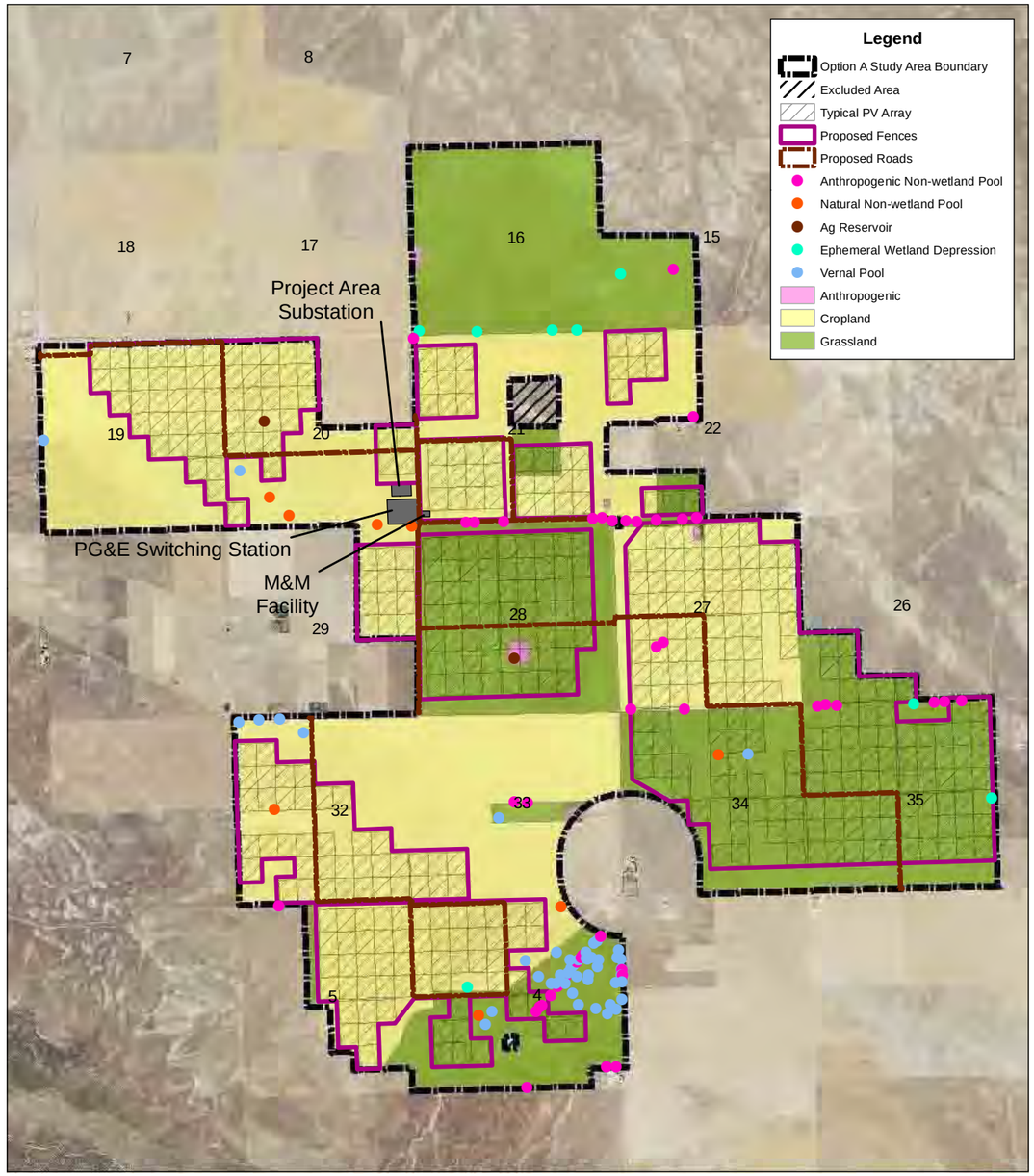



FIGURE 5. LAND USE HISTORY. Agricultural land use history is provided for all Sections within the PSA.

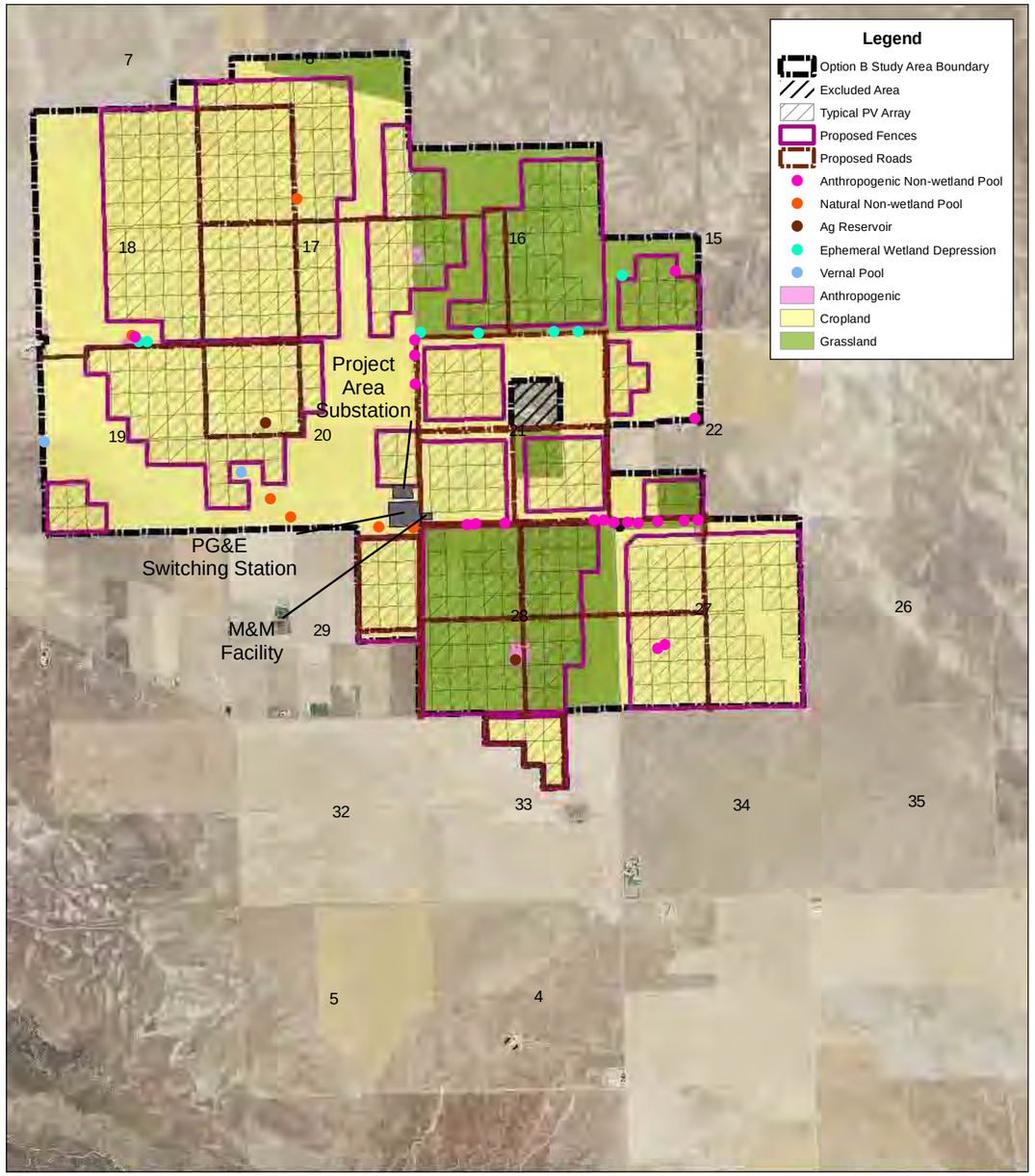
# 13.0 Biological Resource Maps

- **BR Map 1. Topaz Solar Farm Habitat Map**
- **BR Map 2-Option A. San Joaquin Kit Fox Genetic Results**
- **BR Map 2-Option B. San Joaquin Kit Fox Genetic Results**
- **BR Map 3. CDFG Tule Elk Radio Collar Data**
- **BR Map 4. CDFG Pronghorn Antelope Aerial Survey Data**
- **BR Map 5. Special Status Mammal Detections**
- **BR Map 6. BNLL and NEAS Survey Areas 2007-2010**
- **BR Map 7. Western Spadefoot Toad Breeding Pools**
- **BR Map 8. Special Status Wintering Birds**
- **BR Map 9. Burrowing Owl Map**
- **BR Map 10. Listed Vernal Pool Branchiopod Localities**
- **BR Map 11. Golden Eagle Aerial Nest Survey Results**
- **BR Map 12. Special Status Plants Map**
- **BR Map 13. Pronghorn Movement**
- **BR Map 14. San Joaquin Kit Fox Active Den Territories**

# BR Map 1. Topaz Solar Farm Habitat Map




## Option A




## Option B





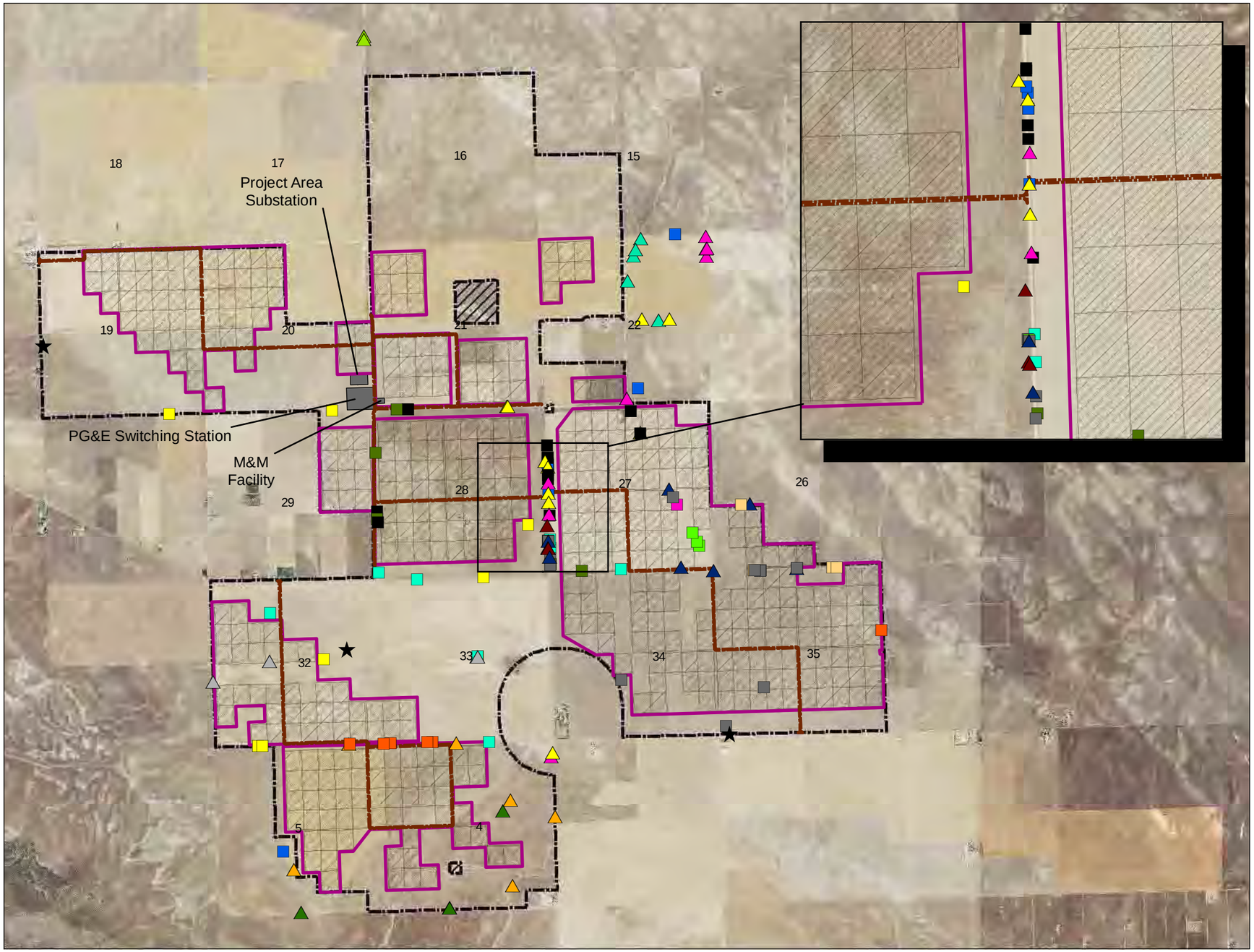



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Map Updated July 29, 2010


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# BR Map 2-Option A. San Joaquin Kit Fox Genetic Results




## Legend

- Option A Study Area Boundary
- Excluded Area
- Typical PV Array
- Proposed Fences
- Proposed Roads
- Red Fox

| Map Symbol | Sex | SJKF Individual | Number of Detections |
|---|---|---|---|
| | Male | 2 | 8 |
| | Male | 3 | 14 |
| | Male | 7 | 6 |
| | Male | 8 | 4 |
| | Male | 9 | 6 |
| | Male | 13 | 4 |
| | Male | 14 | 8 |
| | Male | 15 | 1 |
| | Male | 17 | 7 |
| | Male | 19 | 13 |
| | Female | 1 | 4 |
| | Female | 4 | 3 |
| | Female | 5 | 6 |
| | Female | 6 | 2 |
| | Female | 10 | 4 |
| | Female | 11 | 5 |
| | Female | 12 | 7 |
| | Female | 16 | 8 |
| | Female | 18 | 10 |

*Scat collection locations from Smith 2010*
*Genetic results from Henry and Maldonado 2010*

N W E S

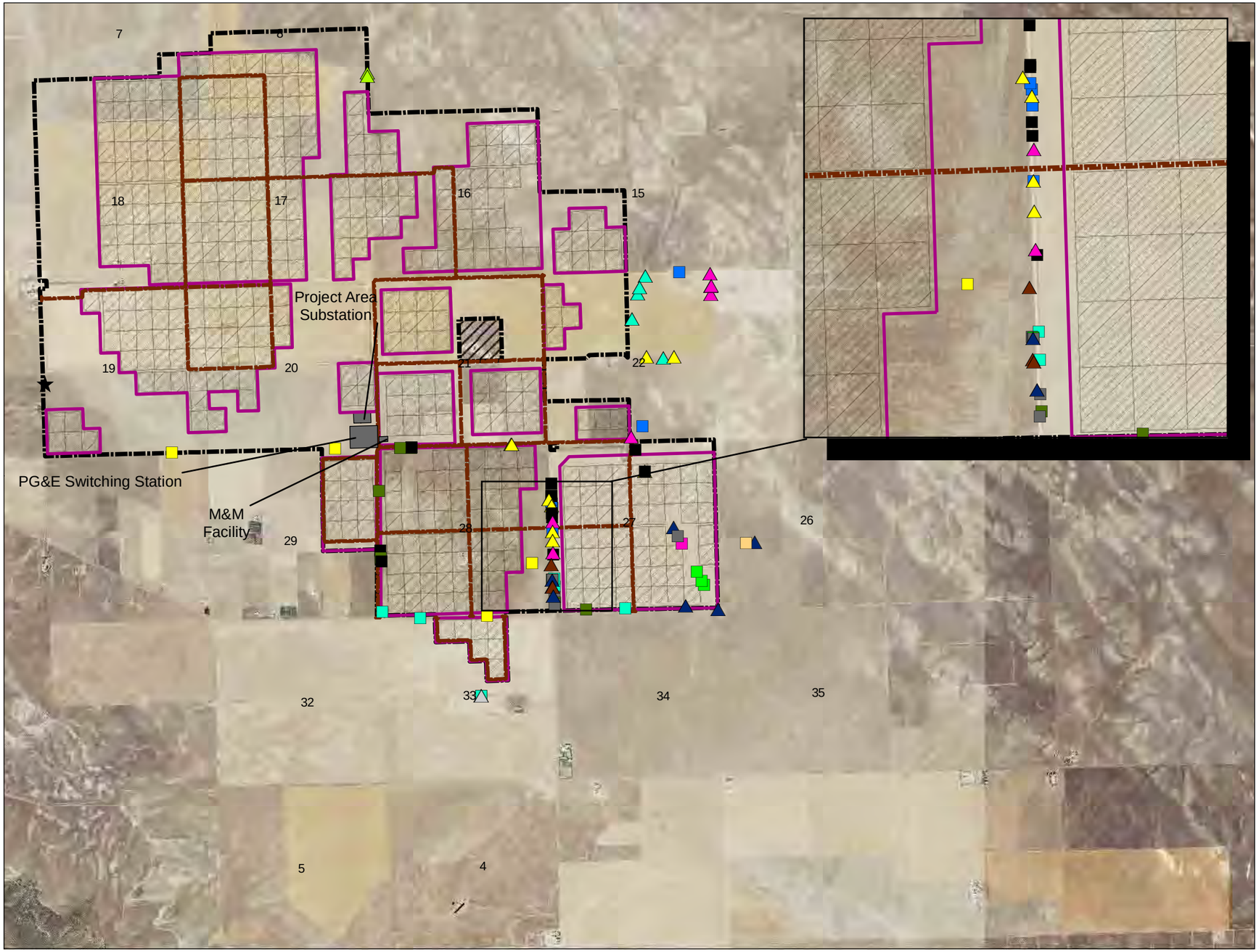
0 0.25 0.5 1 Mile


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# BR Map 2-Option B. San Joaquin Kit Fox Genetic Results




## Legend

- Option B Study Area Boundary
- Excluded Area
- Typical PV Array
- Proposed Fences
- Proposed Roads
- ★ Red Fox

| Map Symbol | Sex | SJKF Individual | Number of Detections |
|---|---|---|---|
| | Male | 2 | 5 |
| | Male | 3 | 6 |
| | Male | 8 | 1 |
| | Male | 9 | 6 |
| | Male | 13 | 4 |
| | Male | 14 | 6 |
| | Male | 15 | 1 |
| | Male | 17 | 6 |
| | Male | 19 | 13 |
| | Female | 1 | 2 |
| | Female | 4 | 3 |
| | Female | 6 | 2 |
| | Female | 11 | 5 |
| | Female | 12 | 6 |
| | Female | 16 | 7 |
| | Female | 18 | 9 |

*Scat collection locations from Smith 2010*
*Genetic results from Henry and Maldonado 2010*

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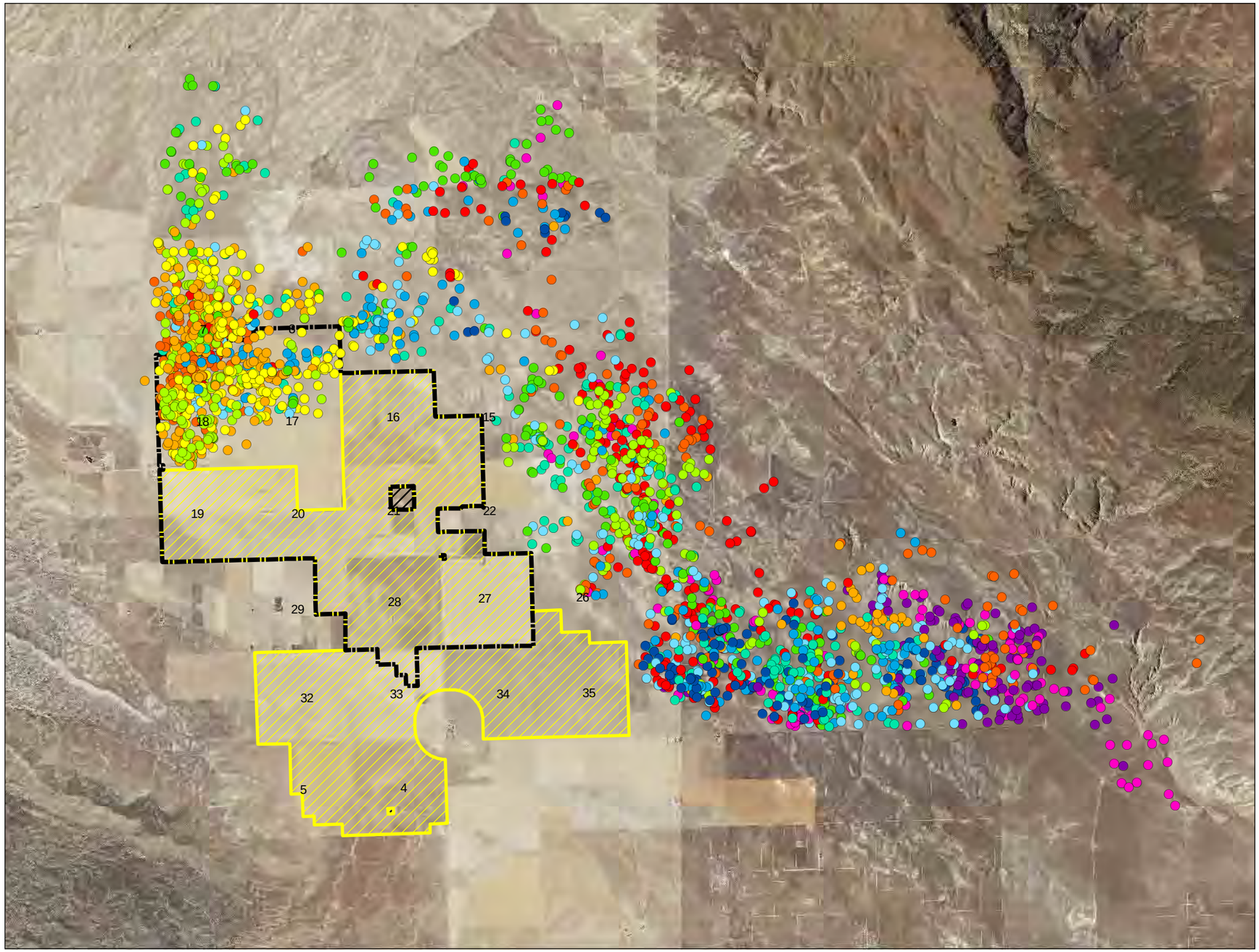
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# BR Map 3. CDFG Tule Elk Radio Collar Data




## Legend

- Option A Study Area Boundary
- Option B Study Area Boundary
- Excluded Area
- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

*2005-2006 Radio Collar Data provided by CDFG*

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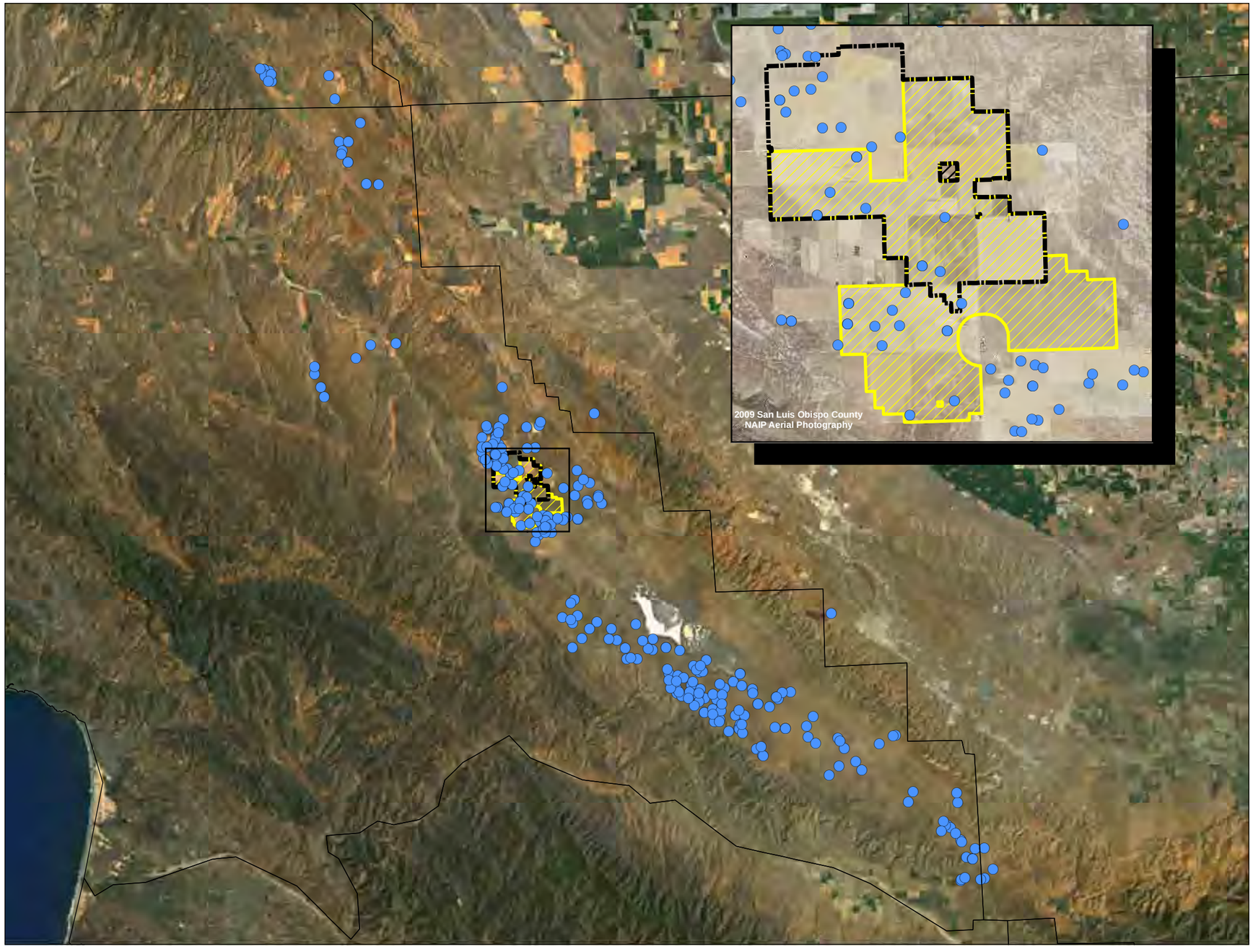
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# BR Map 4. CDFG Pronghorn Antelope Aerial Survey Data




## Legend

- Option A Study Area Boundary
- Option B Study Area Boundary
- Excluded Area
- Pronghorn Sightings

*2000-2008 Pronghorn Aerial Survey Data provided by CDFG*

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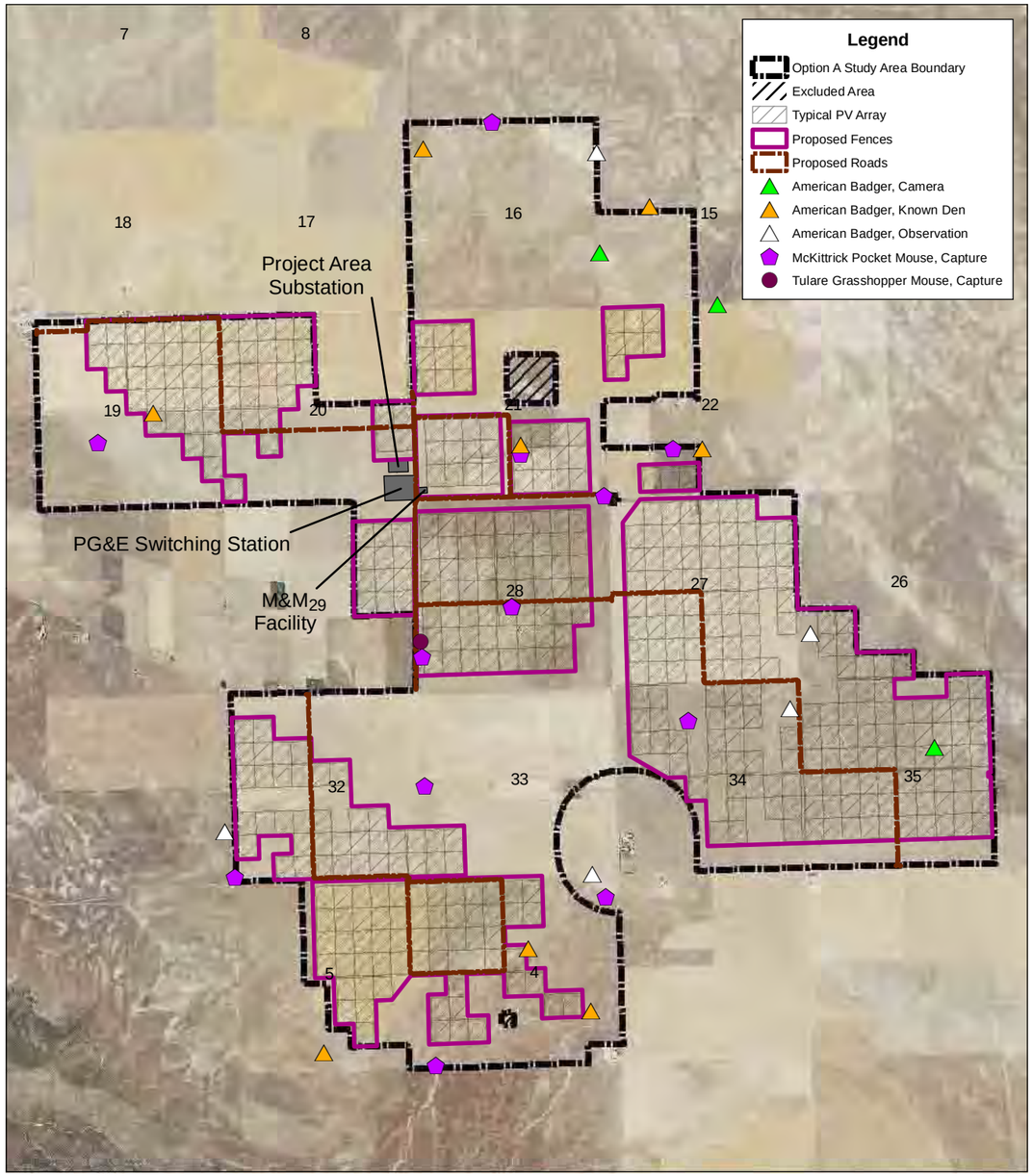
0 3.75 7.5 15 Miles

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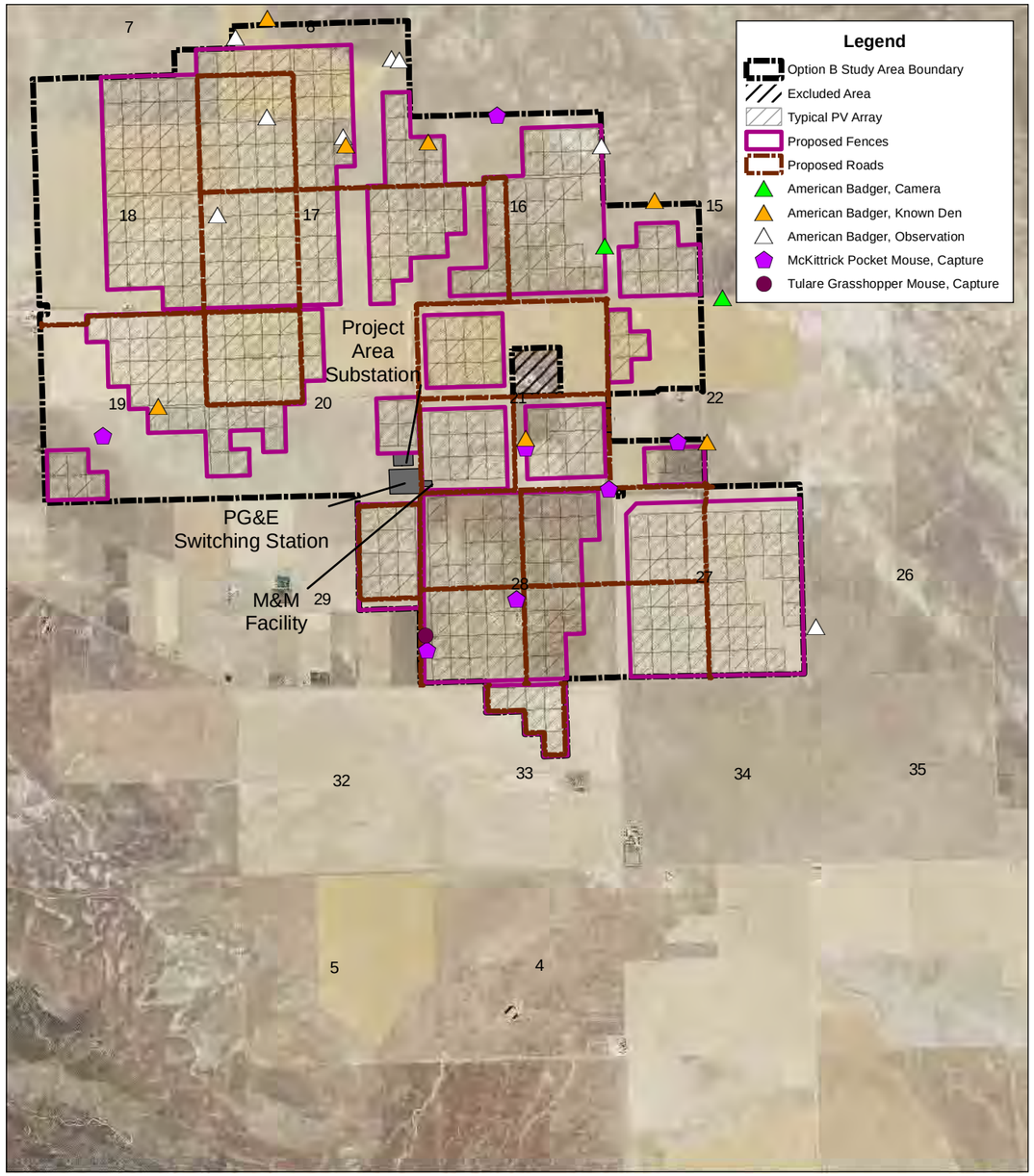
2005
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# BR Map 5. Special Status Mammal Detections




**Option A**




**Option B**





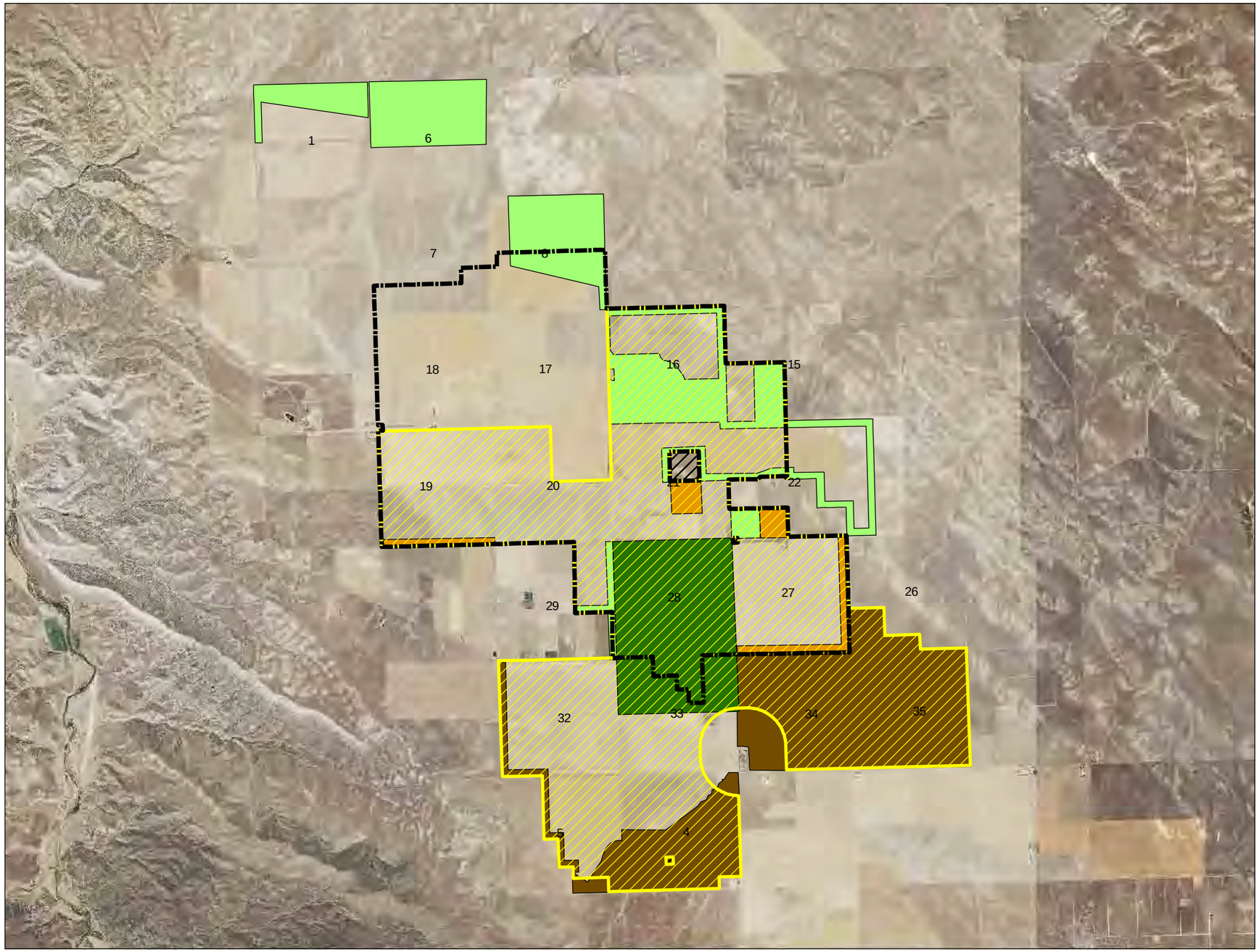



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# BR Map 6. BNLL and NEAS Survey Areas, 2007-2010




**Legend** — **Approx. Acres**

- Option A Study Area Boundary
- Option B Study Area Boundary
- Excluded Area
- '07-'08 Ausra Survey Area...1020
- 2008 Survey Area.....1584
- 2009 Survey Area.....224
- 2010 Survey Area.....2010

*BNLL: Blunt-nosed Leopard Lizard*
*NEAS: Nelson's Antelope Squirrel*

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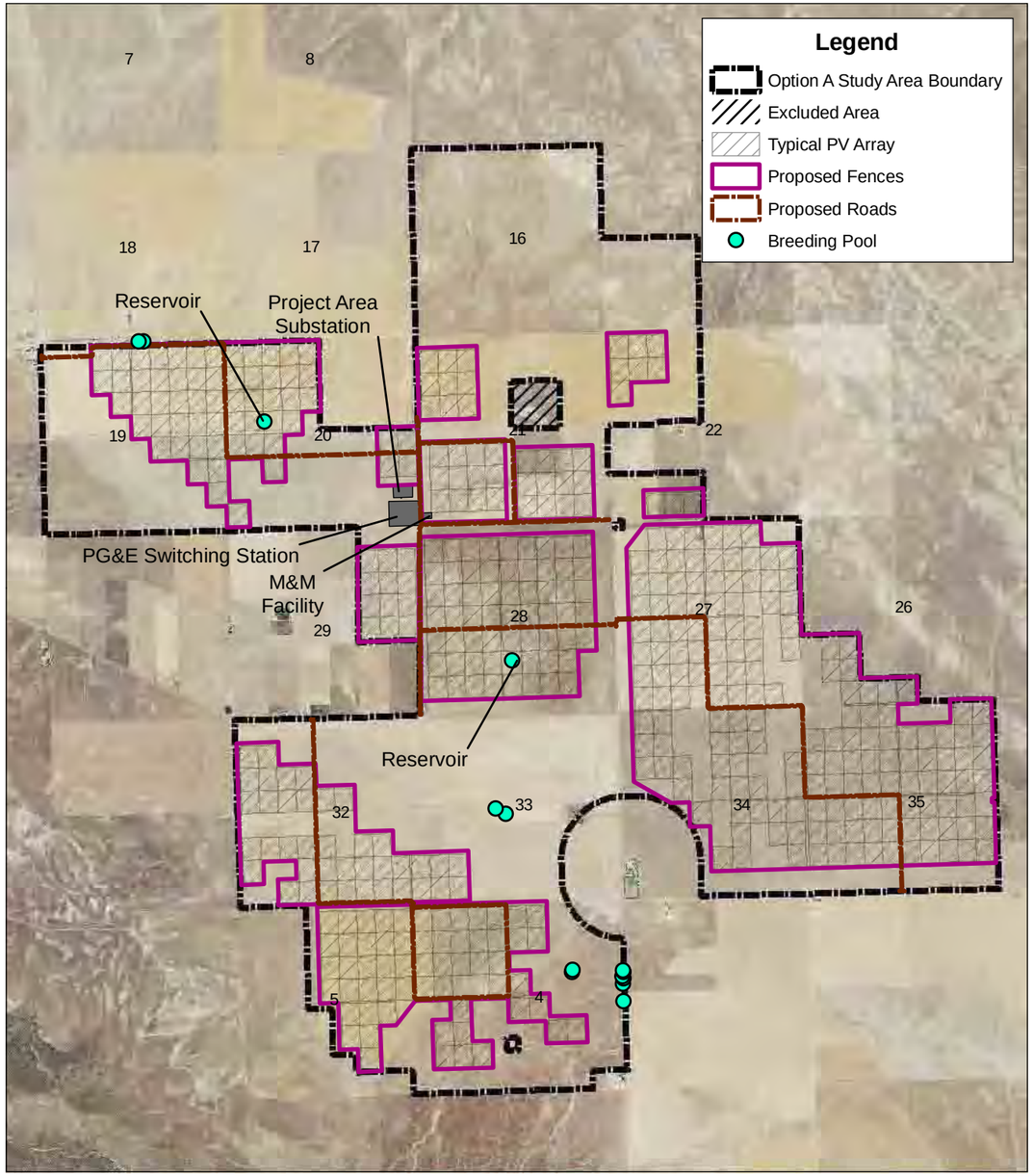
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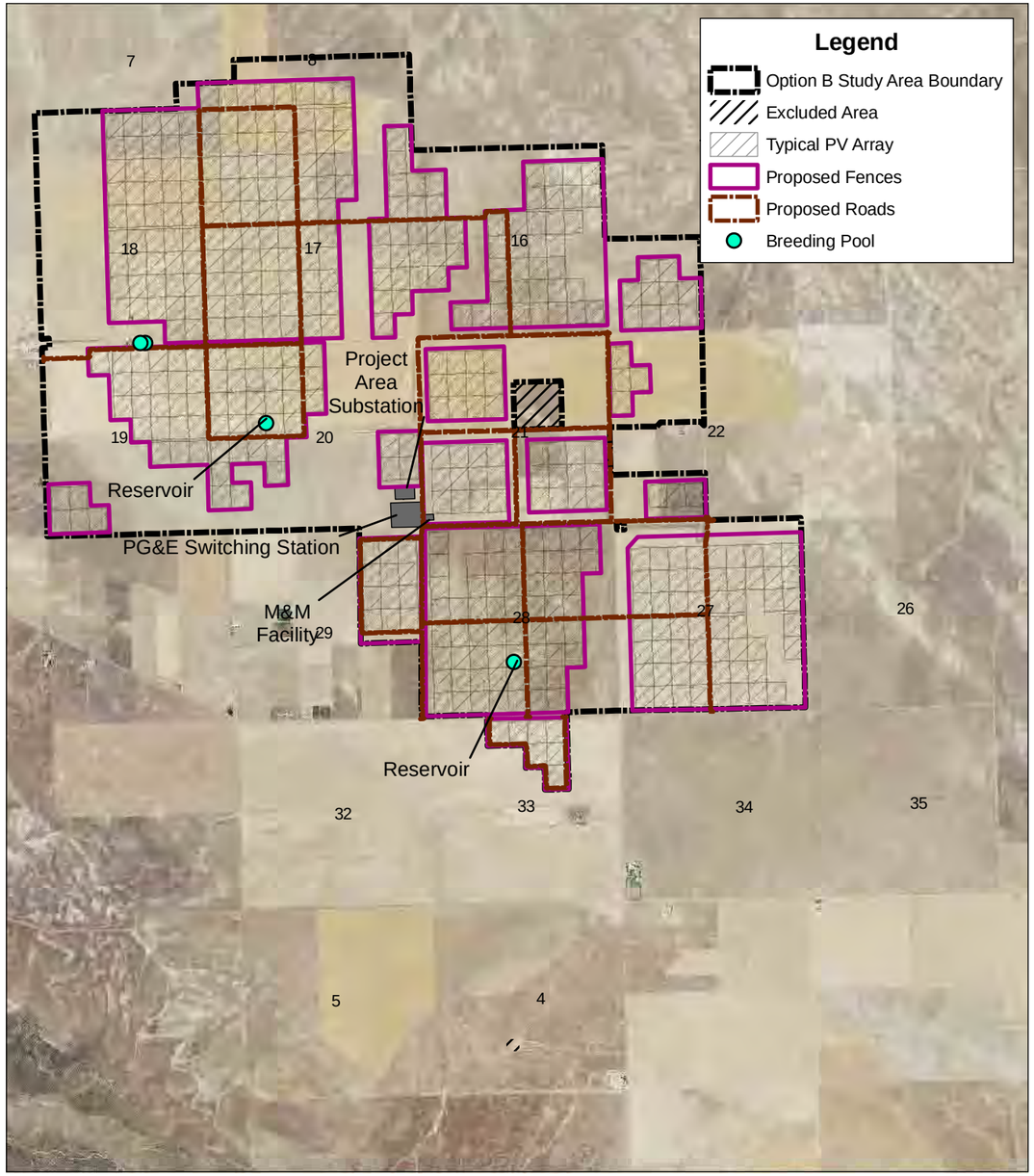

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# BR Map 7. Western Spadefoot Toad Breeding Pools




**Option A**




**Option B**

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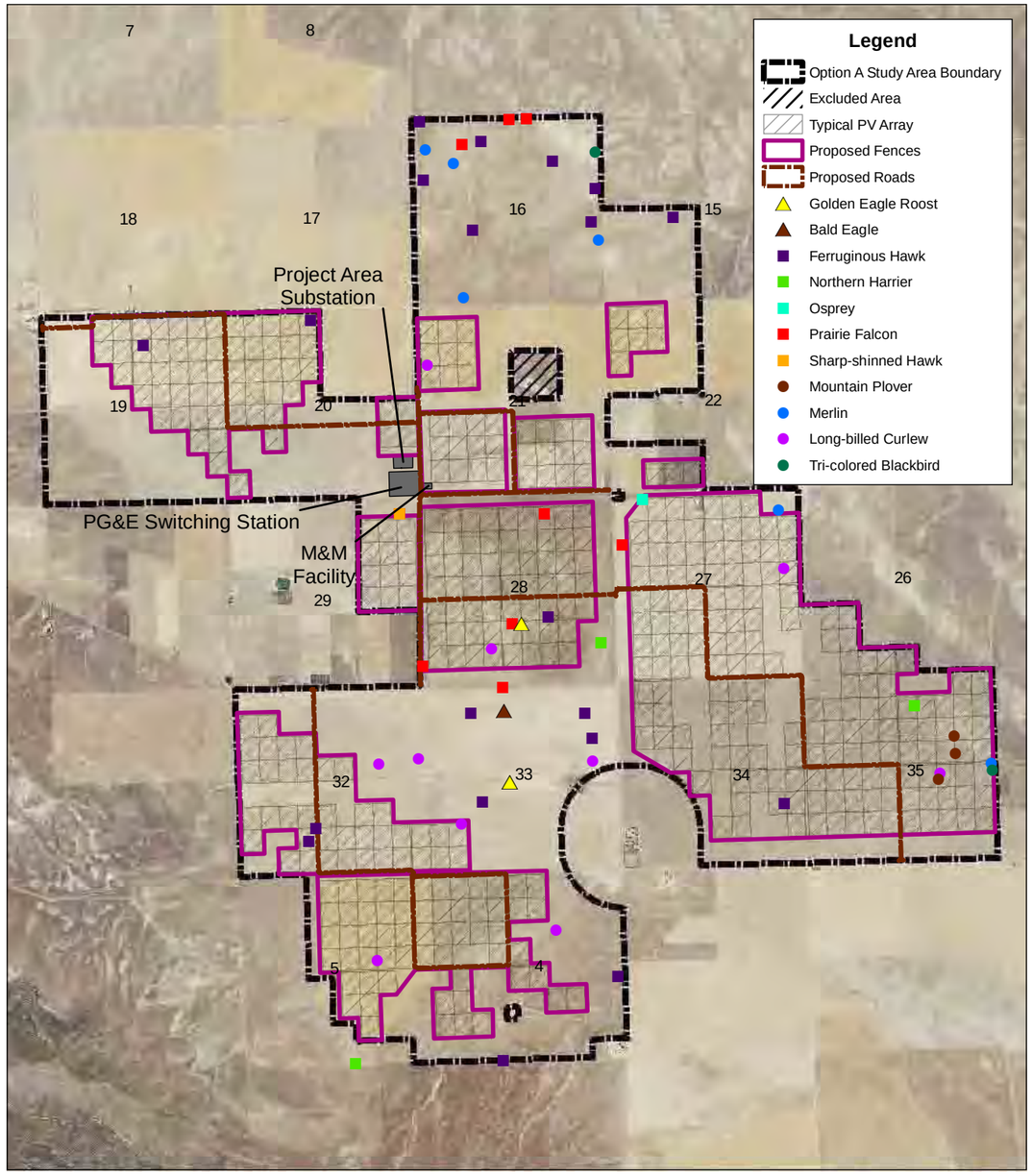
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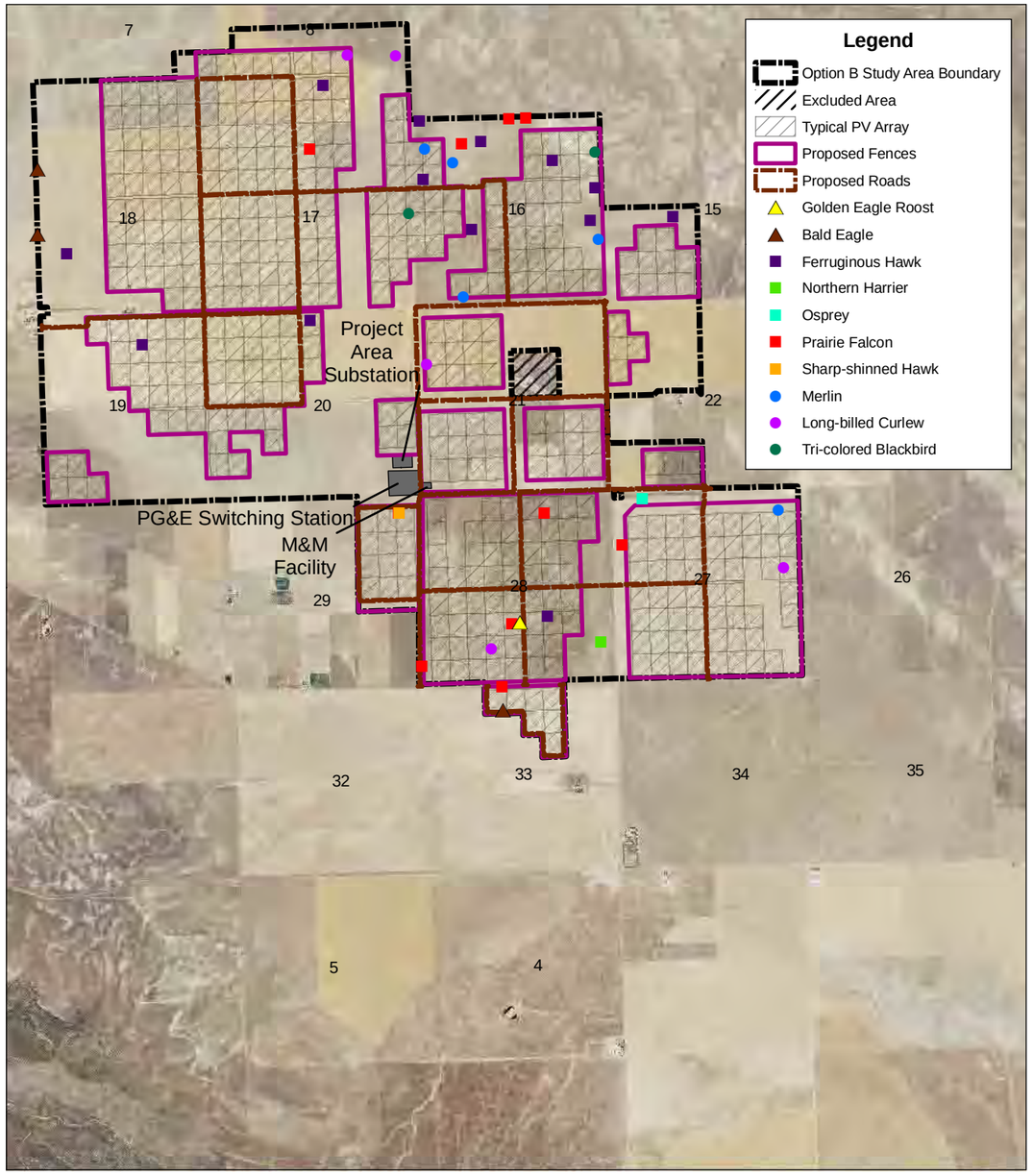
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# BR Map 8. Special Status Wintering Birds




**Option A**




**Option B**

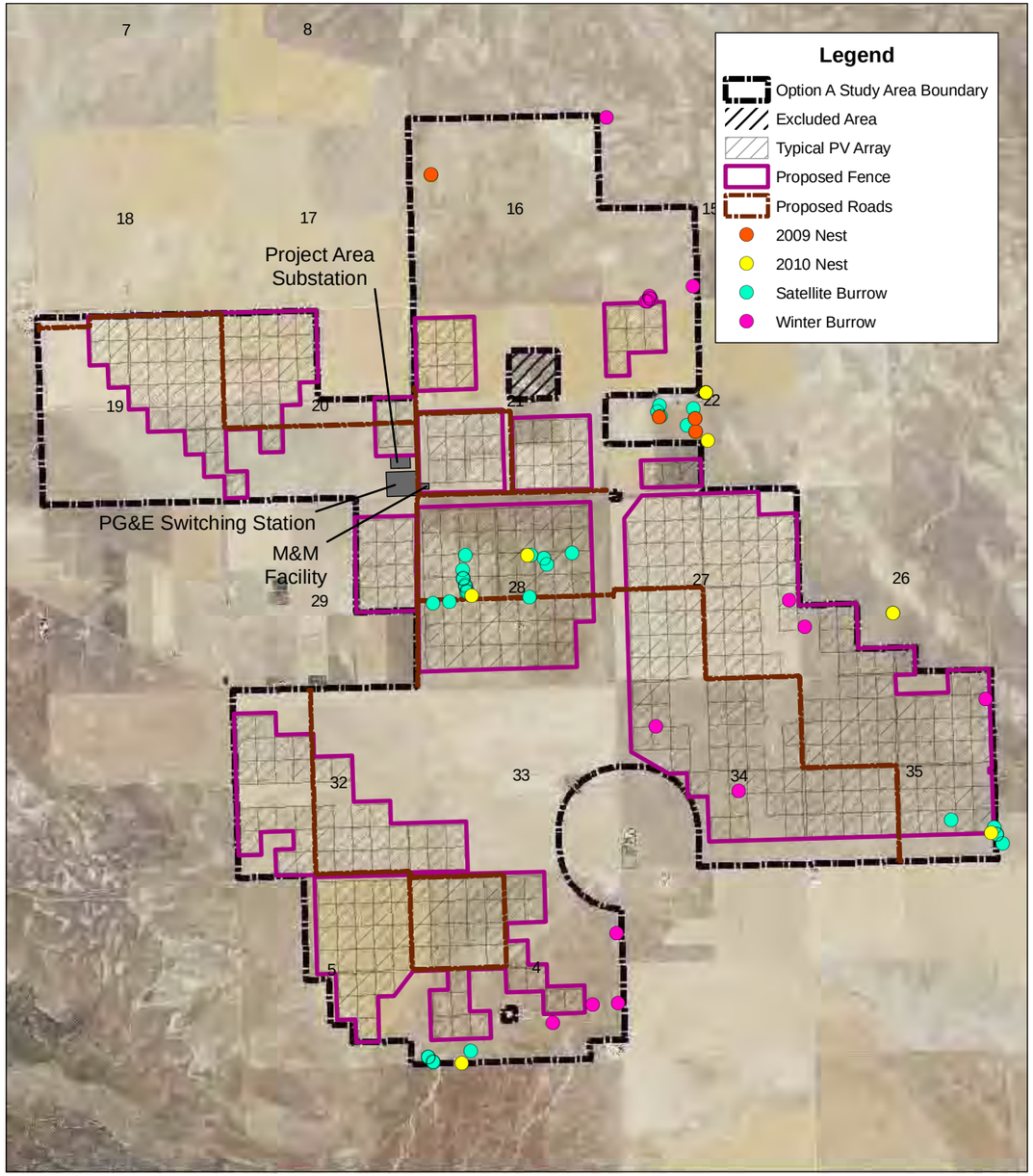
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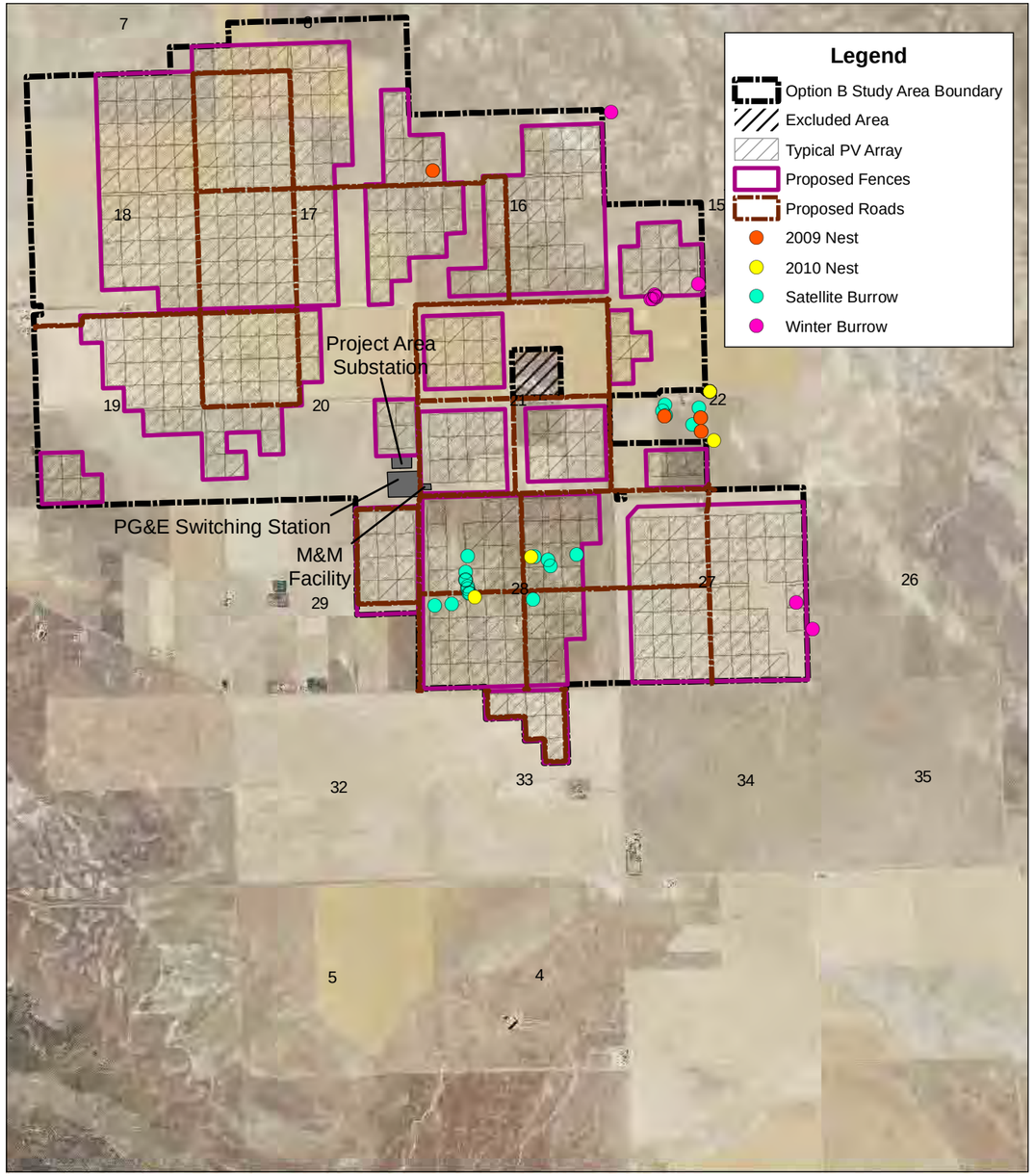

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**Option A**




**Option B**

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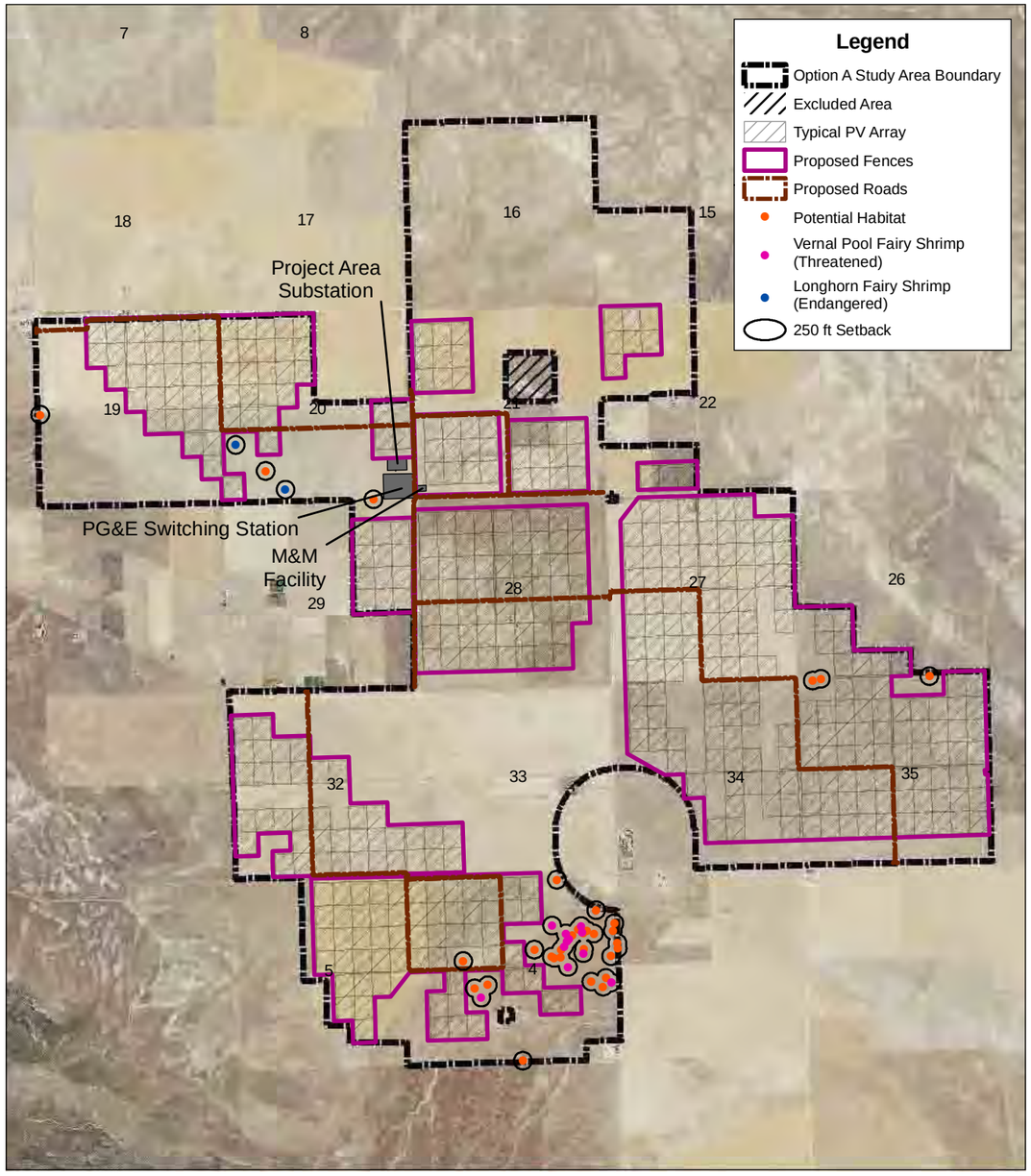
***BR Map 9. Burrowing Owl Map***

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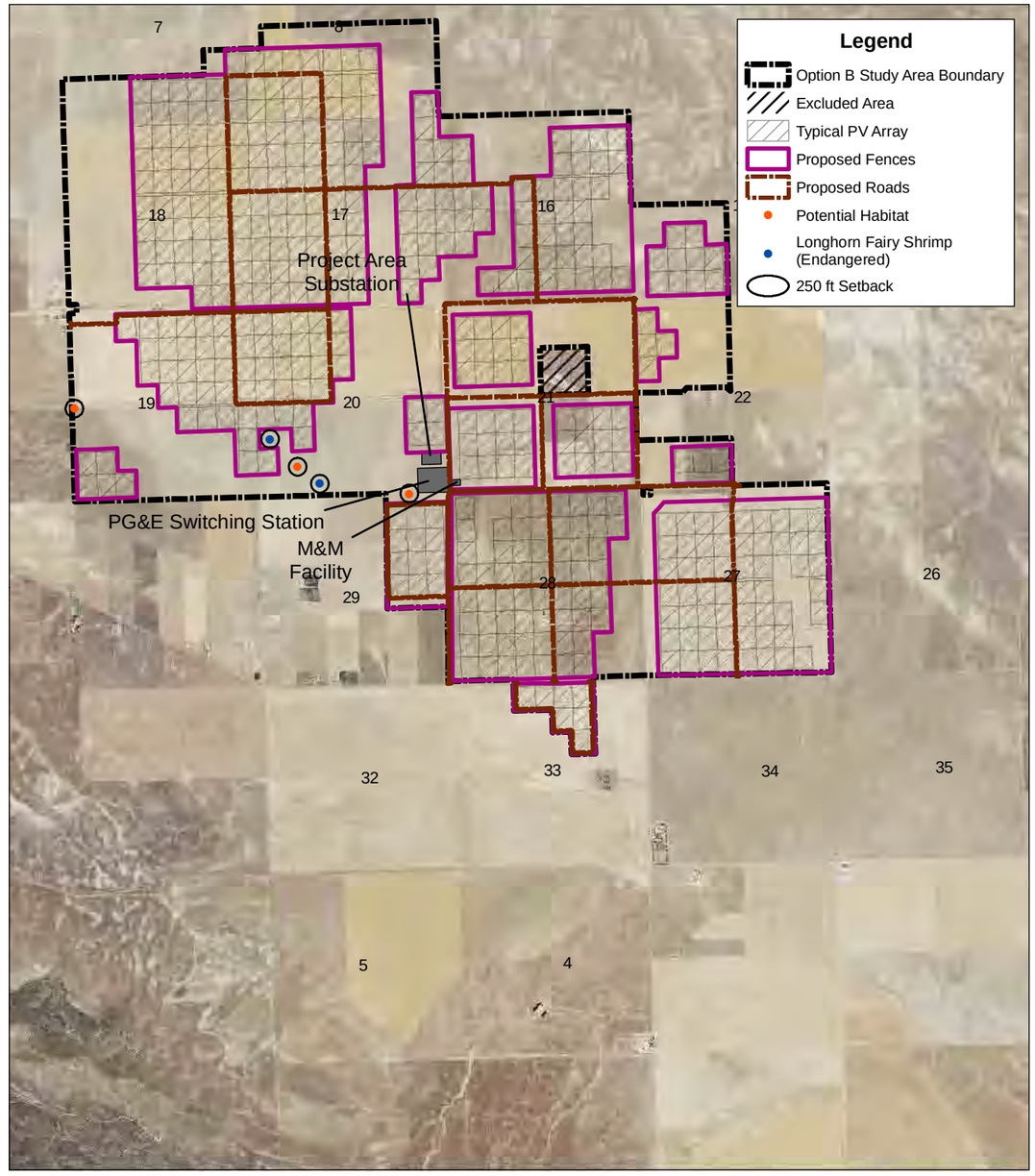
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# BR Map 10. Listed Vernal Pool Branchiopod Localities




**Option A**




**Option B**

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0 0.5 1 2 3 Miles

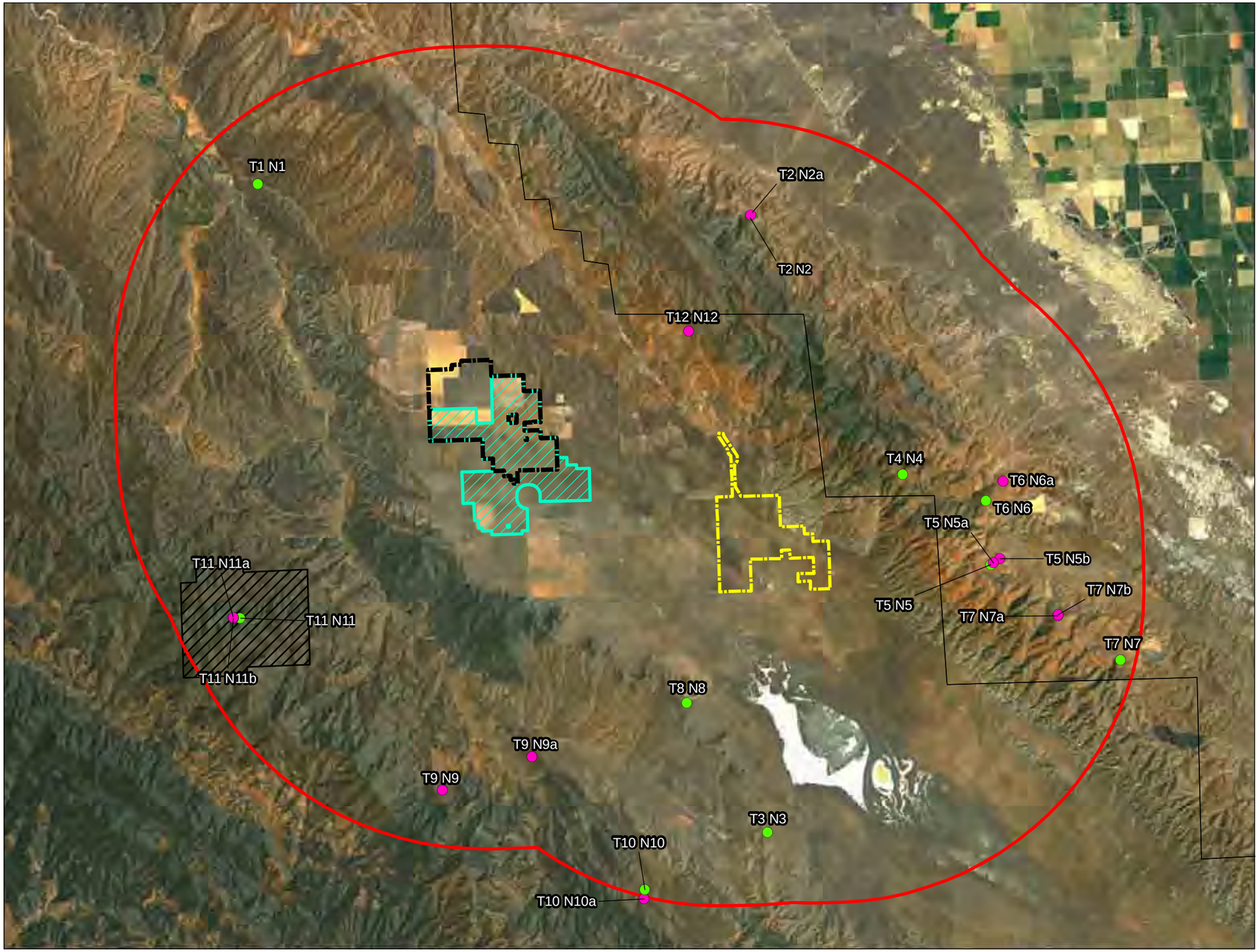
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# BR Map 11. Golden Eagle Aerial Nest Survey Results




## Legend

- Option A Study Area Boundary
- Option B Study Area Boundary
- Sun Power Study Area
- Survey Area (448,647 acres)
- California Condor Critical Habitat
- Active Nest
- Inactive Nest

T1= Eagle Territory Number
N1= Eagle Nest Number

N
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0 2 4 8 Miles

*Aerial nest surveys conducted by:*
*Brian Latta*
*Senior Raptor Biologist*
*230 Ross St.*
*Santa Cruz, CA 95060*

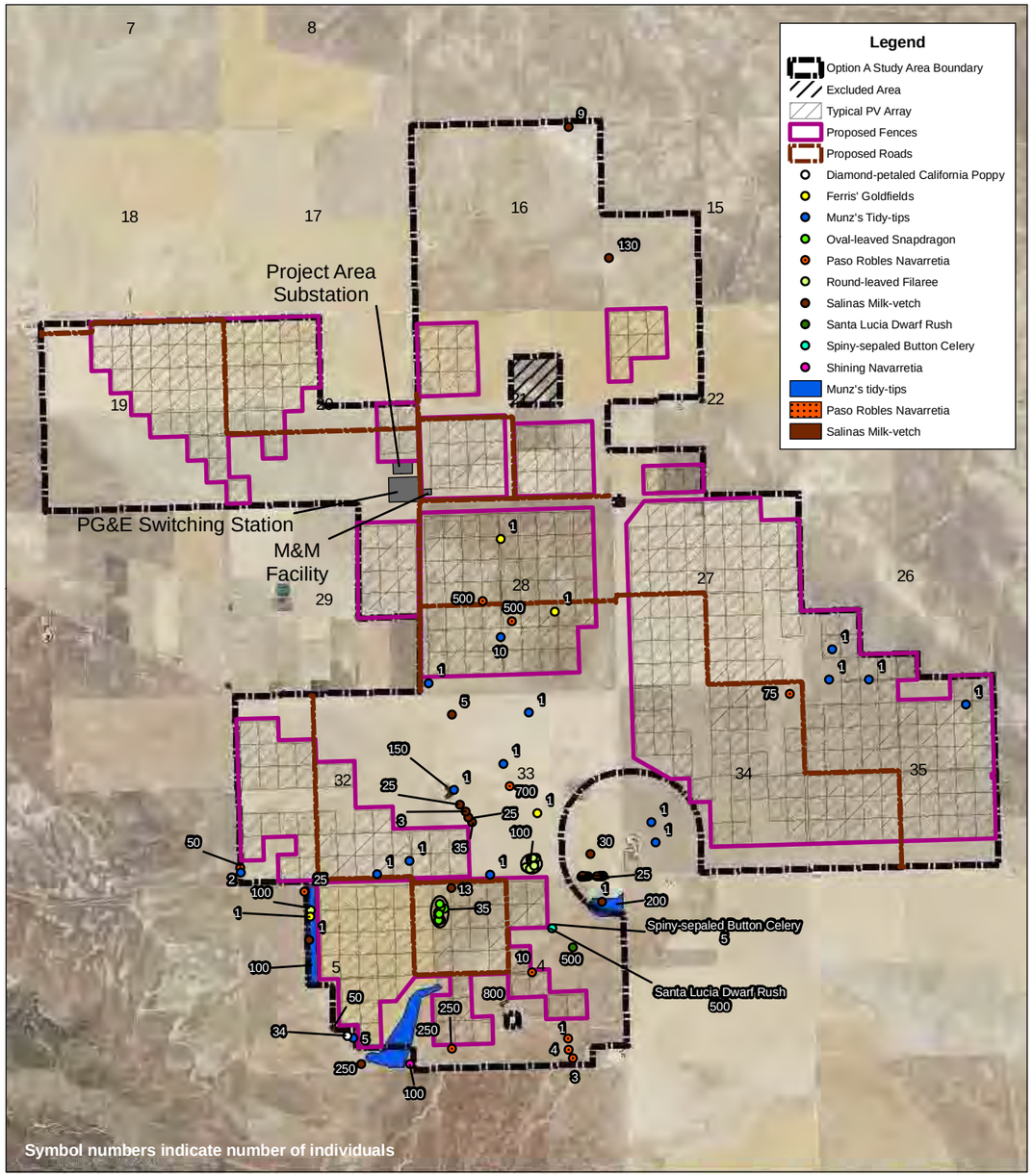
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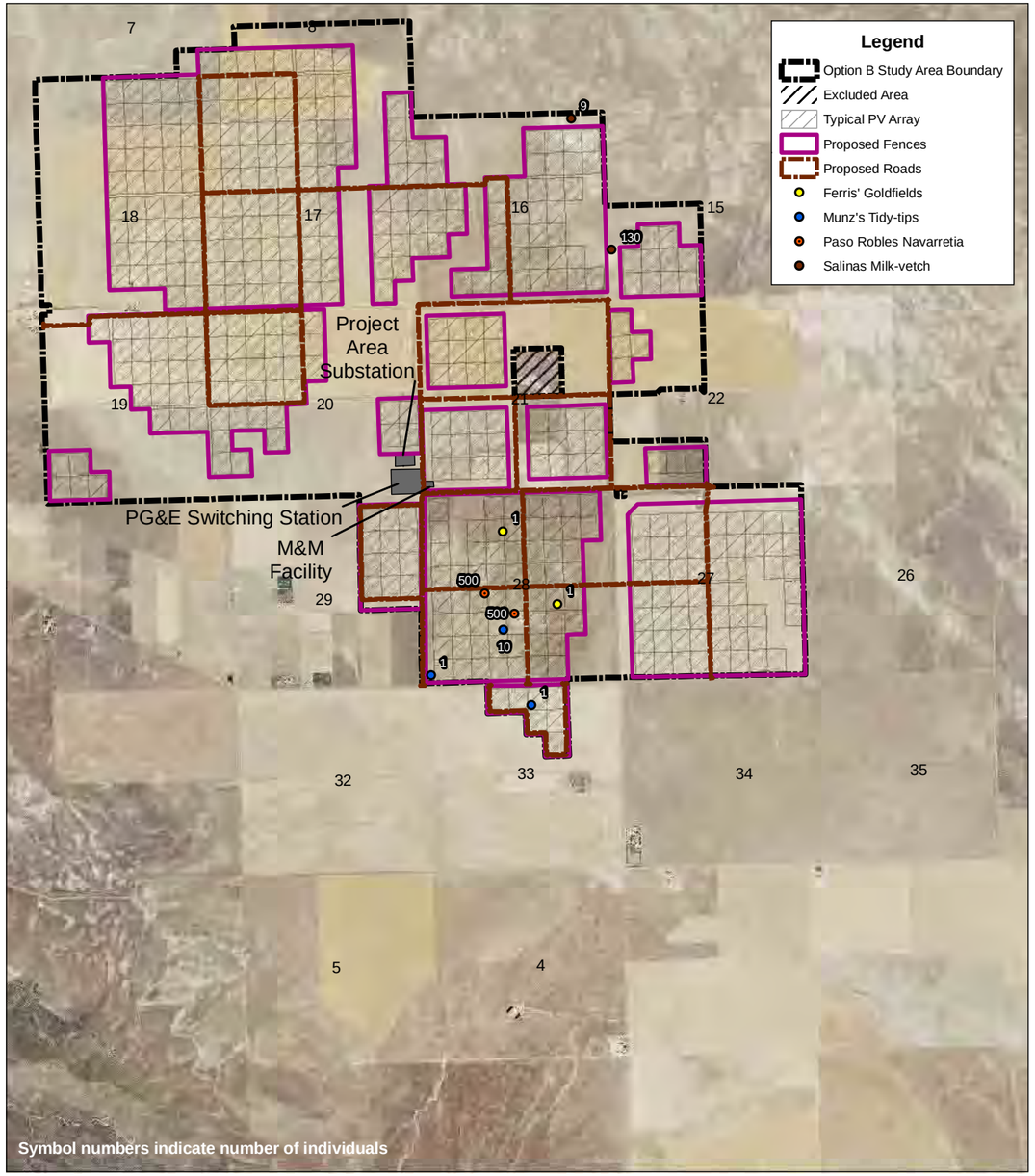
2005
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# BR Map 12. Special Status Plants




Option A




Option B

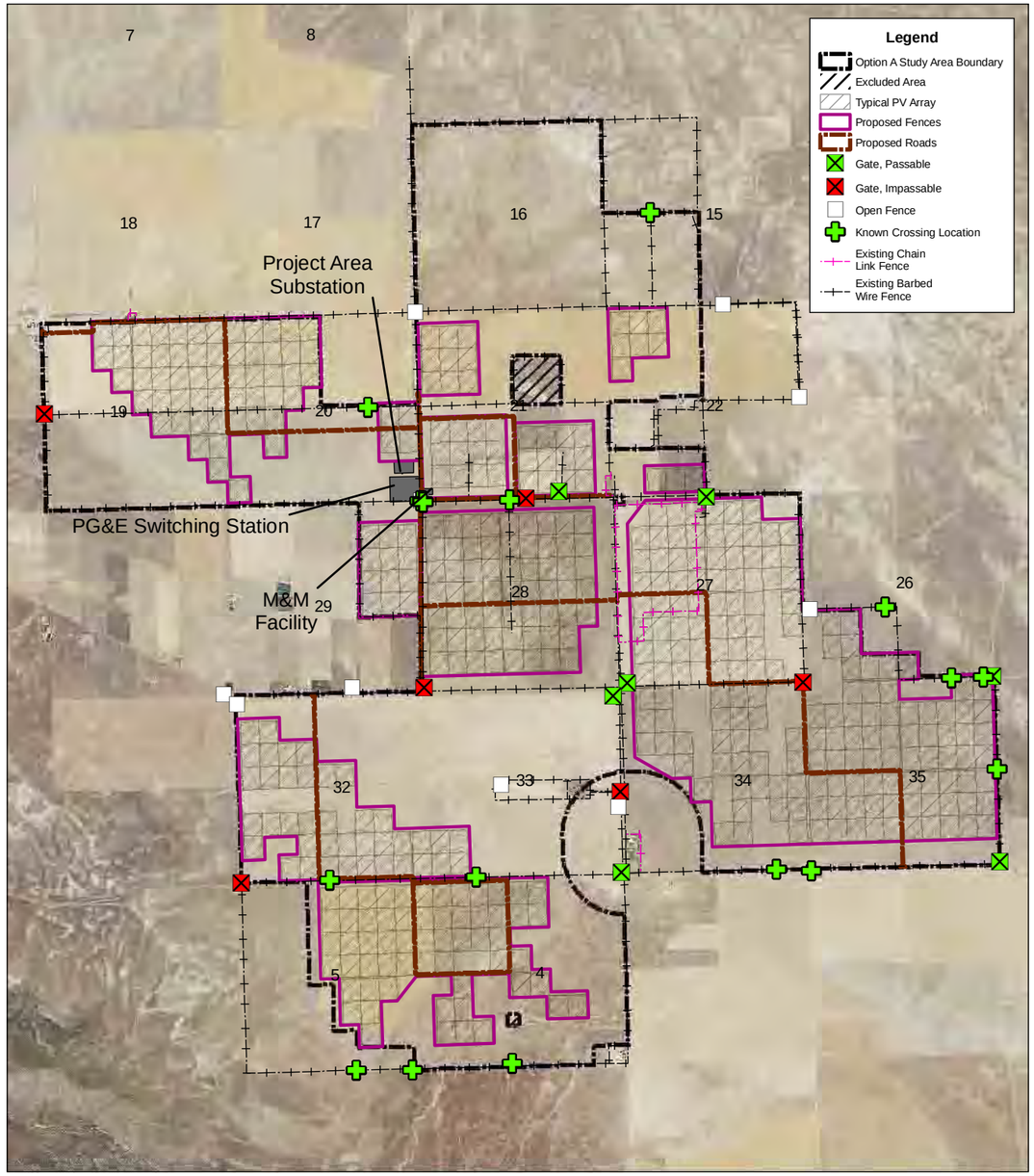



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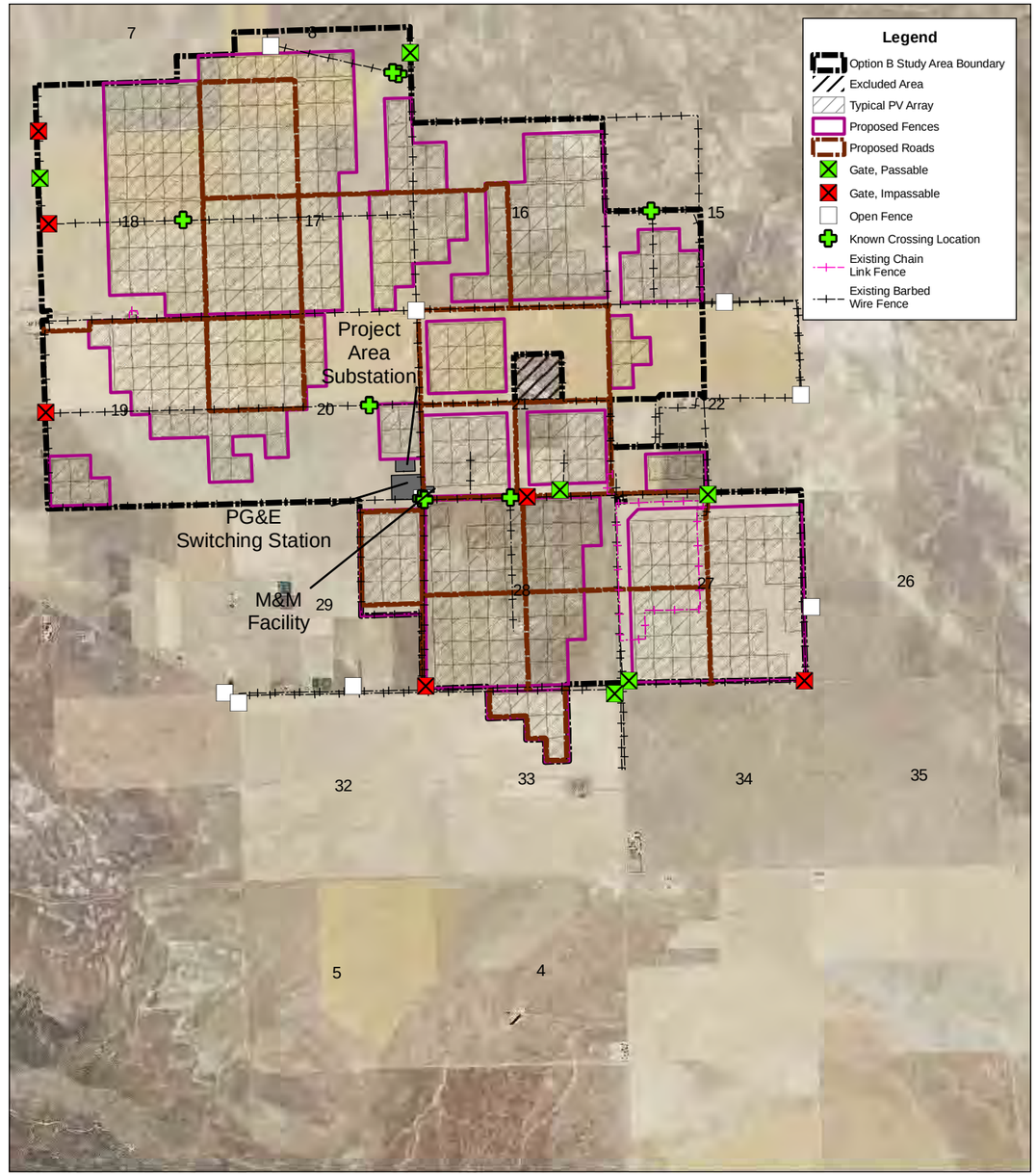
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**Option A**




**Option B**

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0 0.5 1 2 3 Miles

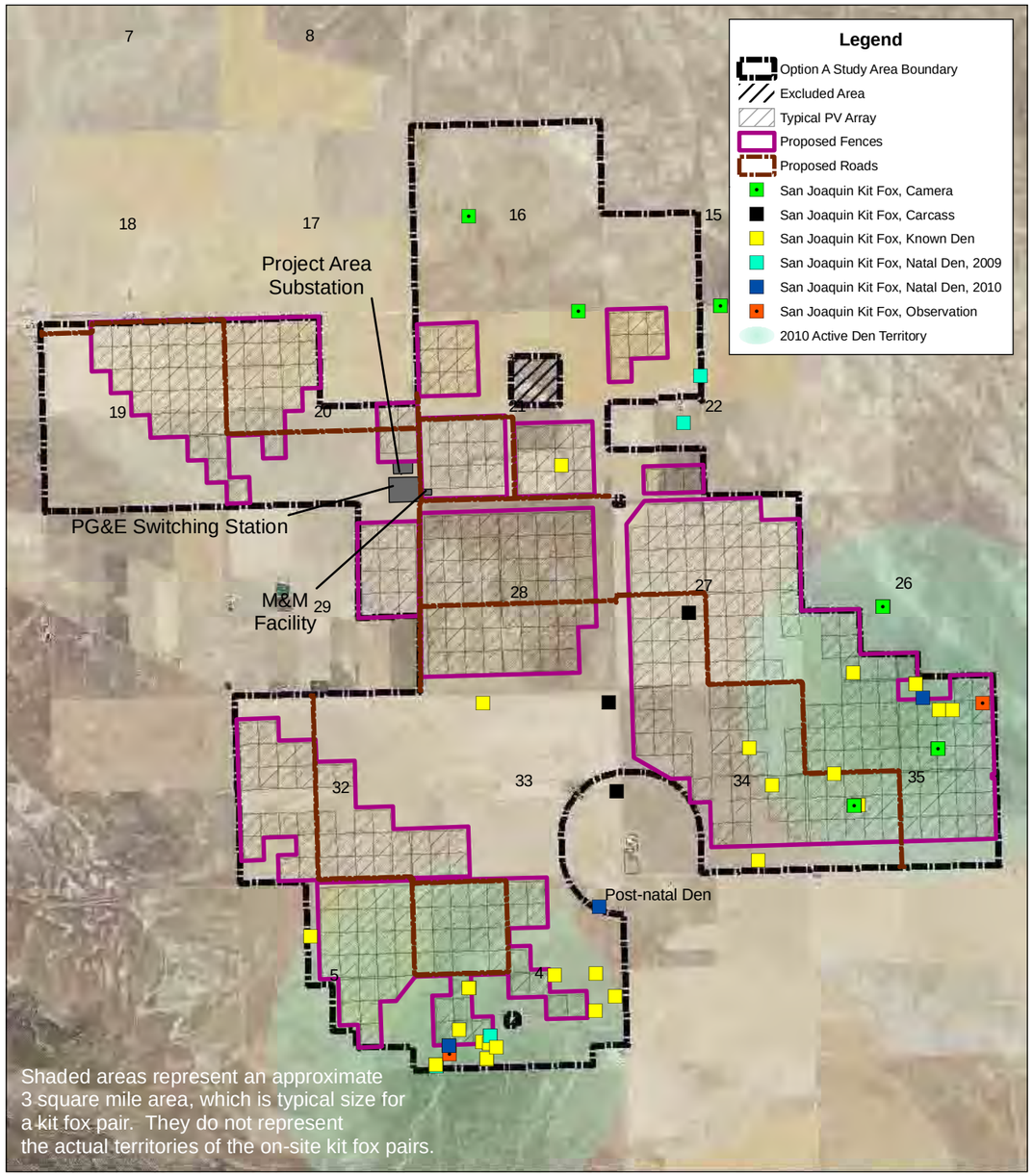
# BR Map 13. Pronghorn Movement


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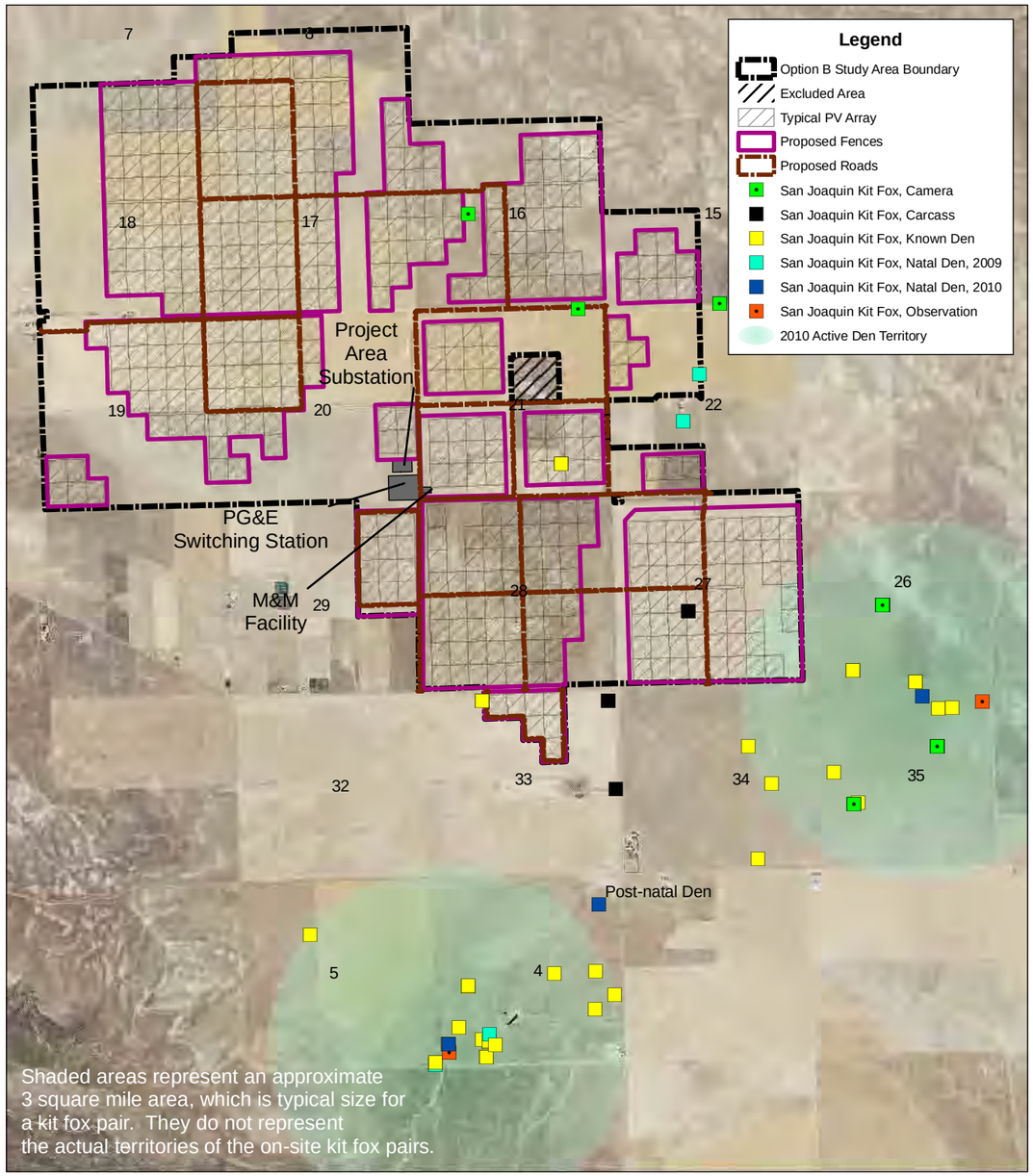

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# BR Map 14. San Joaquin Kit Fox Active Den Territories




**Option A**




**Option B**







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# 14.0 Photographs

- **Photo Collection 1 – Land Sections**
- **Photo Collection 2 – Reference Sites**
- **Photo Collection 3 – Habitats**
- **Photo Collection 4 – Plants**
- **Photo Collection 5 – Wildlife**
- **Photo Collection 6 – Vegetation Test**

## Photo Collection 1 – Land Sections



1. Section 4, view west of grassland habitat. Photo taken on March 4, 2010.



2. Section 4, view west of grassland habitat. Photo taken on April 23, 2010.



3. Section 5, view east of cropland habitat. Photo taken on April 16, 2010.



4. Section 5, view south of grassland habitat. Photo taken on April 23, 2010.



5. Section 7, view north of cropland habitat. Photo taken on April 6, 2010.



6. Section 8, view north of grassland habitat. Photo taken on April 15, 2008.

## Photo Collection 1 – Land Sections



7. Section 15, view north of grassland habitat. Photo taken on March 25, 2010.



8. Section 16, view southwest of grassland habitat. Photo taken on April 15, 2008.



9. Section 17, view west of cropland habitat. Photo taken on March 25, 2010.



10. Section 18, view south of cropland habitat. Photo taken on May 22, 2008.



11. Section 19, view northwest of cropland habitat. Photo taken on April 23, 2009.



12. Section 20, view north of cropland habitat. Photo taken on March 9, 2010.

## Photo Collection 1 – Land Sections



13. Section 21, view south of cropland habitat. Photo taken on March 19, 2009.



14. Section 22, view northeast of grassland habitat. Photo taken on March 27, 2009.



15. Section 26, view south of grassland habitat. Photo taken on March 25, 2010.



16. Section 27, view north of cropland habitat. Photo taken on March 10, 2009.



17. Section 28, view west of cropland habitat. Photo taken on February 11, 2010.



18. Section 29, view south of grassland habitat. Photo taken on February 11, 2010.

## Photo Collection 1 – Land Sections



19. Section 32, view south of cropland habitat. Photo taken on April 9, 2010.



20. Section 33, view east of cropland habitat. Photo taken on April 10, 2010.



21. Section 34, view north of grassland habitat. Photo taken on March 11, 2010.



22. Section 34, view south of grassland habitat. Photo taken on April 15, 2010.



23. Section 35, view south of grassland habitat. Photo taken on March 11, 2010.



24. Section 35, view southwest of grassland habitat. Photo taken on April 15, 2010.

## Photo Collection 2 – Reference Sites



25. Blunt-nosed leopard lizard photographed at Elkhorn Road reference site on May 14, 2008.



26. Nelson's antelope squirrel photographed at Elkhorn Road reference site on May 2, 2008.



27. Giant kangaroo rat precinct photographed at Panorama Road reference site on May 2, 2008.



28. Giant kangaroo rat precinct photographed at Wallace Creek reference site on April 10, 2010.



29. *Delphinium recurvatum* photographed at Belmont Trail reference site on April 6, 2010.



30. *Lasthenia ferrisiae* photographed at Belmont Trail reference site on April 6, 2010.

## Photo Collection 2 – Reference Sites



31. *Madia radiata* photographed at San Diego Road reference site on March 26, 2010.



32. *California macrophylla* photographed at San Diego Road reference site on March 26, 2010.



33. *Caulanthus coulteri* var. *lemmonii* photographed at Chimineas Ranch on March 26, 2010.



34. *Monolopia congdonii* photographed in Carrizo Plain National Monument on April 10, 2010.



35. *Lepidium jaredii* photographed at Belmont Trail on March 25, 2010.



36. *Amsinckia vernicosa* var. *furcata* photographed at Highway 58 reference site on April 10, 2010.

## Photo Collection 3 – Habitats



37. Cropland, view west within Section 17. Photo taken on February 18, 2010.



38. California Annual Grassland, view northwest within Section 16. Photo taken on April 16, 2008.



39. California Annual Grassland, view north within Section 4. Photo taken on April 23, 2010.



40. Vernal Pool, view southwest within Section 4. Photo taken on April 6, 2010.



41. Vernal Pool, view northwest within Section 4. Photo taken on April 23, 2010.



42. Seasonal Wetland, view southwest of Section 15. Photo taken on May 14, 2009.

## Photo Collection 3 – Habitats



43. Ephemeral Wetland Depression, view north within Section 35. Photo taken on April 15, 2010.



44. Natural non-wetland pool, view southwest within Section 4. Photo taken on March 12, 2010.



45. Natural non-wetland pool, view north within Section 20. Photo taken on March 9, 2010.



46. Anthropogenic non-wetland pool, view east within Section 35. Photo taken on February 22, 2010.



47. Agriculture reservoir, view northwest within Section 28. Photo taken on February 11, 2010.



48. Anthropogenic, northeast within Section 28. Photo taken on February 11, 2010.

## Photo Collection 4 – Plants



49. *Castilleja exserta* ssp. *exserta*, common wildflower within the PSA. Photo taken on April 15, 2010.



50. *Antirrhinum ovatum* (CNPS List 4.2), Section 5, on clay soils. Photo taken on June 30, 2010.



51. *Myosurus minimus*, found in vernal pool within Section 20. Photo taken on March 25, 2010.



52. *California macrophylla* (CNPS List 1B.1), photographed in Section 33. Photo taken on April 27, 2010.



53. *Layia munzii* (CNPS List 1B.2), found scattered throughout the PSA. Photographed in Section 5 on April 23, 2010.



54. *Eschscholzia rhombipetala* (CNPS List 1B.1), found within Section 5. Photo taken on March 22, 2010.

## Photo Collection 4 – Plants



55. *Brodiaea terrestris* ssp. *kernensis*, photographed within Section 4 on April 16, 2010.



56. *Uropappus lindleyi*, found throughout the PSA. Photo taken on April 15, 2010.



57. *Elatine rubella*, a vernal pool endemic, found within Section 4. Photo taken on April 27, 2010.



58. *Psilocarphus brevissimus* var. *brevissimus* photographed in Section 4. Photo taken on April 27, 2010.



59. *Pilularia americana*, photographed within Section 4 on April 27, 2010.



60. *Lupinus microcarpus* var. *microcarpus*, found throughout the PSA. Photo taken on April 16, 2010.

## Photo Collection 5 – Wildlife



61. American badger photographed in Section 8 on March 19, 2009.



62. Burrowing owl photographed in Section 22 on May 20, 2009.



63. Pronghorn photographed in Section 20 on May 20, 2009.



64. Gopher snake photographed in Section 33 on April 10, 2010.



65. Golden eagle photographed in Section 28 on January15, 2010.



66. Horned lark nest photographed in Section 16 on April 26, 2010.

## Photo Collection 5 – Wildlife



67. Side-blotched lizard photographed in Section 35 on April 15, 2010.



68. Tule elk photographed in Section 15 with motion detection camera on March 16, 2009.



69. Western spadefoot toad metamorph photographed in Section 4 on April 27, 2010.



70. Northern Pacific rattlesnake photographed in Section 33 on April 10, 2010.



71. San Joaquin kit fox photographed in Section 34 on March 11, 2010.



72. McKittrick pocket mouse photographed in Section 34 on April 10, 2010.

## Photo Collection 6 – Vegetation Test




73. Vegetation test site in Section 29, view west between module tables that are 80 feet long and about 7.8 feet wide. July 7, 2010.



74. Faux module in Section 29. The bottom edge is about 18 inches off the ground, and the upper edge is about 5 feet high. Photo taken on January 7, 2010.



75. First Solar module installation (not to be connected) during pile driving operations.



76. Vegetation and light detection instruments under faux module. Photo taken June 26, 2010.



77. Section 35, vegetation dominated by filaree. Photo taken March 31, 2010.



78. Section 35, view east at north fence. Photo taken on November 9, 2009.

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# Appendix A

**Dry Season Sampling (2010) For Federally Listed Large Branchiopods at the Proposed Topaz Solar Farm. July 2010.**

# DRY-SEASON SAMPLING (2010)
# FOR
# FEDERALLY LISTED LARGE BRANCHIOPODS
# AT THE
# PROPOSED TOPAZ SOLAR FARM

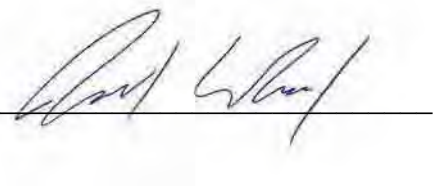



*Prepared for:* **ALTHOUSE & MEADE, INC.**
1875 Wellsona Road
Paso Robles, CA 93446
*Contact:* Daniel E. Meade, Ph.D.
(805) 467-1041

*Prepared by:* **HELM BIOLOGICAL CONSULTING**
2273 Nolen Drive
Lincoln, CA 95648
*Contact:* Brent Helm
(916) 543-7397


**July 2010**

"I certify that the information in this survey report and attached exhibits fully and accurately represent my work."

Todd F. Wood Signature  Date 7-28-10

HELM
BIOLOGICAL CONSULTING
2273 Nolen Drive, Lincoln, CA 95648

# DRY-SEASON SAMPLING (2010) FOR FEDERALLY LISTED LARGE BRANCHIOPODS AT THE PROPOSED TOPAZ SOLAR FARM

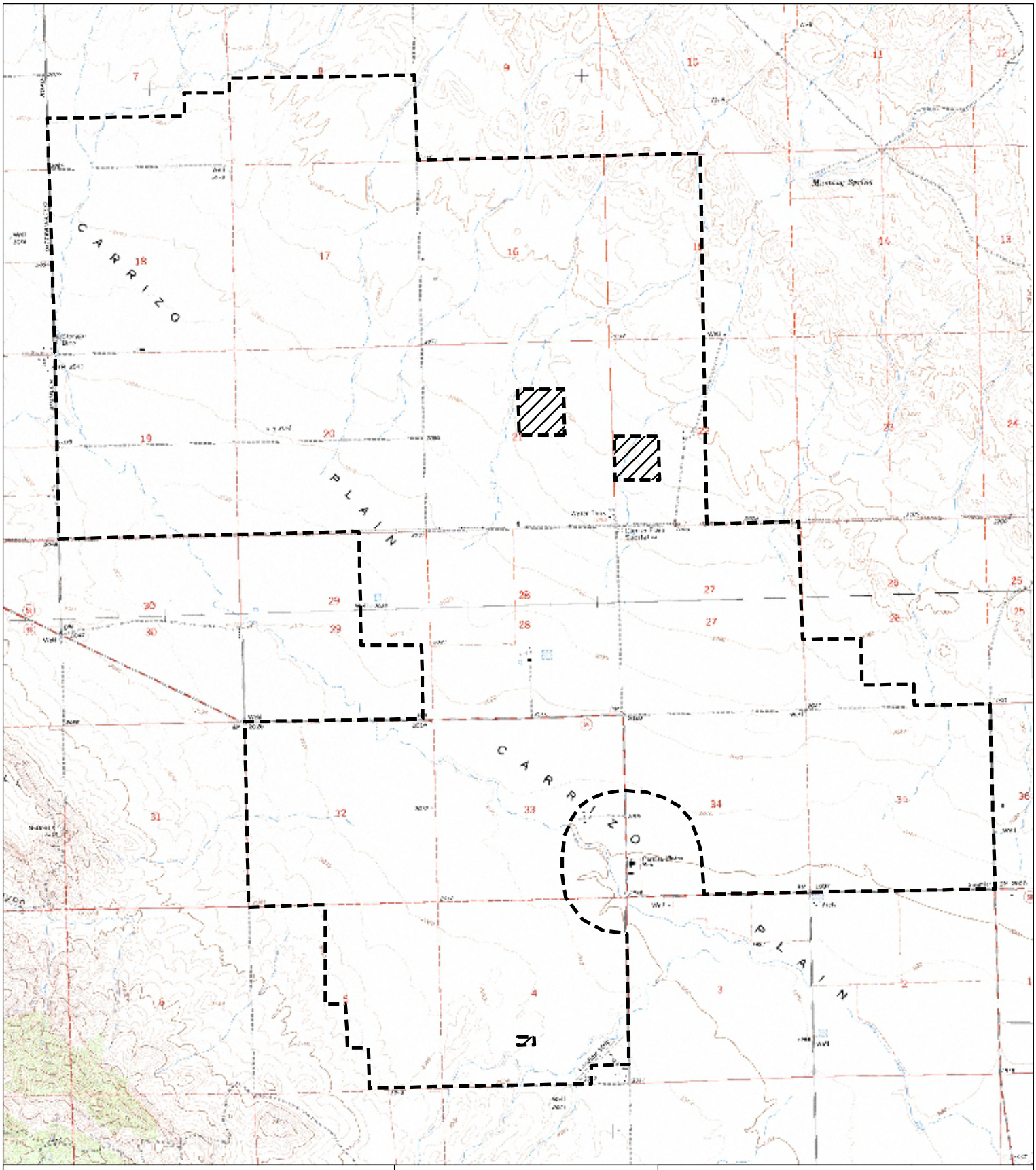
## INTRODUCTION

Helm Biological Consulting (HBC) was contracted by Althouse and Meade, Inc. to conduct dry-season sampling for large branchiopods (fairy shrimp, tadpole shrimp, and clam shrimp) that are listed as threatened or endangered under the federal Endangered Species Act (ESA) (e.g., vernal pool fairy shrimp [*Branchinecta lynchi*] and longhorn fairy shrimp [*Branchinecta longiantenna*]) at the Proposed Topaz Solar Farm.

The Proposed Topaz Solar Farm is located north of State Highway 58 on the Carrizo Plain, San Luis Obispo, California. More specifically, the Proposed Topaz Solar Farm is located in Sections 27, 28, 32, and 35 and in portions of Sections 4, 5, 29, 33, and 34 of Township 29 South, and Range 18 East (Mount Diablo Meridian [MDM]) of the California Valley 7.5 minute U.S. Geological Survey topographic quadrangle map (USGS map), and in Sections 16, 17, 18, 19, and 20 and in portions of Sections 7, 8, 15, 21, and 22 of Township 29 South, and Range 18 East (MDM) of the La Panza 7.5 minute USGS map (Center coordinates in North American Datum 1983 Universal Transverse Mercator Zone 10 North: Northing 3919117.8 and Easting 767591.9) (Figure 1).

HBC conducted dry-season sampling in 2008 and 2009 at the Proposed Topaz Solar Farm. Since the 2008 and 2009 sampling, additional areas have been included within the study area. During the 2009-2010 wet-season, Althouse and Meade, Inc. and Mr. Chris Powers of Advantage Environmental Consultants, LLC identified numerous basins that have the potential to support federally listed large branchiopods within the additional areas. Mr. Powers conducted wet-season sampling for federally listed large branchiopods in 2009-2010 within these additional basins and observed large branchiopods in approximately 50% of the them (Powers pers comm.).

This report discusses the methods and results of the dry-season sampling efforts for federally listed large branchiopods within the additional at the Proposed Topaz Solar Farm.




**Property Center Coordinates in NAD UTM Zone 10 N**
**Northing** 3919117.8 **Easting** 767591.9

1:45,000
1 inch equals 3,750 feet

Approximate Study Area
Excluded Area

**Prepared By:**
Date: 8-18-08
Revised: 6-18-09
Revised: 7-1-10

HELM BIOLOGICAL CONSULTING
2273 Nolen Drive, Lincoln, CA 95648

## Figure 1. Proposed Topaz Solar Farm Location

(Source: U.S. Geological Survey La Panza NE and California Valley 7.5 minute Topographical Quadrangle Map)

## METHODS

Mr. Todd Wood conducted dry-season sampling on July 22, 2009 as authorized by the U.S. Fish and Wildlife Service (USFWS) (Appendix A). Mr. Wood assisted by Mr. Powers Sampling was conducted under permit TE-795930-6 of Section 10(a)(1)(A) of the federal Endangered Species Act, 16 U.S.C. 1531 *et seq*., and its implementing regulations. Methods generally followed *USFWS's Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods* (1996) and are described below.

Dry-season sampling involved the collection of a minimum of ten sub-samples of soil, mainly from the lowest topographic areas within each basin considered potential habitat on site. Soils were collected from only those basins where no large branchiopods were observed during the 2009-2010 wet-season efforts (Powers pers. comm.). Soil samples were placed in liter size plastic freezer bags and marked with the project name, basin number, and date. The soil was then transported to HBC's laboratory for processing and analysis.

In the laboratory, a brine solution was prepared by mixing table salt (NaCl) with lukewarm tap water in a large container. The collected soil material was placed in the brine solution. The soil material was then gently worked by hand to breakdown any persistent soil structure. The organic material rising to the top of the brine solution was skimmed off and placed in a 710-micron diameter pore-size sieve stacked atop a 75-micron diameter pore-size sieve. The soil material was processed through the top sieve by flushing it with lukewarm tap water while gently rubbing it with a soft-bristle brush. The soil retained from the 75-micron diameter pore size sieve was then removed and thinly (≈1.0 mm) spread into plastic petri dishes.

The contents of each petri dish were examined under a 10 to 252-power zoom binocular microscope. A minimum of 0.5-hour was spent searching the contents of each petri dish for large branchiopod cysts (embryonic eggs). HBC's large branchiopod cyst reference collection and scanning electron micrographs of cysts (Hill and Shepard 1998, Mura 1991, and Gilchrist 1978) were used to identify and compare any cysts observed within the soil samples.

## RESULTS

A total of 56 basins were sampled using dry-season techniques in 2010 (Figures 2-6). One basin (38) contained water during the sampling visit and was not sampled. Cysts belonging to the genus *Branchinecta* were observed in soils collected from approximately 55% of the basins sampled on site (Table 1). Representative photographs of the basins on site are in Appendix B.

## DISCUSSION

Several species within the genus Branchinecta are listed as threatened or endangered under the ESA. However, given the geographic location of the project and the types of habitats sampled, the *Branchinecta* cysts most likely belong to one or more of the following species: the non-listed versatile fairy shrimp (*Branchinecta lindahli*), the federally listed as threatened vernal pool fairy shrimp, or the federally listed as endangered longhorn fairy shrimp.

## LITERATURE CITED

Gilchrist, B. M. 1978. Scanning electron microscope studies of the egg shell in some Anostraca (Crustacea: Branchiopoda). Cell Tiss. Res. 193: 337-351.

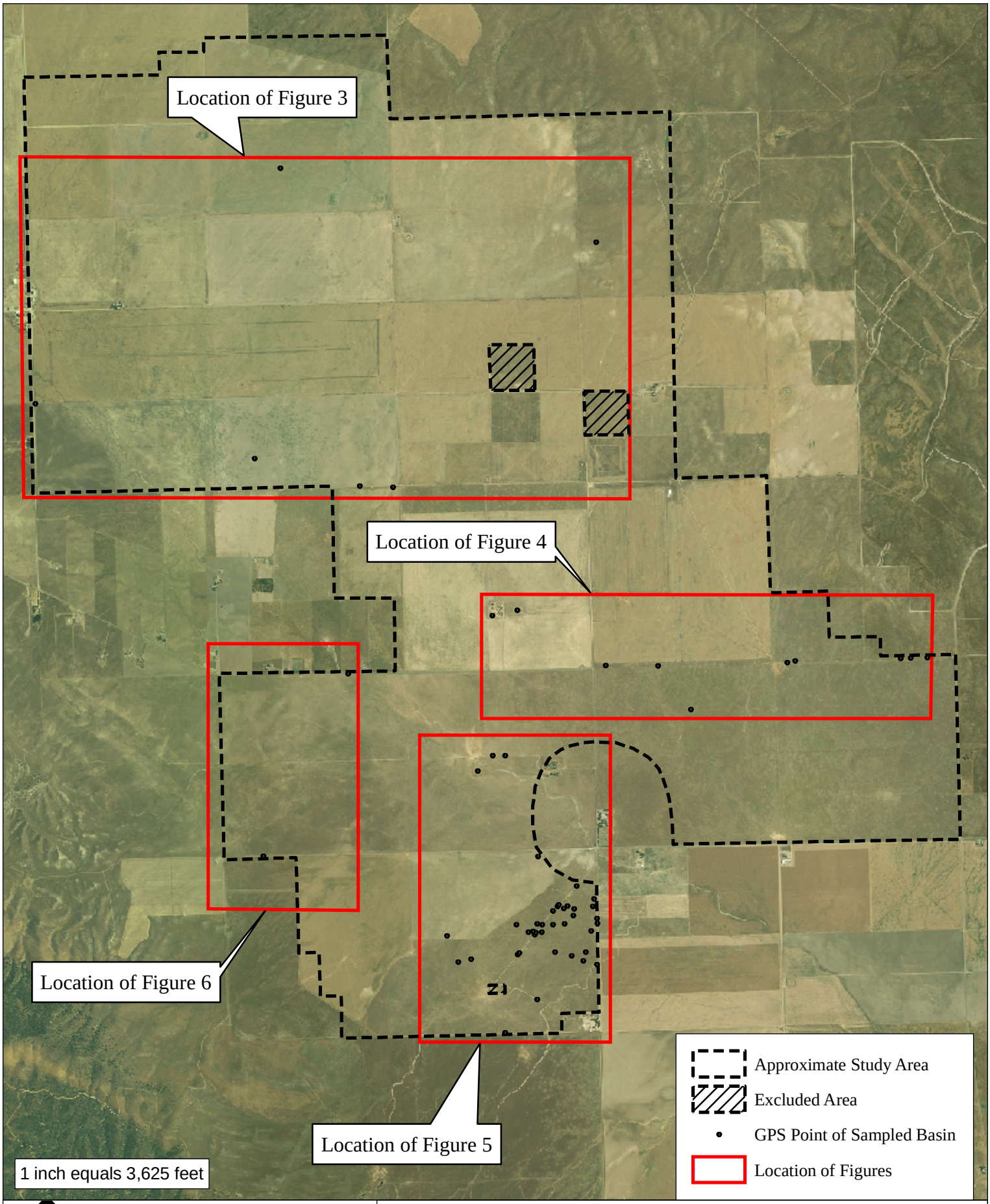
Hill, R. E., and W. D. Shepard. 1998. Observation on the identification of California anostracan cysts. Hydrobiologia 359: 113-123.

Mura, G. 1991. SEM morphology of resting eggs in the species of the genus *Branchinecta* from North America. J. Crust. Biol. 11: 432-436.

U. S. Fish and Wildlife Service. 1996. Interim Survey Guidelines to Permittees for Recovery Permits under Section 10 (a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods. 11 pp.

## PERSONAL COMMUNICATION

Powers, Chris. Biologist. Advantage Environmental Consultants, LLC. July 22, 2009 – conversation during dry-season sampling.

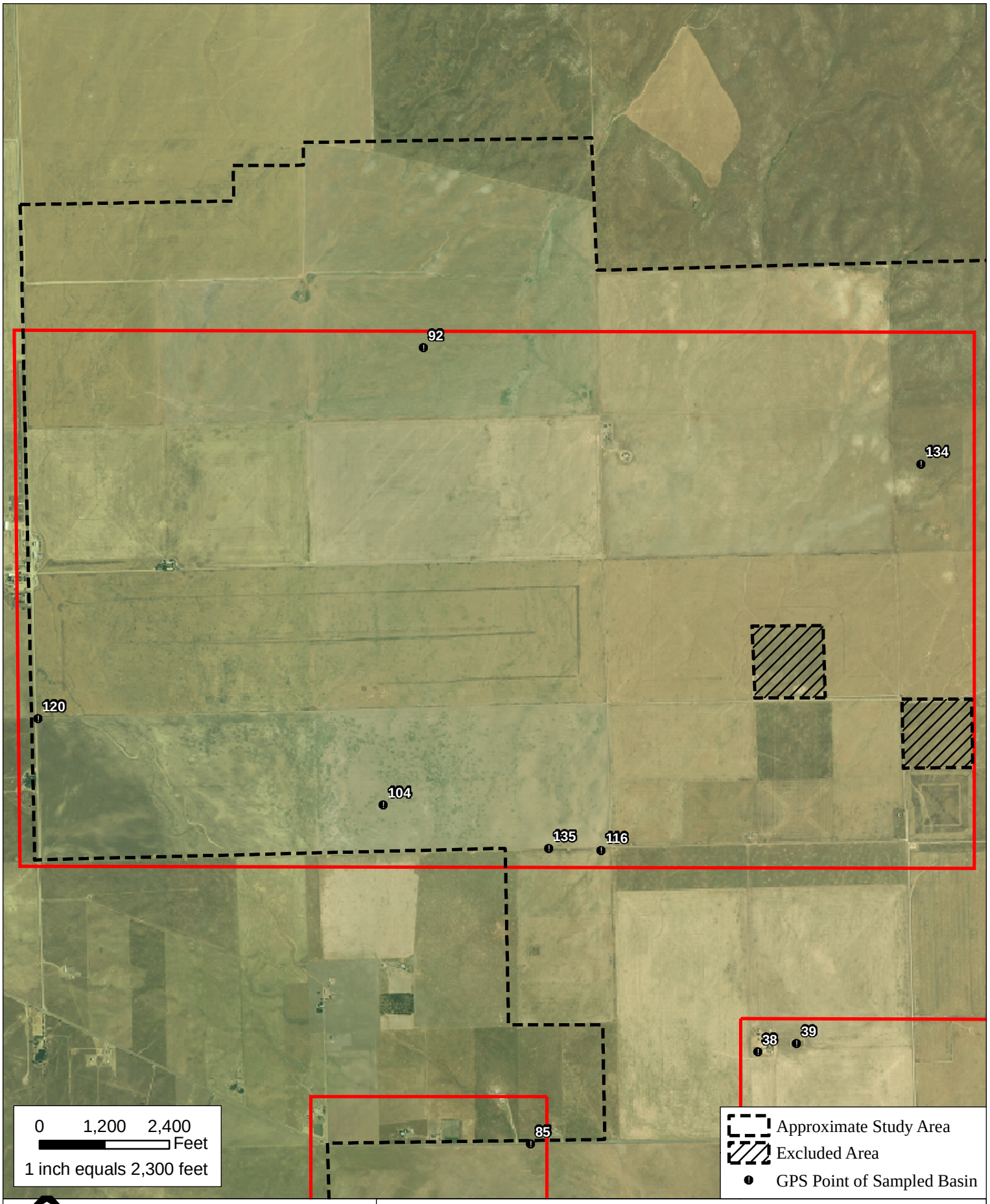



Prepared By: HELM Biological Consulting, 2273 Nolen Drive, Lincoln, CA 95648

Date: 7-27-10

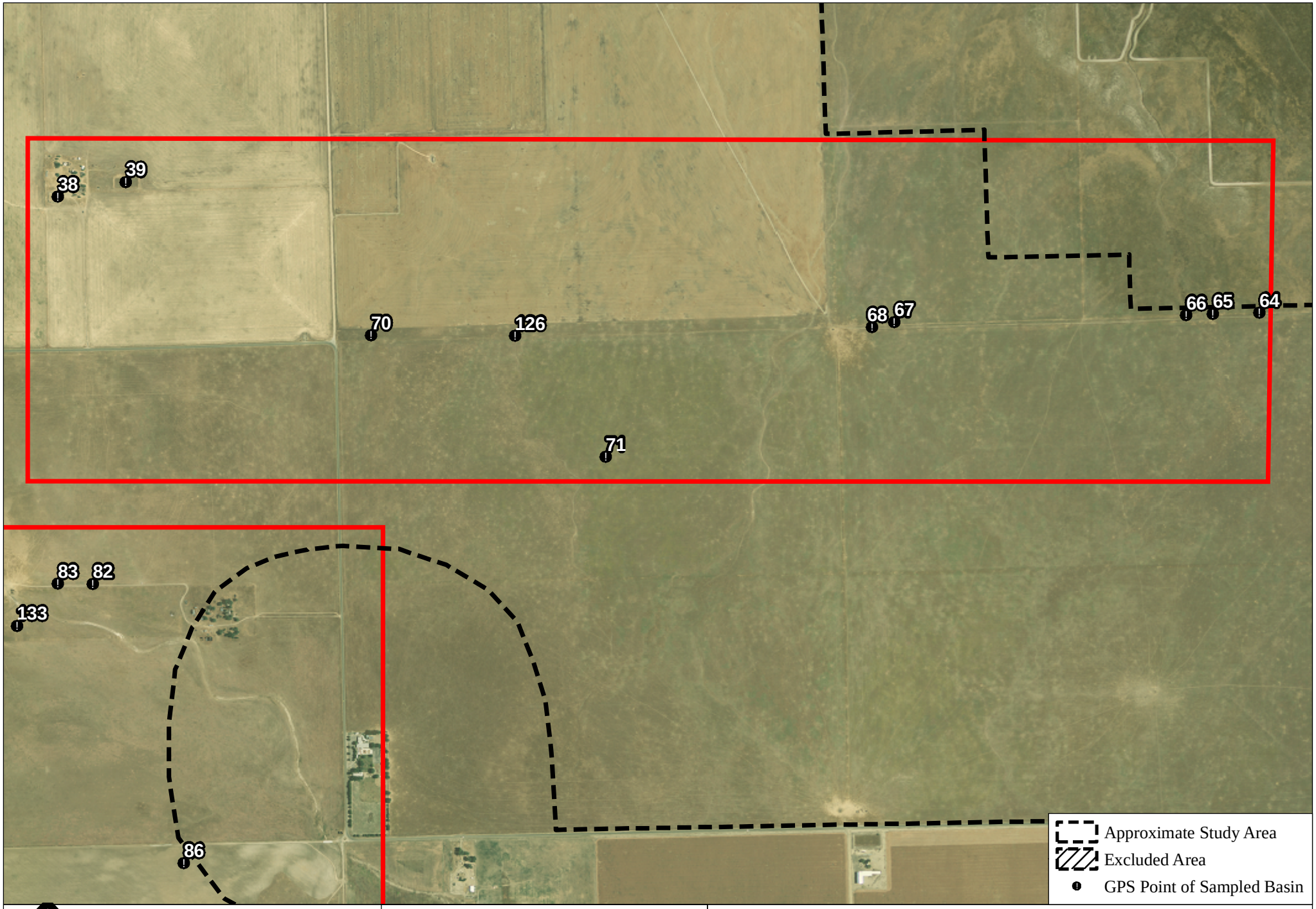
(Aerial Photograph Provided by NAIP 2005)

**Figure 2. Federally Listed Large Branchiopod Dry-Season Sampling (2010) Overview Map at the Proposed Topaz Solar Farm**




Prepared By: HELM Biological Consulting
2273 Nolen Drive, Lincoln, CA 95648
Date: 7-27-10
(Aerial Photograph Provided by NAIP 2005)

**Figure 3. Basins Dry-Season Sampled (2010) for Federally Listed Large Branchiopods at the Proposed Topaz Solar Farm**



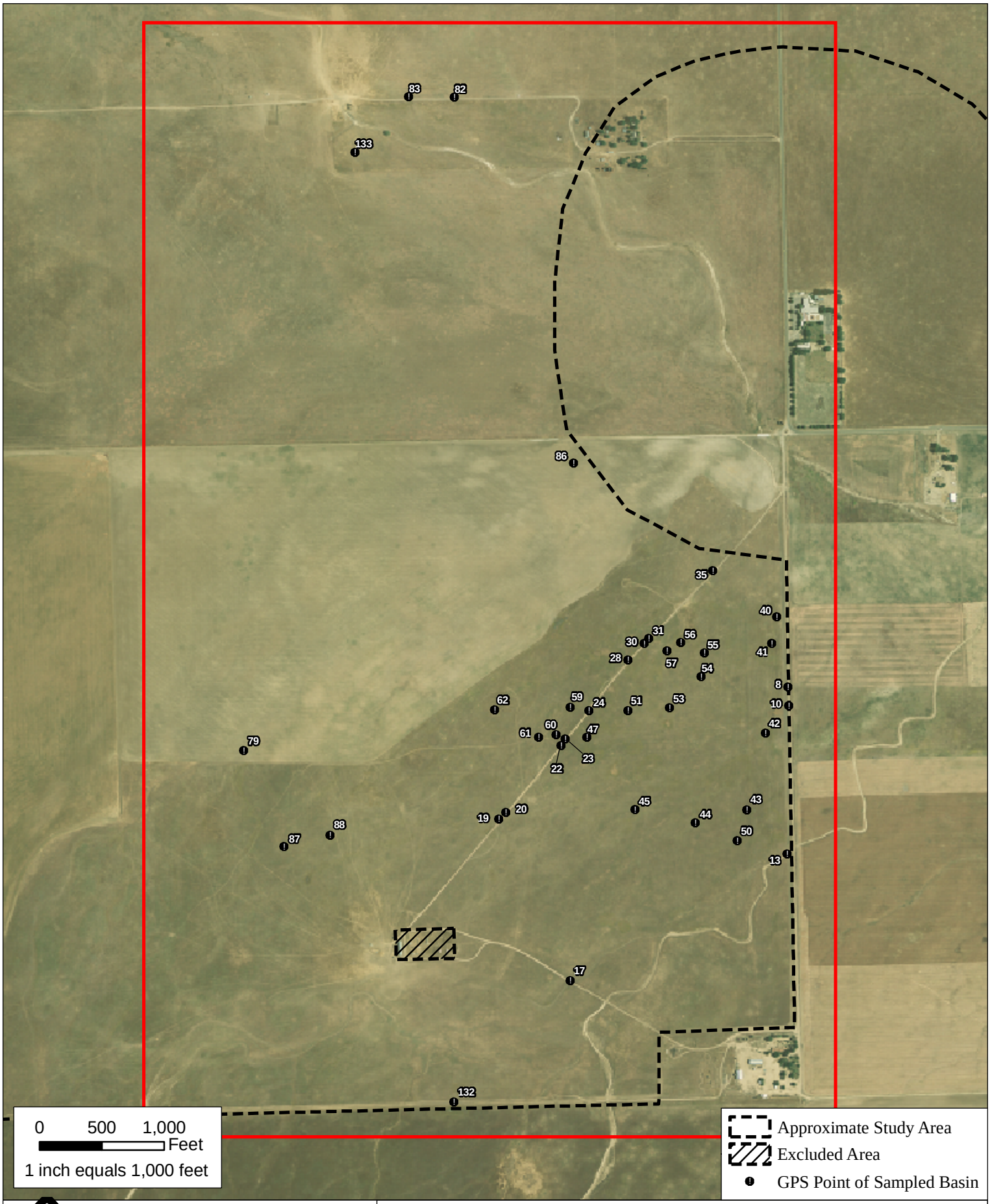

**Prepared By:** HELM Biological Consulting
2273 Nolen Drive, Lincoln, CA 95648
Date: 7-27-10

(Aerial Photograph Provided by NAIP 2005)

0 650 1,300 Feet

1 inch equals 1,300 feet

**Figure 4. Basins Dry-Season Sampled (2010) for Federally Listed Large Branchiopods at the Proposed Topaz Solar Farm**




Prepared By: HELM Biological Consulting
2273 Nolen Drive, Lincoln, CA 95648
Date: 7-27-10
(Aerial Photograph Provided by NAIP 2005)

**Figure 5. Basins Dry-Season Sampled (2010) for Federally Listed Large Branchiopods at the Proposed Topaz Solar Farm**




Prepared By: HELM BIOLOGICAL CONSULTING
2273 Nolen Drive, Lincoln, CA 95648
Date: 7-27-10
(Aerial Photograph Provided by NAIP 2005)

**Figure 6. Basins Dry-Season Sampled (2010) for Federally Listed Large Branchiopods at the Proposed Topaz Solar Farm**

Table 1. Results of Soil Examinations

| Basin No. | Insect Exo Skeletons | Micro-Turbellaria Cysts | Cladocera Ephippia | Ostracods Live/Cysts/ Carapaces | Large Branchiopod Cysts *Branchinecta* sp. |
|---|---|---|---|---|---|
| 8 | X | | | | 2 |
| 10 | X | | | | 1 |
| 13 | | | | | |
| 17 | X | | | | |
| 19 | | | | | |
| 20 | | | X | | |
| 22 | | | | | |
| 23 | X | | | | 2 |
| 24 | X | X | | | 12 |
| 28 | | | | | 4 |
| 30 | X | | | | |
| 31 | X | X | | | 1 |
| 35 | X | | | | 1 |
| 39 | X | X | X | | |
| 40 | X | | | | 1 |
| 41 | X | | | | >50 |
| 42 | X | | | | approx. 20 |
| 43 | X | | | | >100 |
| 44 | X | | | | approx. 30 |
| 45 | X | | | | |
| 47 | X | | X | | >100 |
| 50 | X | | | | 14 |
| 51 | X | X | | | |
| 53 | X | | X | | >100 |
| 54 | X | | | | |
| 55 | X | | | | approx. 20 |
| 56 | X | | | | >50 |
| 57 | X | | | | 17 |
| 59 | | | | | |
| 60 | X | | | | 2 |
| 61 | X | | | | |
| 62 | X | | | | 2 |
| 64 | X | | | | |
| 65 | X | | | | |
| 66 | X | X | | | 1 |
| 67 | X | X | X | | >100 |
| 68 | X | | | | approx. 30 |
| 69 | X | | | | |
| 70 | X | | | | |
| 71 | X | | | | |
| 79 | X | X | | | 1 |
| 82 | | | | | |
| 83 | X | | | | |
| 85 | X | | | | |
| 86 | X | | X | | 19 |
| 87 | X | | | | >100 |
| 88 | X | | | | >100 |
| 92 | | | | | |
| 104 | X | | | | 8 |
| 116 | X | | | | |
| 120 | X | X | X | X | >50 |
| 126 | X | | | | |
| 132 | X | | | | approx. 30 |
| 133 | | | | | |
| 134 | X | | | | |
| 135 | X | | | | >50 |

# APPENDIX A. USFWS AUTHORIZATION LETTER

## SmartZone Communications Center

tfwood@comcast.net

+ Font size -

# Authorization to conduct dry season survey of VPb at the proposed Topaz Solar Farm site

**From :** David Kelly <David_Kelly@fws.gov> Wed Jul 21 2010 9:24:17 AM

**Subject :** Authorization to conduct dry season survey of VPb at the proposed Topaz Solar Farm site

**To :** BHelm69485@aol.com, tfwood@comcast.net

**Cc :** Kenneth Sanchez <Kenneth_Sanchez@fws.gov>, Michael Welsh <Michael_Welsh@fws.gov>, Josh Hull <Josh_Hull@fws.gov>

Brent Helm and Todd Wood,

By this email message, you are authorized to conduct a dry season survey for federally-listed vernal pool branchiopods, per the conditions of recovery permit, TE-795930, and as specified in your July 19, 2010 request letter. The surveys will be conducted at the proposed Topaz Solar Farm site in San Luis Obispo County, California. Your request is to sample from depressional seasonal wetlands, including vernal pools and swales located on-site that are within areas not previously considered for use in the solar project. Surveys may be conducted within each of the features within the described property. Additional wetland features identified on site that may provide suitable vernal pool crustacean habitat may also be sampled under this authorization.

Please remember to carry a copy of your permit while doing the work, and to follow the terms and conditions of the permit and the survey guidelines, including the reporting requirements. In your report, please include which surveys were authorized, the names of all persons involved in the surveys, their recovery permit numbers, if applicable, and the date of this authorization, to help ensure that we correctly record the fulfillment of the reporting requirement under this authorization. Please let us know if the surveys are not performed as authorized, or if they are done by a different permittee under a separate authorization. Please note that federally listed vernal pool branchiopods have been found at the project site during previous surveys and a negative finding from this survey may not be used to conclude an absence of listed branchiopods at this site.

Please send one copy of the report(s) to David Kelly, of our Recovery Branch, and send a separate copy to Ken Sanchez.

Please reference Service File No. 81420-2009-TA-0208 in all future correspondence with this office regarding this authorization.

David Lee Kelly
Biologist, Recovery Branch
US Fish and Wildlife Service
2800 Cottage Way, W-2605
Sacramento, CA 95825
Ph. (916) 414-6492

# APPENDIX B. REPRESENTATIVE PHOTOGRAPHS



Proposed Topaz Solar Farm – Basin 86



Proposed Topaz Solar Farm – Basin 69



Proposed Topaz Solar Farm – Basin 8



Proposed Topaz Solar Farm – Basin 13



Proposed Topaz Solar Farm – Basin 132



Proposed Topaz Solar Farm – Basin 88



Proposed Topaz Solar Farm – Basin 20



Proposed Topaz Solar Farm – Basin 47



Proposed Topaz Solar Farm – Basin 41



Proposed Topaz Solar Farm – Basin 50



Proposed Topaz Solar Farm – Basin 51



Proposed Topaz Solar Farm – Basin 53

# SAN JOAQUIN KIT FOX
# CONSERVATION AND MONITORING PLAN

# Topaz Solar Farm

# San Joaquin Kit Fox Conservation and Monitoring Plan



**Althouse and Meade, Inc.**

**1602 Spring Street**

**Paso Robles, CA 93446**

**805-237-9626**

**June 5, 2011**

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# Synopsis

The Topaz Solar Farm (TSF) Project (Project) is a 550 megawatt photovoltaic (PV) power facility proposed by Topaz Solar Farms LLC (Applicant) that would be constructed on approximately 3,500 acres of land in the northern California Valley area of the Carrizo Plain in San Luis Obispo County (Figure 1). A Final Environmental Impact Report (FEIR) is currently being prepared by San Luis Obispo County that includes two TSF Project layout options: Option A and Option B, and several alternatives, including Alternative 3B.1. In addition, the U.S. Department of Energy (DOE) is currently preparing a Draft Environmental Impact Statement (EIS) that will evaluate Option A and Option B within two alternative study areas

Alternative 3B.1 is a 3,520 acre environmentally superior alternative that is an alternative to the Option A layout, and is situated within the Option A Study Area. The total land area included in baseline studies conducted for this report includes the combined Option A and Option B Project Study Areas (together, referred to as Project Site) of approximately 9,700 acres (refer to Figure 2). This San Joaquin Kit Fox Conservation and Monitoring Plan (CMP) provides conservation measures that address effects to this federally listed species that may result from installation and operation of Alternative 3B.1.

*The San Joaquin Kit Fox*

The San Joaquin kit fox (*Vulpes macrotis mutica*) is a federally listed endangered and state listed threatened species that is known to inhabit the Project Site. Kit fox presence was verified by DNA analysis of fecal samples (scat) collected throughout the Project Site (Althouse and Meade 2010a; Smith 2010; Smith 2011; Maldonado 2010; Maldonado 2011). Kit fox presence was also assessed by direct observations of kit fox at active dens, remote camera capture of kit fox, and occurrence of active and inactive dens observed during transect surveys (Althouse and Meade, Inc. 2010a).

The Project Site is located near the Carrizo Plain National Monument core SJKF population, which is one of three core populations in California. All three core populations are geographically distinct, and together with about a dozen smaller satellite populations comprise the entire SJKF metapopulation. The United States Fish and Wildlife Service (USFWS) recognizes that recovery of the SJKF requires simultaneous action on two tracks: 1) habitat protection and enhancement of core populations and movement corridors, and 2) continued research on population ecology and management strategies (USFWS 1998). The CMP proposes measures to meet both of these goals within and in the vicinity of the TSF Project by establishing prescribed management for

kit fox on thousands of acres and conducting an innovative scat study of the kit fox population as part of the kit fox monitoring program (Section 6.4.13).

*Conservation Strategy*

The TSF Project could potentially result in adverse effects to the SJKF and its habitat. To off-set the potentially adverse effects of the project on SJKF, the Applicant has worked with regional SJKF experts (the TSF Project Kit Fox Conservation Team) to develop a multi-level conservation strategy that consists of avoiding and minimizing Project effects on SJKF by utilizing SJKF friendly design features, implementing a SJKF protection plan during construction, installing on-site habitat enhancements, monitoring on-site kit fox, and protecting off-site SJKF habitat in perpetuity.

The multi-level conservation strategy protects kit fox during construction, provides movement corridors and porous boundaries to facilitate long-range dispersal and short-range movements through and around the TSF Project, and provides a safe haven for SJKF habitation within the TSF Project footprint. It also contemplates conservation of off-site lands to compensate for actual and potential loss of usable SJKF habitat. Some of these off-site lands provided for SJKF conservation may also meet conservation goals for other rare and endangered species, assuming the land is compatible for multiple species. A monitoring and research program to track SJKF use of the TSF Project described in this document will provide important information for management of SJKF on the TSF Project lands. This strategy is consistent with USFWS recovery goals for SJKF.

*SJKF Design Features*

Early in the planning process the Applicant decided to design a project to accommodate SJKF movement through, and habitation within, the TSF Project footprint. Consultation with the TSF Project Kit Fox Conservation Team confirmed that it would be possible to create a porous TSF Project design to achieve these goals. The TSF Project description in this document includes detailed information on fence design, kit fox passages, kit fox dens, predator exclusion, and movement corridors. These are considered Applicant Proposed Measures (APMs) in the TSF Project's EIS being prepared during the National Environmental Policy Act (NEPA) process and in the FEIR being prepared in the California Environmental Quality Act (CEQA) process.

*SJKF Protection Plan*

Since SJKF are known to occupy the Project Site, construction of the TSF Project potentially could result in take of kit fox. A thorough SJKF Protection Plan is provided within this document that outlines a phased pre-construction survey approach to identify areas of kit fox activity in proposed construction blocks to facilitate construction planning. Also included in the SJKF Protection Plan are details regarding setbacks from

occupied dens, on-site biological monitoring, and an array of daily construction requirements to minimize the potential for take of SJKF.

*On-Site Habitat Enhancements*

The passive nature of the TSF Project provides opportunity for SJKF to inhabit the solar array areas. To increase the potential for SJKF habitation of the TSF Project site, the TSF Project Kit Fox Conservation Team developed a suite of on-site habitat enhancement features designed to provide SJKF with a safe haven with natural vegetation, sufficient prey base, and a variety of permanent and artificial denning structures.

*Off-Site Conservation*

The TSF Project has an estimated operational period of 25 years or more. At the end of the operational period, it is possible that the Project would be repowered for an additional operational term. After the productive life of the TSF Project, the solar facility and associated infrastructure would be removed. During the operational period, the Applicant intends to facilitate habitation of SJKF within the Project's fenced area, thereby reducing the potential negative effect of the TSF Project on SJKF. Nevertheless, the TSF Project could result in loss or degradation of SJKF habitat during the operational period. Conservation for potential loss or degradation of SJKF habitat would be achieved by offsite conservation easements or land purchases to protect in perpetuity suitable SJKF habitat in the Carrizo Plain core population region. Offsite conservation lands would be acquired in sufficient quantity and quality to fully compensate for habitat impacts resulting from the TSF Project installation.

*Monitoring Plan*

Monitoring of SJKF within the TSF Project would be conducted as part of the Project conditions of approval included with a Conditional Use Permit to be issued by the County of San Luis Obispo. Monitoring would be sufficient to track use of the solar array areas by kit fox and provide current information to TSF Project management so that kit fox dens could be avoided and animals protected.

# 1.0 Introduction

Topaz Solar Farms, LLC (the Applicant) is proposing to construct a 550 megawatt photovoltaic power facility (the TSF Project) on approximately 3,520 acres in the northern California Valley area of the Carrizo Plain (Figure 1, Section 7.0). The TSF Project would be built in a location where San Joaquin kit fox, a federally endangered and state threatened species, occurs. Alternative 3B.1, the environmentally superior Project alternative designed by the Applicant at the request of the County and wildlife agencies, avoids kit fox natal dens and high use areas. In addition, the Applicant proposes to avoid, minimize and compensate for any potential effects on kit fox caused by the TSF Project construction, operation and decommissioning. This Conservation and Monitoring Plan (CMP) provides information regarding assessment of Project effects on San Joaquin kit fox, and includes conservation measures and recommendations to reduce Project effects on San Joaquin kit fox.

There are two proposed Project Options being evaluated in the Environmental Impact Statement (EIS) (EMPSI 2011): Option A and Option B. Alternative 3B.1, which is located entirely within the Option A Study Area, is a Project alternative that was developed by the Applicant at the request of the County of San Luis Obispo (County) after preparation of the Draft Environmental Impact Report in response to input provided by local, state, and federal agencies. Options A and B and Alternative 3B.1 are among the alternatives that are included in the Final EIR being proposed by the County. Alternative 3B.1 is the environmentally superior alternative. Therefore, this CMP considers impacts and conservation measures applicable to Alternative 3B.1.

## 1.1 Authorship

This Conservation and Monitoring Plan was produced by Daniel E. Meade, Ph.D., Principal Scientist at Althouse and Meade, Inc., in collaboration with three kit fox experts (the TSF Project Kit Fox Conservation Team): Brian Cypher, Ph.D., Associate Director and Research Ecologist, Endangered Species Recovery Program, California State University, Stanislaus; Paul W. Collins, Curator of Vertebrate Zoology, Santa Barbara Museum of Natural History; and Thomas E. Olson, M.S., Wildlife Biologist, Thomas Olson Biological Consulting.

# 2.0 Habitat Assessment

## 2.1 Regional Population

The Carrizo Plain National Monument supports one of three core populations of San Joaquin kit fox. Potential effects of the proposed TSF Project could include disruption of kit fox activities on the Project site during construction, reduction in available habitat following construction due to infrastructure (buildings, inverter pads, posts), reduction in use of grassland/grazing land due to the presence of the solar arrays, and change in movement patterns across the Project's array areas. A potential beneficial effect may be the discontinuation of farming on the Project site.

One concern regarding the regional population is whether the presence of the TSF Project would block or significantly alter movement patterns of kit fox as they disperse from the core population area into other areas. The USFWS San Joaquin Kit Fox Recovery Plan (Recovery Plan) identifies three core areas: Carrizo Plain, Western Kern County, and Ciervo-Panoche area. A recovery action identified in the Recovery Plan is to "protect and enhance corridors of movement of kit foxes through the Salinas-Pajaro Region and from the Salinas Valley to the Carrizo Plain and San Joaquin Valley." Although paths taken by dispersing kit fox are not well understood, nor is the dispersal range well documented, it is most likely important that the northern Carrizo Plain not be blocked for kit fox movement. A few kit foxes have been detected in the Shandon area, near the San Juan Creek to the northwest of the site, and north of the site on Pinole Ranch. Kit fox are present along Bitterwater Valley Road and in the Bitterwater Valley, although it is not known how many of these foxes are resident, or whether they more frequently connect with closer fox populations to the east, rather than with the Carrizo population to the south.

Movement opportunity around the TSF Project would continue to be present after the Project is built, and the site would have improvements to enhance kit fox movement and survival. Improvements would include removal of some existing fencing that could inhibit kit fox movement, and installation of escape dens. Examples of existing fencing that would be removed from the TSF Project site include approximately 12,000 feet of cyclone fence around the former Arco solar farm site within Section 27. Fencing would be installed around all of the solar arrays and would have a five to six inch gap at the base for the entire length of the fence to allow kit fox passage, while excluding larger canids (refer to Figure 10 for the proposed perimeter fence design and Appendix A for a study on kit fox fencing). Escape dens would also be provided both outside and inside of the array areas.

Habitat within the Project area is in four classes: active cropland, recently fallowed cropland, grazing land dominated by non-grass species, and annual grassland dominated by introduced grass species.

## 2.2 Onsite Population

There is a high variation in habitat quality for kit fox utilization in the Project Site, ranging from good to poor. Areas in the northwest portion of the Project Site, consisting of Sections 17, 18, 19, 20, 21 and portions of Sections 7 and 8, are poor quality. These parcels have been in cropland production for about 70 years. Better quality habitat occurs in the eastern and southern portions of the Project Site consisting of all or portions of Sections 22, 26, 27, 28, 34, 35, 4 and 5. These areas contain habitat that has not been cropped for up to 25 years. Sections 34 and 35 had relatively low abundance of kit fox prey, possibly due to grazing practices that reduce the naturalized seed crop. Sections 4 and 5 had low small mammal abundance that is partially attributable to a shallow to moderately deep bedrock layer (25 to 100 cm) that causes water to perch and flood burrows. These conditions seem to limit small mammals from being able to establish populations on these Sections despite the absence of tilled agriculture for more than 25 years. Although prey abundance was low on Sections 4 and 5, several kit fox dens were detected there. Section 16 is improving grassland habitat following the end of crop production in 2006, and Section 15 contains good grassland habitat. The location of kit fox sign is consistent with habitat quality in the Project Site (Figures 3 and 4).

Presence of San Joaquin kit fox in the Project Site was examined by two scat surveys, one conducted in 2009 and one conducted in 2010 by Dr. Debbie Smith and Alice Whitelaw of Working Dogs for Conservation Foundation (Smith and Whitelaw 2010a; Smith and Whitelaw 2011), and DNA analysis by Dr. Jesus Maldonado and Tammy Henry at the Center for Conservation and Evolutionary Genetics, Smithsonian Institution (Maldonado 2010; Maldonado 2011). A total of 64.19 miles (103.31 kilometers) of transects were surveyed in 2009, and 67.13 miles (108.04 km) were surveyed in 2010 using dogs trained to locate kit fox scat. The 2010 surveys included an additional 10.9 miles (17.55 km) of surveys outside of the Project Site to inspect potential conservation land. Survey routes for both 2009 and 2010 were determined by Dr. Smith to provide complete coverage of the Project Site, and detect scat of every kit fox that utilized the property during the eight day survey period.

In 2009, the survey was separated into two parts, one in August and September 2009 and one in November 2009. Scat locations were determined with hand held GPS units. A total of 414 kit fox scats were detected. One-hundred fifty-three (153) fresh scats (eight days old or less) were collected and sent to the genetics laboratory at the Smithsonian Institution, National Zoological Park in Washington, D.C. for analysis. Coordinates of each scat sample collected were entered into a GIS map of the Project Site (refer to Smith 2010, in Althouse and Meade, Inc. 2010b).

A repetition of the kit fox scat survey was conducted in November 2010 to track the baseline kit fox population. The 2010 survey was not separated over time as in 2009. Since the 2009 scat surveys were completed for different portions of the Project Site a

few months apart, the August/September 2009 survey likely included many kit fox pups that had not yet dispersed, while the November 2009 survey likely occurred after some pups had either dispersed or died. November is a more appropriate time of year to determine a baseline number of resident kit fox because dispersal and early mortality are more likely to have occurred and breeding foxes are not yet sequestered in their dens (Cypher et al. 2000, Smith 2010 pers. com). A November survey from year to year is more likely to have lower variability, can be more easily repeated, and provides a better picture of how many resident foxes are supported. In addition, because the 2009 survey was necessarily split between August and November, the calculation of population size using the capture-recapture methodology could not be performed since a split study period is not consistent with statistical assumptions of that analysis. A one bout scat survey allows calculation of population size.

The number of fresh kit fox scats detected in the November 2010 survey was 63, and there were 199 old scats found. Results for individual genetic identity found seven individual kit fox within the Project Site. An additional four individuals were found on the Little San Juan Ranch property east of the Project Site, and two individuals were found higher in the Temblor range on the Thorup property, within 460 yards of the main ridge of the mountains (Figure 4). Three individuals found in 2009 were detected again in 2010; two still on the Topaz Project Site and one on the Little San Juan Ranch property. The 2010 scat survey found less than half the number of scat as were found in 2009, reflecting the time of the year (November) that the survey was conducted (the 2010 survey did not include an August to September survey). Results of the genetic analysis will provide additional information regarding population structure in the Project Site and will be used to establish the baseline kit fox population.

Both the 2009 and 2010 scat studies found evidence of kit fox predominately on eastern and southern areas of the Project Site (Figures 3a, 3b and 4). Other areas of the Project Site had fewer detections (one or more scats), and Sections 7, 16, 17 and 18 in the northern and western portion of the Project Site had no detections in 2009. In 2010, there were no detections in Sections7, 8, 16, 17, 18 19, 20, 21, 22, 28, and 29.

The 2009 scat surveys were conducted from August 18 through September 1, and from November 11 - 21. The August survey period occurred during a time when annual population numbers tend to be high, and when family groups are still together prior to dispersal (Brian Cypher, pers. com. 2010; Maldonado 2010).

A total of 19 individual kit fox were detected within the survey area in the 2009 survey. After field work was conducted, a portion of the survey area was removed from potential project use, leaving 18 individual foxes detected within the current Project Site. Genetic analysis found that all 19 foxes were significantly related to other foxes in the study area. The genetic analysis allows potential family groups to be described. A potential family group was found centered near Section 22 that consisted of eight individuals (two parents

and six offspring). We observed this family during the spring and summer surveys, and observed at least three pups with parents in 2009. Local residents said there were four pups with this family in 2009, although we observed only three. Kit fox can have six pups in a litter (Cypher et al., 2000), and in some conditions as many as nine (Table 5.3 in Cypher 2010b), although average litter size on the Carrizo can be only two (White and Ralls 1993). However, additional individuals could have been previous year pups, including a helper offspring that is still part of the family group assisting with pups.

A second family group was detected in the southern portion of the Project Site. This group had nine related individuals with two different matings by one male fox. Three of these individuals were also strongly related to the first family group. One mother was detected in Section 26, and another mother in Section 5. Offspring are likely from the same father, who was detected in Section 4. Another group of four individuals was related to the second family group through a male fox. The high degree of relatedness suggests that the number of foxes detected in the Project Site includes offspring prior to dispersal.

Future surveys should also be conducted during the same time of year (November), so that results are comparable to the baseline condition established prior to construction.

Of these eighteen foxes occurring within the Project Site in 2009, three were detected ten or more times, eight were detected five to nine times, and seven were detected one to four times. There were no detections of transient foxes that were not related to the residents. The foxes that were detected only one to four times may have most of their home range outside the Project Site.

In 2009, 14 individual kit foxes were detected within and adjacent to TSF Project Alternative 3B.1 (Figure 4). The 2009 scat detections in Alternative 3B.1 were in the southern two-thirds of the Project, with no detections in the Project area north of the high-voltage power lines along Tracy Lane. Scat survey detections in 2010 were in the southern third of the Project with the exception of one detection along Tracy Lane above section 27. Other scat detections were east of Alternative 3B.1 in Sections 34 and 35. The northwest portion of the Project Site, where active croplands are dominant, had no detections of kit fox (Figure 3a). The survey results demonstrate that kit fox utilize the Project Site, with most activity occurring in the southern and eastern portions.

Since the end of the 2009 scat survey, we found the remains of two kit fox (cause of morality unknown) within the Project Site, located in sections 33 and 27. Kit fox juvenile survival reported for the Carrizo Plain is 64 percent, ranging from 50 percent to 74 percent for the years 1989 – 1991 (Cypher 2010). In Lokern, a wide range of juvenile survival has been documented ranging between 20 percent and 81 percent (Cypher et al. 2000). Factors contributing to kit fox survival include precipitation amounts and prey availability (Cypher et al. 2000, Cypher 2010).

The 2010 survey of the Project Site was conducted from November 2 through November 17, 2010. A total of seven individual kit fox were detected within the Project Site in the 2010 survey. Four females and three males were detected. Two of the individual foxes, a male (TZ01) and a female (TZ02), found within the Project Sites were also found by the 2009 survey. These two foxes were highly related, and are likely brother and sister. Both of these foxes (TZ01 and TZ02) and one more fox (TZ24) were detected within the proposed solar array areas; the other four foxes were detected within the Project Site, but outside of the proposed solar array areas.

Of the seven foxes occurring within the Project Site in 2010, two were detected ten or more times, two were detected five to nine times, and three were detected one to four times. The three foxes detected within the proposed solar array areas were found four, six, and seven times. These foxes were all detected in the southern portion of the 3B.1 project layout in Sections 4 and 5.

The 2010 survey results support the conclusion that many of the kit fox individuals detected in 2009 were pups and relatives of two to three pairs that since have dispersed or died. Seven kit fox were detected in November 2010 that represent the kit fox population in the Project Site area following pup dispersal and/or mortality.

Prey abundance is directly related to abundance and reproductive success of SJKF (Egoscue 1975). Prey abundance was generally low across the Project Site as determined by small mammal trapping (URS 2008, Vanherweg 2008, Collins 2009, Collins 2010). Trap success, the ratio of captures to trap nights, was approximately 5% in 2008 (1600 trap nights), 11.78% in 2009 (720 trap nights), and 5.56% in 2010 (1220 trap nights), all of which are extremely low. Capture rates for small mammal trappings in the Cuyama area within a few days of the 2010 TSF Project study were 62.5% (Paul Collins, pers. com). Normal capture rates for small mammals in valley grassland and grassland-scrub habitats in the region can range from 25%-60% on untilled lands (P. Collins, unpubl. data). This capture rate drops off dramatically depending on the subject property's frequency of tilling, intensity of grazing, and time since it was last tilled. Small mammal abundance is also affected by season of the year, with highest abundance in late spring and summer following the recruitment of young. Trapping studies were conducted on the Project Site in August 2008, September 2009, and April 2010. Trap success increases in these dry grasslands as grazing intensity declines and thatch accumulates in the habitat.

Vegetation types within the 9,700-acre Project Site include cropland (6,205 acres), California annual grassland (3,463 acres), vernal pool (2.12 acres), ephemeral wetland depression (0.7 acres), natural non-wetland pool (0.7 acres), anthropogenic non-wetland pool (0.77 acres), agricultural reservoir (0.04 acres) and anthropogenic (28 acres). Kit fox primarily utilize two of these habitat types: croplands and California annual grasslands. Cropland areas within the Project Site are typically plowed every year and planted to crops on alternate years. After harvest, the croplands are grazed by cattle.

Grazing land and grasslands are grazed by stock every year (every three years for lands in the Conservation Reserve Program). Different dominant vegetation types occur in parcels that are heavily grazed (see Photo 1, below) and parcels that are not heavily grazed (Photo 2). Plant diversity in heavily grazed parcels is low, with little grass across many acres in 2010. Within the Project Site, cropland and fallow cropland habitat types had few SJKF detections, while areas near grazing/pasture land and annual grassland had more SJKF detections.

In the Carrizo Plain region, kit fox density is estimated to be one fox pair per 3 to 6 square miles in average habitat areas and one pair per 2 square miles in highest quality habitat area (Brian Cypher, pers. com.). Factors controlling kit fox density include territorial spacing, the ratio of adults to juveniles, and food availability (White and Garrott 1999; Cypher, B.L. et al. 2000). During the spring and summer, each kit fox pair can typically have a family group consisting of three pups and a helper offspring, or six foxes.

Agricultural and grazing operations appear to have reduced habitat value for SJKF within the Project Site. The ongoing cropland disturbance regime consisting of plowing, spraying, harvesting, heavy grazing of stubble (remnant vegetation after harvest), and plowing appears to bias utilization of the Project Site by kit fox to the eastern and southern portions (Figures 3a, 3b, and 4). Cropland on the Project Site provides usable habitat for kit for movement and some prey (e.g. ground squirrels), but is not equivalent to natural grassland with respect to prey diversity and abundance, denning opportunities, or protection from predators and disturbance.

The conservation measures proposed by the Applicant for long-term impacts to kit fox may result in an equivalent or greater number of kit fox utilizing the TSF Project Site after construction as before construction, with no adverse affect to kit fox connectivity or off-site kit fox populations. If an equivalent number of kit fox do not utilize the TSF Project site after construction, offsite conservation areas would supplement or enhance kit fox abundance to achieve an equivalent population of kit fox as were present before TSF Project site disturbance.

The conservation and enhancement of land proposed by the Applicant would permanently protect a movement corridor east of the Project, from the vicinity of Highway 58 to the northwest edge of the Carrizo Plain. This conservation measure would protect lands from detrimental land uses or installation of barriers, and would provide certainty that a wildlife movement path will remain open. In combination with proposed enhancement, the Applicant would reclaim thousands of acres currently in crop production and convert it to natural grassland, a significant improvement to habitat and a beneficial effect for kit fox.



Photo 1. Section 35, eastern portion, dominated by *Erodium cicutarium* (filaree). Photo taken March 12, 2010. Example of area that has been grazed for many years.



Photo 2. Section 28, dominated by *Hordeum murinum* (foxtail barley) and *Vulpia myuros* (rat-tail fescue). Photo taken March 15, 2010. Example of area not heavily grazed.

# 3.0 SJKF Protection and Enhancement Design Features

A primary goal of TSF Project design and construction methodology is to avoid take of kit fox. Project design incorporates the following measures to reduce the impact on San Joaquin kit fox:

- Perimeter fencing around solar arrays would be constructed to provide a 5 to 6 inch gap at the bottom for the entire length of the fence (Figure 10). This will provide excellent kit fox passage into and through the TSF Project. No interior fences within the perimeter fencing would be present.
- Construction activities would be adjusted to avoid active dens.
- Escape dens would be located both inside and outside the Project fences.
- Artificial dens capable of supporting kit fox pairs and pups would be located in every section (or square mile) of TSF Project.
- Solar arrays mounted on steel posts with lower edge of modules at least 18 inches above the ground to would allow kit foxes to see under the arrays.
- The ground under and between the solar arrays would be vegetated with a dominant cover of grasses and herbs to promote a more natural habitat that supports kit fox prey. Vegetation height would be controlled by pulse grazing sheep or other means not hazardous to kit fox.
- Cross fencing and wildlife wire fencing would be removed from corridors outside of the solar arrays where feasible.
- The TSF Project would reduce cropland production that regularly disturbs the land by plowing, seeding, harvesting, and spraying, and is therefore currently dangerous to kit fox. Kit fox use may increase with change from cultivated agriculture to the TSF Project.

# 4.0 Impact Assessment

The TSF Project potentially would have short-term and long-term effects on San Joaquin kit fox. Potential short-term effects are likely to include displacement of foxes from portions of the Project where they are known to be present, changes in daily movement and hunting patterns of individual foxes, removal of denning sites, and potential injury or death to individual kit foxes due to construction activities. Potential long-term effects include a change in the habitat structure in the area which could alternatively result in, 1) a decrease in kit fox numbers utilizing the TSF Project lands, 2) maintenance of kit fox numbers using the TSF Project lands, or 3) an increase in kit fox numbers using the TSF Project lands. A decrease in kit fox numbers would result if rodent populations decrease in the TSF Project's solar array areas or the surrounding grasslands, if active burrows and dens are filled, or if foxes do not den near solar arrays. An increase in kit fox numbers utilizing the TSF Project lands could occur if release from current farming operations creates usable habitat, if foxes adjust to solar arrays and take up residence within the array fences, if vegetative cover in the solar arrays is sufficient to support and increase rodent prey, and if array fencing provides a refuge to kit foxes from predation. The goal of this SJKF Conservation and Monitoring Plan is to facilitate the latter scenario. Kit foxes have successfully utilized other modified habitats (Cypher 2010), and examples of this are provided in Section 6.1, entitled "Examples of Habitat Enhancement Programs."

Blockage of movement pathways out of the Carrizo Plain could affect dispersing kit fox. Currently, kit fox occupy dens in the eastern and southern portions of the Project Site. Evidence of kit fox has been detected in the northwestern portion of the site but was far less frequent than in the southeast in 2009 (Figure 4), and was not found in 2010 (Figures 3a and 3b). Kit fox have been detected to the east of the Project (Figures 3a and 3b). Preservation of conservation land near the Project and the use of kit fox permeable fencing would ensure the preservation of these potential movement pathways for SJKF.

Potential short-term effects of the TSF Project:

- Ground disturbance includes limited grading, smoothing ground surface, driving support rods, assembling arrays, and trenching that could displace kit fox.
- Potential for SJKF take without careful monitoring
- Potential exclusion from work area during TSF Project construction
- Potential displacement of denning foxes

Potential long-term effects of the TSF Project:

- Could create safe haven for SJKF
- Vegetative cover could increase prey abundance for SJKF

- Change in the habitat structure in the area which could result in a decrease in kit fox numbers utilizing the TSF Project lands
- End of farming within the solar array and conservation areas would open many square miles for SJKF use and increase prey abundance
- Conservation easements on adjacent parcels would result in limiting agricultural uses to grazing, which would be beneficial rather than damaging to SJKF
- SJKF movement would not be blocked by fences
- Project kit fox enhancement measures
    - Artificial dens – as per Endangered Species Recovery Program (ESRP) guidelines
    - Escape dens – might also be used by other species, such as burrowing owl
    - Fencing that allows kit fox entrance but discourages entrance by coyotes

The TSF Project would utilize driven support posts for the PV modules that have eliminated any need for the previously proposed on-ground concrete ballasts. This would allow line of sight for small mammals and leave a greater area open for use within the solar arrays.

Fencing is intended to provide security for solar arrays and would consist of a six foot cyclone fence topped with barbed wire. A 5 to 6 inch gap would be created between two bottom rails, extending the entire length of the fence, for kit fox passage into and through the TSF Project (Figure 10).

Traffic increases from the TSF Project would occur during the construction phase. Construction traffic is estimated by the Applicant at 107 roundtrips per day, including six trips per day for gravel trucks traveling locally within the valley. Construction worker trips would total 78 per day. Trucks bringing material to the site would account for 29 trips per day. The DEIR Transportation chapter found that approximately 340 trips per day occurred along Highway 58 east of Bitterwater Road in the current condition. Since kit fox are nocturnal, remaining in or very close to their dens during the day, an increase in traffic during daylight hours would not result in an increase in kit fox mortality. This plan includes a recommendation to limit most worker and construction traffic to daylight hours.

## 4.1 Habitat Evaluation

Projects in San Luis Obispo County have utilized the San Joaquin Kit Fox Habitat Evaluation Form created by the California Department of Fish and Game (CDFG) in cooperation with USFWS to determine appropriate off-site conservation. Off-site conservation options for other projects have included acquisition of fee or a conservation easement of suitable kit fox habitat, or the purchase of kit fox credits in a kit fox conservation bank, or payment of an in-lieu fee. The SJKF Habitat Evaluation Form is

utilized to determine habitat quality on a project site. The land to be conserved is then calculated based on the project area actually removed from use by kit fox.

The TSF Project and its passive solar farm design are not typical of projects that have utilized the SJKF Habitat Evaluation Form. Therefore, an impact assessment specific to the TSF Project is appropriate.

To determine appropriate acreage for off-site conservation land the existing habitat type and proposed project use were examined. Areas that would be developed with TSF Project PV module posts, buildings, hard surface roads, inverter pads, and other hard surfaces would not be used by kit fox (unless they dig under edges). Areas under solar arrays are shaded and may be utilized but may not be as desirable as open areas. The entire fenced array area contains open space along the fence line and roads that may be utilized. Open space areas outside the perimeter fence are likely to be utilized. Each of these areas has a different probability of being utilized by kit fox. However, to provide a robust and conservative conservation program, all of the areas within the TSF Project fence are considered affected, and therefore are included in the calculation of conservation acres (Table 2).

The Project design has progressed through much iteration that incorporated agency input and reduced the overall footprint, concentrated arrays, and protected wildlife corridor areas to the east and west of the Project. The result is Alternative 3B.1, an improved design that reduces Project effects relative to previous designs. Tables 1 and 2 provide acreages for Alternative 3B.1, and for comparison, provide acreages for Options A and B.

The Alternative 3B.1 plan has a total area of approximately 3,520 acres. Cropland areas that will be converted to grassland habitat are 2,675 acres. Grassland habitat in the Project area totals 835 acres. Of the 835 acres of grassland within the Project, 535 acres are of low quality for San Joaquin kit fox due to farming in 2004 and 2005, and subsequent weedy vegetation.

TABLE 1. PROJECT AREA ACREAGES BY USE. Acreages may vary slightly on final plans. Lines 1, 3, and 5 include roads and electrical collection system lines outside of fences, monitoring and maintenance facility, substation, and switching station.

| | | **Option A acres** | **Option A % of fenced area** | **Option B acres** | **Option B % of fenced area** | **Alternative 3B.1 acres** (approximate) | **Alternative 3B.1 % of fenced area** |
|---|---|---|---|---|---|---|---|
| 1 | Area fenced* | 4,104 | 100.0% | 4,007 | 100.0% | 3,520 | 100.0% |
| 2 | Area of panels | 1,353 | 32.9% | 1,353 | 33.6% | 1,424 | 40.4% |
| 3 | Area within fence in cropland | 2,375 | 57.9% | 2,870 | 71.6% | 2,675 | 76.2% |
| 4 | Area of roads outside array fence | - | - | - | - | 13 | na |
| 5 | Area within fence in grassland | 1,719 | 41.9% | 1,124 | 28.1% | 835 | 23.5% |
| 6 | Area of arrays | 3,339 | 81.2% | 3,339 | 82.9% | 3,274 | 92.8% |
| 7 | Area of piles /fence posts | 4 | <0.1% | 4 | <0.1% | 4 | 0.1% |
| 8 | Area of substations, PCS's, PVCS's** | 15 | <0.4% | 15 | <0.4% | 15 | 0.4% |
| 9 | Area of roads | 42 | 1.0% | 65 | 1.6% | 71 | 2.0% |

*Also includes roads and power line areas outside of fences

**PCS = Power Conversion Stations. PVCS = Photo Voltaic Combining Switchgear housing. These project components are placed on concrete foundations within arrays.

Habitat protection and enhancement is a primary recovery action under the Recovery Plan (USFWS 1998, Recovery Plan, page 134). Appropriate land use management of kit fox habitat is essential for successful habitat protection and enhancement. The TSF Project proposes to acquire property by fee purchase or establish conservation easements that provide for appropriate management of land for the conservation of SJKF. Table 2 shows the acreages of each type of effect and the level of effect of the proposed TSF Project.

Proposed conservation ratios in Table 2 are based on recommendations provided in the Draft Environmental Impact Report (DEIR) for the TSF Project (Aspen 2010). Grassland is scored as 4 to 1 ratio and cropland is scored as a 1 to 1 ratio. In addition, because cropland near historic natal den locations could provide movement opportunity in some

seasons, and may provide some habitat value, those cropland areas within a three square mile area around kit fox natal dens observed in 2010 as shown in Figure C.6-4 of the DEIR are scored as 2 to 1 ratio conservation area.

Even though lands within the TSF Project array fences are likely to be utilized by SJKF, and may provide a refuge for SJKF that improves survival, acquisition of additional land for conservation is suggested as a contingency in case lower levels of use occur within the TSF Project fences than under current baseline conditions.

The County has calculated lands for mitigation under CEQA with the following formula: (A × 4) + (B × 1) - C + (C × 2) = Total Mitigation Acres, where A = impacted grassland acres, B = impacted cropland as shown on Figure C.6-4 of the DEIR, and C = impacted cropland acres within natal den territory as shown on Figure C.6-4 of the DEIR. CEQA mitigation requirements would be satisfied for Alternative 3B.1 with 6,512 acres of land (Table 2).

Lands outside of the array fence on parcels adjacent to the TSF Project will be enhanced and managed for SJKF use and are included in the Topaz compensation package. These lands are included in Table 3.

TABLE 2. PROJECT CONSERVATION RATIOS. Lines 1, 2, and 3 include roads and electrical collection system lines outside of fences, monitoring and maintenance facility, substation, and switching station.

| | **Impact level** | **Option A** | **Option B** | **Alternative 3B.1** | **Net effect** | **Ratio** | **Total Conservation Acres A, B, Alt 3B.1** |
|---|---|---|---|---|---|---|---|
| 1 | Land within fences in cropland (excludes acres in line 3) plus any Project components outside fences | 1,845 | 2,773 | 2,178 | Habitat may be improved for kit fox | 1:1 | A: 1,845<br>B: 2,773<br>3B.1: 2,178 |
| 2 | Land within fences in grassland | 1,719 | 1,124 | 835 | Habitat may be used by kit fox | 4:1 | A: 6,876<br>B: 4,496<br>3B.1: 3,340 |
| 3 | Land within fences in cropland near natal dens | 530 | 97 | 497 | Habitat may be used by kit fox | 2:1 | A: 1,060<br>B: 194<br>3B.1: 994 |
| 4 | Conservation land needed, sum | | | | Enhancement or protection | | A: 9,781<br>B: 7,463<br>3B.1: 6,512 |

The ratios presented in Table 2 are calculated based on recommendations in the EIR, and are not applicable to the "take" permit process through the USFWS and CDFG. They are presented here for information only. Refer to Section 5.5 (below) for conservation measures.

### 4.2 Temporary Impacts

Work activities that may occur outside of the array areas that cause minor disturbance, such as driving across grassland or plowed fields, are temporary effects. Temporary effects could occur throughout the fenced areas of the TSF Project. This Conservation Plan includes all areas within the fences as Project areas. Therefore, areas of temporary impact, outside of the PV arrays but within the fences, are included in the permanent effect compensation calculation. No areas outside of the fence line will be permanently affected for the Project with the exception of access roads and the electrical collection system. Accordingly, the acreage for access roads and the electrical collection system is included in the fenced area calculation (Table 1).

### 4.3 Traffic

Traffic is a minor cause of kit fox mortality in non-urban populations. Kit fox populations in the Naval Petroleum Reserve in Kern County, a grassland and arid shrub land habitat, experienced predation responsible for 56 percent of kit fox deaths, with vehicle strikes accounting for 9 percent of kit fox deaths (Cypher et al. 2000). In Lokern Natural Area, an area with more roads than the Carrizo Plain, including Highways 58, 33, and Lokern Road, no significant effect on the demographics and population of kit fox could be attributed to vehicle strikes (Cypher, Bjurlin and Nelson 2009) with about 8,000 vehicle trips per day. Estimated daily trips on Highway 58 in the Carrizo Plain are 340 (Aspen 2010). In four other studies (see Cypher, Bjurlin and Nelson 2005, pg 12), kit fox mortality from vehicles was found to be very low as was mortality from vehicles to swift fox, a similar species. In Bakersfield, an urban environment, 26.9 percent of kit fox deaths documented were caused by vehicle strikes, and 16.7 percent were caused by predation. This higher level of vehicular strikes is consistent with much higher traffic volume. Mean traffic volume for locations where strikes were documented in Bakersfield was 21,861 trips per day, or approximately 73 times the current traffic rate in the Carrizo Plain and 54 times the expected TSF Project construction period traffic rate (estimated by adding the current traffic rate to the TSF Project construction daily vehicle trips).

Kit fox are primarily nocturnal animals that spend their days, every day, in dens (Cypher 2010b). Most vehicle strikes of kit fox occur at night (Bjurlin 2004). Limiting most traffic to and from the Topaz Solar Farm to daylight hours will effectively prevent vehicular strikes from significantly increasing mortality among the Carrizo Plain kit fox population.

# 5.0 Conservation Plan

The proposed on-site measures outlined above would constitute important TSF Project components that reduce the need for off-site conservation. TSF Project plans and monitoring measures provide a high potential for avoidance of injury to or death of kit fox. The Conservation Plan is designed to compensate for actual ground lost, to improve habitat conditions to compensate for temporary impacts and potential loss of use of habitat within the solar arrays, to enhance habitat within the solar array site, to enhance open space areas through and around the fenced solar arrays, and to establish off-site protected habitat to promote conservation of the species.

## 5.1 Site Enhancement and Conservation Measure Summary

- TSF Project onsite habitat enhancements would include establishment and maintenance of natural vegetation and artificial dens. The goal is to provide accessible and appropriate habitat attractive to kit fox. Enhancements utilized would be based on successful enhancement programs currently in place in other communities and habitat areas, as detailed in the section "Examples of Habitat Enhancement Programs" in Section 6.1 of this Plan.
- Offsite conservation lands will be restored to annual grassland or maintained as annual grassland, included in a conservation easement or equivalent mechanism, and managed to promote kit fox and other native species. This will be achieved either through fee purchase or dedication with a conservation easement, along with appropriate enhancement and endowment funds.
- A three-stage survey protocol and protection program will be utilized to prevent injury or death of kit fox during TSF Project construction.
- Fencing around the TSF Project solar arrays will provide kit fox passage and exclude large animals.
- At least 12 artificial dens (two per square mile) and 28 artificial escape dens will be installed within the solar array fences at appropriate locations.
- Artificial escape dens will be installed outside of the TSF Project fences to provide refuge locations.
- Management practices will avoid the use of rodenticides.
- A monitoring program will determine if kit fox take up residence and re-establish use of the TSF Project site at levels equivalent to or better than existing use.
- The TSF Project site will be made available for research projects approved by the USFWS if approved by the Applicant in advance and accompanied by necessary protections and indemnities.

- A worker training program regarding SJKF identification, life history and habits, population status, and protection measures, and penalties for unauthorized take of SJKF will be provided for all construction and operational employees.
- Public education material will be provided to all TSF Project guests and visitors. Signage will be placed at the Solar Energy Learning Center and the Operations and Maintenance building to provide education regarding kit fox and other rare species.
- Pets will not be allowed on the TSF Project.
- TSF Project night lighting will be minimized so as to not illuminate open space areas.
- During construction, survey and monitoring measures will be conducted specific to the TSF Project that meet or exceed the standard San Joaquin kit fox CEQA mitigation measures approved by the County of San Luis Obispo and CDFG, as well as the USFWS standardized recommendations for protection of San Joaquin kit fox prior to or during ground disturbance.
- Scheduled construction traffic will be limited to daylight hours, within one-half hour after sunset or before sunrise. Speed limits on-site will be strictly enforced.

## 5.2 Conservation Goals and Objectives

The goals of the Conservation Plan are to have an equivalent or greater number of kit fox on the TSF Project site after completion of the TSF Project as were present before the TSF Project. Further objectives of these conservation recommendations are to prevent loss of kit fox during construction and facility operation, to improve habitat in the area so that kit fox survival and breeding success will be enhanced, and to provide certainty with respect to the ability of kit fox to connect with core habitat areas. A conservation benefit would be accomplished if the number of kit fox utilizing the TSF Project site after construction are equivalent to or greater than the number of kit fox utilizing the TSF Project site before construction, and the off-site habitats are enhanced for kit fox.

Nevertheless, the TSF Project could result in loss or degradation of SJKF habitat during the operational period. Acquisition of off-site conservation easements or land purchases to protect in perpetuity suitable SJKF habitat in the Carrizo Plain core population region would compensate for the effect of potential loss or degradation of SJKF habitat. Offsite conservation lands would be acquired in sufficient quantity to compensate for permanent habitat impacts resulting from the TSF Project. Therefore, even if an equivalent number of kit fox do not utilize the TSF Project site after construction, conservation would still have been achieved by setting aside offsite conservation areas to supplement or enhance kit fox abundance to achieve an equivalent or greater population of kit fox as were present before TSF Project site disturbance. In addition, offsite acquisition of conservation lands would provide certainty with respect to preserving an avenue for kit fox movement across ranch and farm land. This would occur by protecting movement

corridor lands from detrimental land uses that degrade habitat, and by preventing barriers, such as wildlife fencing, chain link fencing or structures, from being installed on the properties.

The TSF Project design is intended to provide denning opportunities within the site, and to allow transient kit fox opportunity to move through the Project. Fences would be designed to provide readily accessible passage for kit fox. Easy passage for kit fox through the fence is more important than exclusion of coyotes (B. Cypher, pers. com., 2010). The fencing plan proposed by the Applicant has a 5-6 inch opening at the base of fences that provides easy passage for kit fox. Den sites would be provided within the TSF Project and escape dens would be provided on adjacent land outside the array fences. Monitoring would document presence of SJKF and provide information to the TSF Project manager so that SJKF is protected. The proposed protective measures would prevent injury to kit fox during construction, would maintain access to the TSF Project site by kit fox once construction is complete, and would provide an enhanced and protective habitat for kit fox while increasing understanding of kit fox biology.

Conservation measures protecting offsite lands would compensate for acreage removed from use, protect kit fox habitat in perpetuity, improve land management for kit fox and other listed species, and result in a conservation benefit for kit fox. Habitat enhancement outside of the project footprint would include installation of escape dens and improved habitat management for kit fox. Enhancement of existing habitat on site will provide increased protection and denning habitat for the foxes. Installation of artificial dens, escape dens, visitor and worker education programs, kit fox friendly management practices, monitoring on site, and large areas of open space would reduce the effects of modification of 3,500 acres of kit fox habitat within the TSF Project Alternative 3B.1 fences. The offsite conservation measures proposed are intended to fully compensate for effects of the action. Onsite conservation measures, while not credited toward compensatory conservation, would benefit kit fox and other native species.

## 5.3 Conservation Site Selection and Justification

The Applicant's selection of conservation lands to be secured by the TSF Project, which has been done in consultation with USFWS and CDFG, has been directed at meeting recovery plan goals of habitat protection and population interchange. Therefore, the proposed off-site conservation lands 1) provide habitat appropriate to sustain resident kit fox, and/or, 2) protect and enhance corridors for movement into and out of the Carrizo Plain region. If conservation lands can provide both of these services, a higher value for kit fox recovery could be achieved per conservation acre. A Habitat Mitigation and Monitoring Plan will specify conservation land management goals and tasks to benefit kit fox.

An additional benefit of conservation lands would be inclusion of other rare or sensitive species habitat. Benefits to other species are discussed further in the comprehensive Biological Report (Althouse and Meade, Inc. 2010). Proposed off-site conservation lands are located in close proximity to the TSF Project, or else have significant beneficial value that compensates for impacts at the TSF Project site, or potential cumulative impacts in the region. Potential for enhancement of land areas for SJKF that result in improved habitat add to conservation land value.

Most of the proposed conservation lands are contiguous to the TSF Project site. These areas include grassland and cropland habitats. Much of this land has been surveyed for biological resources by Althouse and Meade, Inc. Survey data shows that current utilization of these potential conservation lands by kit fox varies by habitat quality and is expected to change to the benefit of kit fox if land use is changed from cropland or heavily grazed land to properly-managed grassland.

An index score was created to evaluate potential conservation lands according to factors that contribute to conservation value (Table 3). Factors include (Table 3 columns from left to right):

1) suitability of existing habitat
2) enhancement potential
3) kit fox presence
4) importance to movement corridor
5) location as per the SC Wildlands habitat suitability model
6) location as per the Phillips-Cypher habitat suitability model
7) slope of the parcel

This ranking provides an index to compare Project Site properties and to gauge how the selected conservation properties compare with onsite land being impacted (reference sites from within the Project Site are included in Table 3). The ranking exercise shows that selected offsite conservation parcels provide a range of habitat quality comparable to or better than the TSF Project areas. The acres of conservation land proposed (12,147) is more than 5,600 acres more than recommended in the DEIR formulation for Alternative 3B.1 (6,512). Conservation lands consist of almost 7,000 acres of grassland and approximately 5,200 acres of cropland (Table 3). Cropland areas provide the opportunity for recovery of these lands to usable kit fox habitat within a few years. The conversion of cropland to grassland would increase the acreage of quality habitat for kit fox and other species in the region.

Twenty-three parcels are offered as conservation lands. Habitat types found on these parcels range from well-maintained California annual grassland to plowed cropland. Conservation properties with grassland habitat are primarily (88.4%) on flat ground (slopes 0 to 10 percent), and support kit fox. Conservation properties on cropland are also mostly on flat ground (75.7%), and have the potential to support many more kit fox after enhancement. Properties that have little to no slope are considered most valuable

for kit fox. The conservation lands under consideration are shown in Figures 5 through 9, in Section 7.0.

As described in Table 1, Topaz Solar Farm Alternative 3B.1 would utilize 3,520 acres of land, of which 76.0% is cropland, 23.7% is grassland, and less than 0.3% is anthropogenic habitat. Alternative 3B.1 has approximately 3,237 acres of lower suitability habitat (mostly cropland and recently retired cropland with index scores less than 75), and approximately 263 acres of higher suitability habitat (grassland with an index score higher than 75).

Table 3 shows habitat rankings for conservation lands under consideration. Of the total 12,147 acres under consideration, 53.4%, or 6,490 acres are higher suitability and 46.6%, or 5,657 acres are lower suitability when a ranking of 75 is utilized as the break between higher and lower suitability. The ratio of higher to lower value conservation lands is therefore 1.15 for all the conservation lands under consideration. A larger number means that more of the area under examination is of higher suitability. Using grassland and cropland habitat types as a general proxy for suitability in project areas, the ratio of 1.15 for mitigation land compares favorably with a higher to lower suitability ratio of 0.08 for Alternative 3B.1. Therefore, the potential conservation lands have more area of higher suitability than the Project areas. In addition, many of the lower suitability lands used for conservation will be enhanced from currently disturbed conditions to higher quality grassland habitat, resulting in additional higher suitability conservation lands.

TABLE 3. OFFSITE CONSERVATION LANDS. Conservation lands as shown in Figure 5. Factors that contribute to conservation land value for wildlife are listed in top row. Total Index Score (column 2) provides a relative habitat quality ranking for each parcel. Desirable conservation land is not just the highest scored parcels. Low scoring parcels may present high opportunity for habitat enhancement. Rankings show that offsite conservation lands contain similar habitat to lands in the TSF project areas. Parcels listed by section number at the bottom of the table are within the Topaz Project; these are not proposed conservation lands, they are listed for comparison to the proposed conservation lands.

| **Map Label (Figure 5)** | **Total Index Score 100 pts maximum** | **Site-Specific Habitat Suitability (Althouse & Meade) 40 pts** | **Enhance-ment Potential 10 pts** | **Kit Fox Presence 10 pts (5 if not surveyed, 0 if absent in surveys)** | **Within Movement Corridor 10 pts** | **SC Wildlands Suitability Map 10 pts** | **Phillips-Cypher Suitability Map 10 pts** | **Slope 10 pts (10=flat)** | **Notes** | **Approx. Mitigation Land Size (acres)** |
|---|---|---|---|---|---|---|---|---|---|---|
| J4 | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 39 |
| I | 89 | 40 | 2 | 10 | 10 | 9 | 10 | 8 | Grassland with kit fox, low hills | 2,714 |
| J1 | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 84 |
| J2 | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 158 |
| J3 | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat | 41 |
| L | 89 | 40 | 2 | 8 | 10 | 10 | 10 | 9 | Grassland, mostly flat, GKR, SJKF | 40 |
| C2 | 86 | 35 | 6 | 10 | 10 | 7 | 10 | 8 | Grassland, low hills, kit fox present | 40 |
| G | 84 | 40 | 2 | 10 | 10 | 10 | 2 | 10 | Grassland with kit fox, flat | 930 |
| H1 | 83 | 40 | 2 | 8 | 10 | 5 | 8 | 10 | Grassland, flat | 343 |

| Map Label (Figure 5) | Total Index Score 100 pts maximum | Site-Specific Habitat Suitability (Althouse & Meade) 40 pts | Enhance-ment Potential 10 pts | Kit Fox Presence 10 pts (5 if not surveyed, 0 if absent in surveys) | Within Movement Corridor 10 pts | SC Wildlands Suitability Map 10 pts | Phillips-Cypher Suitability Map 10 pts | Slope 10 pts (10=flat) | Notes | Approx. Mitigation Land Size (acres) |
|---|---|---|---|---|---|---|---|---|---|---|
| D | 83 | 38 | 3 | 10 | 9 | 7 | 6 | 10 | Grassland, small cropland areas, flat | 1150 |
| C3 | 83 | 35 | 5 | 8 | 10 | 5 | 10 | 10 | Grassland, flat | 82 |
| F | 82 | 40 | 2 | 10 | 6 | 10 | 8 | 6 | Grassland with kit fox, some hills | 623 |
| H2 | 78 | 30 | 6 | 10 | 10 | 6 | 6 | 10 | Cropland and grassland with kit fox, flat | 246 |
| C1 | 74 | 30 | 5 | 10 | 10 | 3 | 8 | 8 | Grassland with kit fox, tall grass | 656 |
| E1 | 73 | 40 | 2 | 10 | 5 | 3 | 3 | 10 | Grassland | 95 |
| O | 67 | 26 | 7 | 5 | 10 | 5 | 5 | 9 | Cropland and grassland, flat | 60 |
| H6 | 65 | 20 | 5 | 5 | 10 | 5 | 10 | 10 | Half grass, half crop | 75 |
| H4 | 63 | 10 | 10 | 10 | 10 | 3 | 10 | 10 | Cropland, flat | 40 |
| A | 59 | 12 | 10 | 5 | 10 | 4 | 8 | 10 | Cropland with small grassland area, flat | 1,290 |
| B | 59 | 15 | 8 | 10 | 8 | 3 | 5 | 10 | Cropland with smaller grassland area, flat | 2,400 |

| **Map Label (Figure 5)** | **Total Index Score 100 pts maximum** | **Site-Specific Habitat Suitability (Althouse & Meade) 40 pts** | **Enhance-ment Potential 10 pts** | **Kit Fox Presence 10 pts (5 if not surveyed, 0 if absent in surveys)** | **Within Movement Corridor 10 pts** | **SC Wildlands Suitability Map 10 pts** | **Phillips-Cypher Suitability Map 10 pts** | **Slope 10 pts (10=flat)** | **Notes** | **Approx. Mitigation Land Size (acres)** |
|---|---|---|---|---|---|---|---|---|---|---|
| H5 | 59 | 10 | 10 | 10 | 10 | 3 | 8 | 8 | Cropland, low hills | 165 |
| C4 | 54 | 10 | 10 | 10 | 10 | 3 | 3 | 8 | Cropland with kit fox | 165 |
| N | 54 | 10 | 10 | 10 | 8 | 3 | 3 | 10 | Cropland, flat | 120 |
| H3 | 53 | 10 | 10 | 10 | 10 | 3 | 3 | 7 | Cropland, hilly | 162 |
| K | 50 | 10 | 10 | 5 | 10 | 3 | 2 | 10 | Cropland, flat | 319 |
| M | 48 | 10 | 10 | 5 | 9 | 2 | 2 | 10 | Cropland, flat | 40 |
| E2 | 46 | 10 | 10 | 5 | 5 | 3 | 3 | 10 | Cropland | 70 |
| **Total Acres of Conservation Land** | | | | | | | | | | **12,147** |
| Topaz Section 34 | 85 | 40 | 2 | 10 | 10 | 10 | 3 | 10 | Grassland with kit fox, flat | -- |
| Topaz Section 28 | 72 | 25 | 10 | 10 | 10 | 4 | 3 | 10 | Grassland with kit fox, flat | -- |
| Topaz Section 33 | 67 | 20 | 8 | 10 | 10 | 2 | 7 | 10 | Cropland with kit fox, flat | -- |
| Topaz Section 27 | 67 | 20 | 8 | 10 | 10 | 2 | 7 | 10 | Cropland with kit fox, flat | -- |
| Topaz Section 32 | 56 | 10 | 10 | 10 | 10 | 3 | 3 | 10 | Cropland with kit fox, flat | -- |

| **Map Label (Figure 5)** | **Total Index Score 100 pts maximum** | **Site-Specific Habitat Suitability (Althouse & Meade) 40 pts** | **Enhance-ment Potential 10 pts** | **Kit Fox Presence 10 pts (5 if not surveyed, 0 if absent in surveys)** | **Within Movement Corridor 10 pts** | **SC Wildlands Suitability Map 10 pts** | **Phillips-Cypher Suitability Map 10 pts** | **Slope 10 pts (10=flat)** | **Notes** | **Approx. Mitigation Land Size (acres)** |
|---|---|---|---|---|---|---|---|---|---|---|
| Topaz Section 19 | 53 | 10 | 10 | 10 | 7 | 3 | 3 | 10 | Cropland with kit fox, flat | -- |

## 5.4 Conservation Outcome

The population of kit fox measured within the Project Site in November of 2010 was seven individuals (Smith 2010b, Maldonado 2011). These individuals were found only in the southern and eastern portions of the Project Site (Figure 3 and 4a). The 2010 kit fox scat survey was done in November, after most young foxes would have dispersed from their family groups. The survey area was approximately 15.15 square miles, slightly smaller than in 2009 due to refinement of the Project Site. Seven individual kit foxes were detected within the Project Site boundaries, which equals 0.46 foxes per square mile. The survey data therefore demonstrates that habitat within the 3,520 acre (5.5 square mile) fenced area for Alternative 3B.1 supported 2.5 foxes if average density is used (Figure 4). Because a low percent of Alternative 3B.1 land is high quality kit fox habitat (7 percent) the average density overestimates the actual value of the project site for kit fox use. Only three kit fox were detected within the Alternative 3B.1 area, but are likely to have been also utilizing higher quality habitat to the west, east, and south of the proposed Project fences.

By way of comparison, the 2010 survey of the Little San Juan Ranch property (Parcel I on Figure 5) found four individual kit fox on 2,700 acre of annual grassland, or a density of 0.95 foxes per square mile in only one survey pass. Actual density could be higher. The survey on the Thorup property found two kit foxes on 800 acres of annual grassland, or a density of 1.6 foxes per square mile.

The scat survey methodology provides a robust and complete estimate of individuals, a method that is shown to be more thorough than other population estimate methods (Kohn, et al. 1999, Harrison et al. 2002, Smith et al. 2003, Smith et al, 2005, and Smith and Whitelaw 2010). Although variation in number of individuals from year to year is normal, a kit fox scat survey, conducted in a similar manner that detects the same or greater number of individuals after TSF Project completion, would support a conclusion that on-site conditions provide good habitat for kit fox (although off-site conservation measures will be relied upon to provide certainty of compensation for project effects). The proposed TSF Project would allow large areas of cropland to revert to naturalized grassland, and would reduce impacts from overgrazing on other areas of grassland. It is very likely that land within the array fences would be utilized by kit fox.

Kit fox surveys that identify individuals utilizing the Project area will be conducted in November every year for five years to determine if an equal or greater number of kit fox persist within Project. If so, the utilization of the Project by kit fox will be an additional benefit to kit fox beyond the conservation value achieved by protection and enhancement of off-site kit fox habitat. Protection and improvement of this kit fox habitat within protected areas outside of the TSF Project fenced areas would compensate for take of kit fox during Project construction and for the project area if kit fox do not use areas within Project fences following completion. Operation of the TSF Project through several

decades is not expected to result in any take of kit fox because it is a passive solar facility with only rare isolated maintenance activities occurring.

An equal or greater number of kit fox utilizing the project site would also meet the TSF Project goal of fully mitigating any impacts to kit fox ("full mitigation" is a CESA requirement). Full mitigation would be achieved for the TSF Project in one or both of the following ways:

1. Full mitigation would be achieved if the number of kit foxes utilizing the TSF Project site after construction is equivalent to the number of kit fox utilizing the TSF Project site before construction (see Section 2.2).
2. Full mitigation would be achieved through protection and enhancement of thousands of acres of off-site kit fox habitat, some of which would be located in important wildlife movement corridors.

As described above, in the event that kit fox do not re-populate the completed TSF Project at pre-project density, lands set aside as part of the conservation program would provide improved and protected habitat to fully compensate for project effects. Twelve-thousand-one-hundred-thirty-nine (12,147) acres would be protected outside of the TSF Project fenced areas (Table 2), not including some potentially usable habitat between the fenced areas. At the kit fox density discovered in the Project Site during the 2010 survey (0.46 per square mile), this would mean that habitat utilized by 8.6 foxes, or approximately four breeding pairs, would be protected on conservation lands. Conservation lands include areas of grassland and cropland (see Table 3, Conservation Land Categories). Kit fox density per square mile over the entire kit fox survey area was 0.46 in 2010, reflecting the low level of use found in cropland areas. It is likely that density in recovered cropland areas would be higher than existing conditions across the entire kit fox survey area.

Low levels of detection of some kit fox individuals indicate that the density estimates presented above include both resident kit fox and kit fox that may be at the edge of their home range and just occasional within the study area. Some of these animals probably have a larger proportion of their home range outside of the study area than in the study area. Therefore, these density estimates do not mean that the kit fox individuals observed are completely supported by the habitat within the survey areas.

Some agricultural lands in California Valley North within and close to the Project Site could be enhanced for SJKF use, and would provide excellent conservation value. This value would be obtained not just by providing useable habitat, but by changing use from agricultural practices that are potentially dangerous to SJKF, such as chisel plowing, to agricultural uses that are benign or beneficial, such as managed grazing. The Applicant has worked with the TSF Project Kit Fox Conservation Team, CDFG, and USFWS to determine the most appropriate offsite conservation land for the TSF Project.

## 5.5 Conservation Measures

The following specific conservation measures (CM) are recommended to address potential TSF Project impacts to SJKF.

Through implementation of CM-1 a total of 12,147 acres for Alternative 3B.1 would be protected and preserved for kit fox in perpetuity (Table 3).

**CM-1** Prior to issuance of grading and/or construction permits, the applicant shall submit evidence to the USFWS and the County of San Luis Obispo, Department of Planning and Building, Environmental and Resource Management Division (County) that states that the following San Joaquin kit fox conservation measure has been implemented:

**A)** Provide for the protection in perpetuity, through acquisition of fee or a conservation easement of 12,147 acres identified above (Table 3) within San Luis Obispo County kit fox habitat and/or within the potential movement area linking the Carrizo Plain to other habitat to the north, and provide for a non-wasting endowment to provide for management and monitoring of the property in perpetuity. Lands to be conserved shall be subject to the review and approval of the United States Fish and Wildlife Service, the California Department of Fish and Game, and the County of San Luis Obispo.

**CM-2** Prior to issuance of grading and/or construction permits, the applicant shall provide evidence that they have retained a qualified TSF Project biologist acceptable to the County. The biologist shall perform the following monitoring activities before and during construction activities:

**A)** Pre-construction surveys for San Joaquin kit fox shall consist of three phases: den location surveys, work area clearance surveys, and daily work area surveys.

**B)** Den location surveys shall be conducted up to several months in advance of any proposed site disturbance and shall locate all dens or potential kit fox dens within the TSF Project site. The goal of these surveys is to establish locations of current kit fox dens on the TSF Project site. A combination of scat survey information, walking transect surveys, tracks, motion detecting cameras, and spotlighting will be utilized to determine kit fox den locations. If natal dens are located, the USFWS will be contacted and appropriate setback areas will be established based on this consultation. Potential kit fox dens on the TSF Project site shall be monitored to determine use. Locations of kit fox found on the TSF Project site shall be recorded and provided to the USFWS and the DFG within 48 hours of detection.

**C)** Work area clearance surveys shall be conducted up to one month in advance of any proposed TSF Project construction activity, including site disturbance activities, and will completely cover all ground surfaces within proposed work areas. The purpose of this survey is to locate kit fox dens sufficiently in

advance of construction activities to adjust work locations or clear areas. The survey will locate and identify inhabitants of all burrows or dens capable of containing kit fox. Burrows and dens not in use, as verified by the project biologist using tracking medium or motion detecting camera, may be closed to prevent occupation by kit fox. If denning kit fox are located, a motion sensing camera shall be placed to observe the den entrance(s), or tracking powder shall be placed around the den entrance(s), and the den location shall be protected from activity by a 100 foot buffer area until it is established that the kit fox has moved from the den. Once the qualified biologist has established that no kit fox occupy the den, the den may be closed by careful excavation with hand tools and filling. If active natal dens are located the USFWS will be notified and consulted regarding setbacks and protective measures. Standard protective measures (see Exhibit A) shall be utilized unless the USFWS determines additional measures are appropriate. Locations of kit fox natal dens found on the TSF Project site during this survey shall be recorded and provided to the USFWS and the DFG within 24 hours.

**D)** Daily work area surveys shall be conducted every morning before any construction activities that could disturb the site are performed. Surveys will cover all ground surfaces within an area where work will occur that day. The survey will establish that there are no possible denning sites for San Joaquin kit fox in or within 150 feet of any proposed disturbance, construction work, vehicular traffic, or other ground disturbing activities that can occur that day on the TSF Project site. If a potential kit fox den is discovered, it shall be protected from any disturbance within 100 feet and observed using cameras and tracking medium for three days to determine that it is not occupied by kit fox. If a non-natal den is occupied by kit fox, a 50 foot setback shall be observed until the fox moves out of the den. Locations of kit fox found on the TSF Project site shall be recorded and provided to the USFWS and the DFG within 48 hours. Any injury or harm done to a kit fox in the course of TSF Project on-site activities will be reported immediately to USFWS and the DFG.

**CM-3** Implement all pre-construction surveys and conditions for protection of San Joaquin kit fox required in the USFWS biological opinion regarding work at the TSF Project site. At a minimum the following measures shall be followed.

**A)** Prior to issuance of grading and/or construction permits, the applicant shall clearly delineate the following as a note on the TSF Project plans: "*Speed signs of 25 mph (or lower) shall be posted for all onsite construction traffic to minimize the probability of road mortality of the San Joaquin kit fox".* Speed limit signs shall be installed on the TSF Project site within 30 days prior to initiation of construction, including site disturbance activities.

**B)** During the construction phase, any site disturbance activities after dusk shall be prohibited unless coordinated through the County, during which additional

kit fox conservation measures may be required. Workers and worker shuttles shall be instructed to arrive at the construction site no earlier than one-half hour before sunrise and depart from the site no later than one-half hour after sunset. Some electrical connection work will be allowed after dark. Delivery of materials by truck shall be restricted to daylight hours between sunrise and sunset.

**C)** Prior to issuance of grading and/or construction permits and within 30 days prior to initiation of site disturbance and/or construction, all personnel associated with the TSF Project shall attend a worker education training program, conducted by TSF Project biologist, to avoid or reduce impacts on sensitive biological resources (i.e. San Joaquin kit fox). At a minimum, as the program relates to the kit fox, the training shall include the kit fox's life history, legal status, penalties associated with unauthorized take, all conservation measures specified by the County, and information regarding the local kit fox population. The applicant shall notify the County shortly prior to this meeting. A kit fox fact sheet shall also be developed prior to the training program, and distributed at the training program to all contractors, employees, and other personnel involved with the construction of the TSF Project. Protection of kit fox shall be emphasized as a TSF Project priority.

**D)** During the site-disturbance and/or construction phase, to prevent entrapment of the San Joaquin kit fox, all excavations, steep-walled holes and trenches in excess of two feet in depth shall be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Trenches shall also be inspected for entrapped kit fox each morning prior to onset of field activities and immediately prior to covering with plywood at the end of each working day. Before such holes or trenches are filled, they shall be thoroughly inspected for entrapped kit fox. Any kit fox so discovered shall be allowed to escape before field activities resume, or removed from the trench or hole by a qualified biologist and allowed to escape unimpeded.

**E)** During the site-disturbance and/or construction phase, any pipes, culverts, or similar structures with a diameter of four inches or greater, stored overnight at the TSF Project site shall be thoroughly inspected for trapped San Joaquin kit foxes before the subject pipe is subsequently buried, capped, or otherwise used or moved in any way. If, during the construction phase, a kit fox is discovered inside a pipe, that section of pipe will not be moved. If necessary, the pipe may be moved only once to remove it from the path of activity, until the kit fox has escaped.

**F)** During the site-disturbance and/or construction phase, all food-related trash items such as wrappers, cans, bottles, and food scraps shall be disposed of only in closed containers. These containers shall be regularly removed from the site. Food items may attract San Joaquin kit foxes onto the project site, consequently exposing such animals to increased risk of injury or mortality. No deliberate feeding of wildlife shall be allowed.

**G)** Prior to, during and after the site-disturbance and/or construction phase, use of pesticides or herbicides by the applicant shall be in compliance with all local, State, and Federal regulations. Use of rodenticides would be prohibited. This is necessary to minimize the probability of primary or secondary poisoning of endangered species utilizing adjacent habitats, and the depletion of prey upon which San Joaquin kit foxes depend.

**H)** During the construction phase, including site disturbance**,** any contractor or employee that inadvertently kills or injures a San Joaquin kit fox or who finds any such animal either, dead, injured, or entrapped on the TSF Project site shall be required to report the incident immediately to the applicant and County. In the event that any observations are made of injured or dead kit fox, the applicant shall immediately notify the USFWS and CDFG by telephone. In addition, formal notification shall be provided in writing within three working days of the finding of any such animal(s). Notification shall include the date, time, location and circumstances of the incident. Any threatened or endangered species found dead or injured shall be turned over immediately to CDFG for care, analysis, or disposition.

**I)** Should any long internal or perimeter fencing be proposed or installed, the applicant shall do the following to provide for kit fox passage:

i. Fences around PV arrays shall provide a 5 to 6-inch tall space at the bottom of the fence.
ii. Upon fence installation, the applicant shall notify the County to verify proper installation. Any fencing constructed by the TSF Project, with the exception of the TSF Project substation fencing and PG&E's switching station fencing, shall follow the above guidelines.

# 6.0 Habitat Enhancement

This section describes examples of habitat enhancement measures for San Joaquin kit fox similar to those proposed for implementation on the TSF Project site. The examples of successful enhancement programs described below demonstrate the credibility of proposed habitat enhancement measures and are provided as evidence in support of an enhancement program at the TSF Project.

## 6.1 Examples of Habitat Enhancement Programs

### *6.1.1 Seven Oaks Golf Course*

Four artificial dens were voluntarily installed on the Seven Oaks Country Club golf course in Bakersfield, as part of a habitat enhancement program. The four dens have been very successful and are currently occupied by kit fox (Brian Cypher, pers. com. 2009). The presence of kit fox on the golf course has been met with appreciation by users of the facility, even though a kit fox occasionally steals a ball from play. Brian Cypher monitors kit fox activity on this property, and suggested that twice the number of dens would probably be occupied at all times if available.

### *6.1.2 Paramount Farming Company*

San Joaquin kit fox refugia were created in 2000 by installing twenty-one escape structures and four artificial dens on the Paramount Farming Company property. The site is located approximately 10 miles north of Highway 46, immediately west of the California aqueduct in Kern County. The installation was part of an experiment in cooperation with the Endangered Species Recovery Program (ESRP), and Environmental Defense Fund in Washington, D.C. The dens were installed in a linear configuration near access roads within the farm property. Agricultural activities at the time of refugia creation consisted of orchard and field crop, and are presently almost entirely orchard. The program was enrolled in a Safe Harbor Agreement with the USFWS. The artificial refugia were utilized by kit fox in an agricultural setting and provided escape and denning habitat for kit fox (Cypher, et al. 2005). The local population of kit fox has since disappeared at this location, but the project showed that artificial dens would be utilized in an agricultural production area (Brian Cypher, pers. comm. 2010).

## 6.2 Known Enhancement Practices

The Topaz Solar Farm CMP incorporates elements recommended in the Metropolitan Bakersfield Habitat Conservation Plan and the Carrizo Plan National Monument management plan. These elements include installation of artificial dens, control of herbicides and pesticides, and potential utilization of grazing to manage vegetation. The following excerpts are from these two plans.

The Metropolitan Bakersfield Habitat Conservation Plan includes resource management and habitat enhancement measures for SJKF.

> Specifically, resource management can include conducting controlled burn programs, grazing programs, exotic species control, erosion control, native community enhancement, sensitive species enhancement (such as constructing artificial dens), coyote control, control of pesticides, herbicides and rodenticide on preserve land and on adjacent lands and coordination of any research conducted within the preserves by outside groups. A copy of all research documents produced pertaining to the preserves should be obtained and kept as part of the documentation on the preserve.
>
> Metropolitan Bakersfield Habitat Conservation Plan, 1994. Page 86

The Carrizo Plain National Monument Proposed Resource Management Plan (October 2009) specifies that "Management of prey populations and an open low grass structure of vegetation have been the primary focus of kit fox management." The plan goes on to specify that grazing or burning is being utilized "to maintain kit fox prey populations in the occasional years of high vegetation biomass."(pages 3-15).

## 6.3 Habitat Enhancement Implementation Work Plan

### *6.3.1 Fencing*

All solar array fencing at the TSF Project will incorporate a continuous kit fox passage along the base of the fence between posts providing a 5 to 6 inch opening. The opening would be between two narrow metal pipes, one on the ground. This would allow kit fox to move easily through the fence and the TSF Project, and would discourage larger animals from entering the project site. Openings would be constructed so that no sharp edges are present and so that the opening size cannot be forced open by larger animals. Fencing would be erected by the Applicant. Fencing of the portion of the TSF Project being completed would be accomplished prior to its commencement of operation.

Movement corridors would remain outside of the fenced solar array areas of the TSF Project, but would also be available through the solar arrays for kit fox. The entire TSF Project solar array area would be accessible to kit fox once they enter the perimeter fence. Kit fox movement on TSF Project site would be across open space areas within the fenced area, along road ways, under solar modules, and along rows within solar arrays. Kit fox could move across the TSF Project site, or could remain within the fenced solar array areas.

Complete exclusion of coyotes from the solar array areas is not a necessary goal for kit fox protection. Human presence and activities may discourage coyotes from entering the solar array area, and kit fox would be likely to avoid them within the array area by utilizing natural and artificial dens (Cypher, pers. com. 2009).

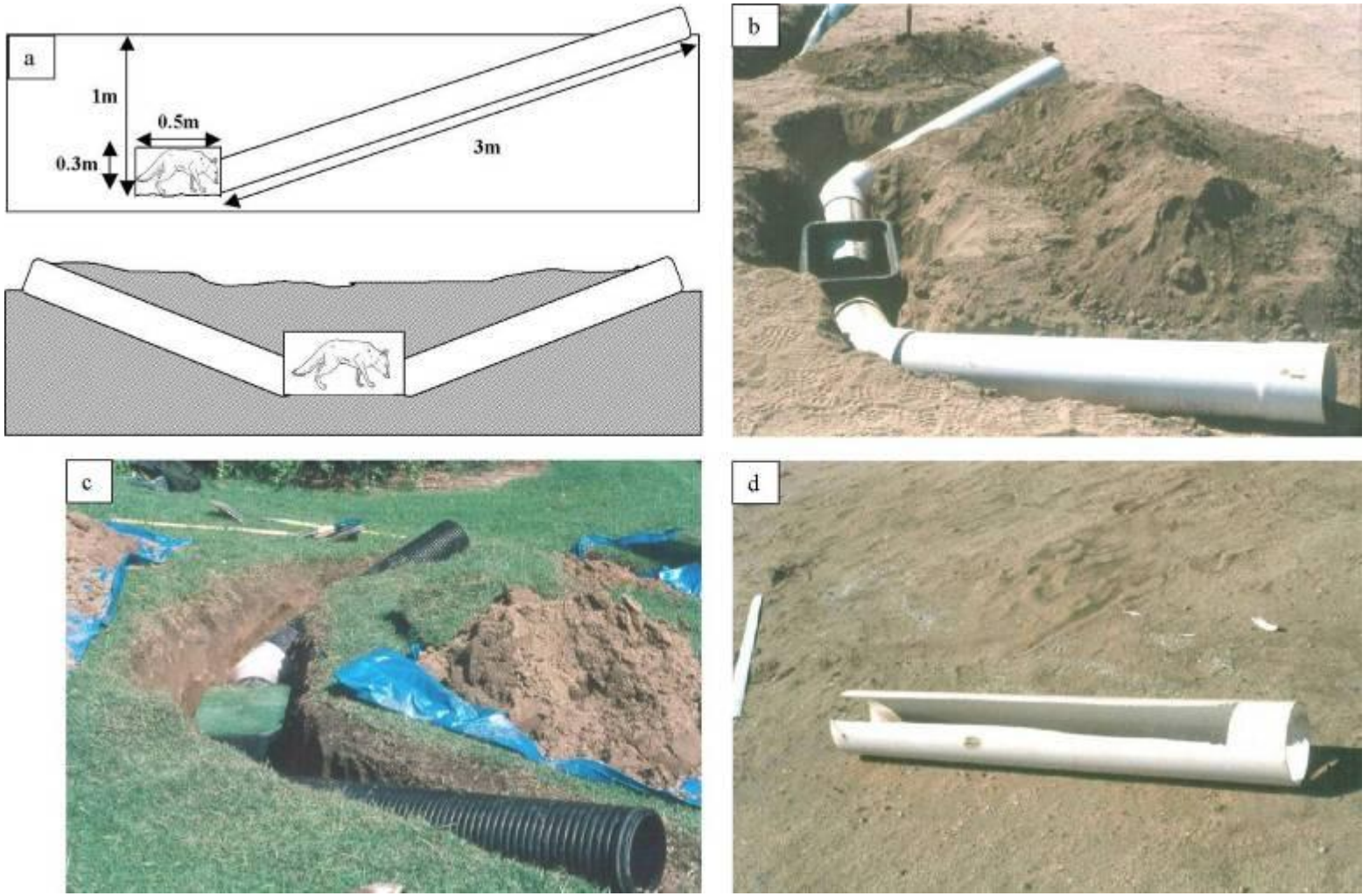
### *6.3.2 Artificial dens*

Locations will be selected for installation of artificial kit fox dens once the TSF Project layout option is finalized and final design details are prepared. We recommend that two-chambered dens be installed for each square mile, and at least four escape dens installed per square mile. Also, escape dens should be installed near the perimeter fence at a rate of one den per 1,000 feet. See plans and photos below for construction methods. Locations will be selected to provide denning sites that will be attractive to San Joaquin kit fox. Criteria for location selection include distance from buildings or regularly maintained infrastructure, open grassland habitat, distance from nearest den, relatively flat topography, and potential prey base. Dens would only be constructed in places that do not flood.

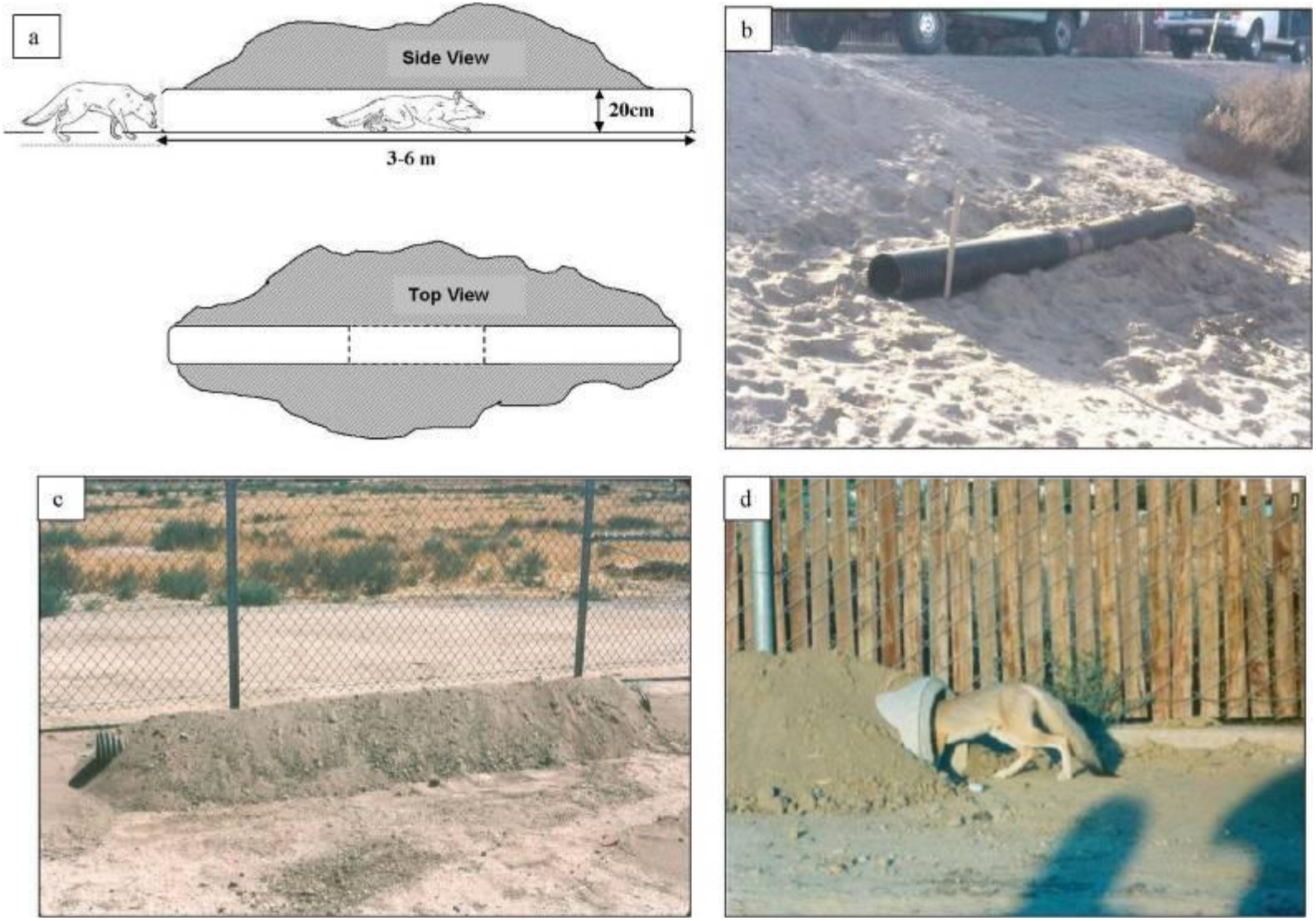
Dens shall be installed under the direction of a qualified kit fox biologist as per the specifications provided by the Endangered Species Recovery Program. Work will involve excavating a trench for chambered dens, placing the pipes and den box, and covering the den with soil. Grassland species can be planted over and around the den, with entrances left exposed. Escape dens consist of pipes placed on the ground and covered with soil.

Pipe used can be corrugated plastic pipe. Studies have demonstrated that corrugated plastic pipe works as well as other pipe types, and is less expensive (B. Cypher, pers. com. 2009).

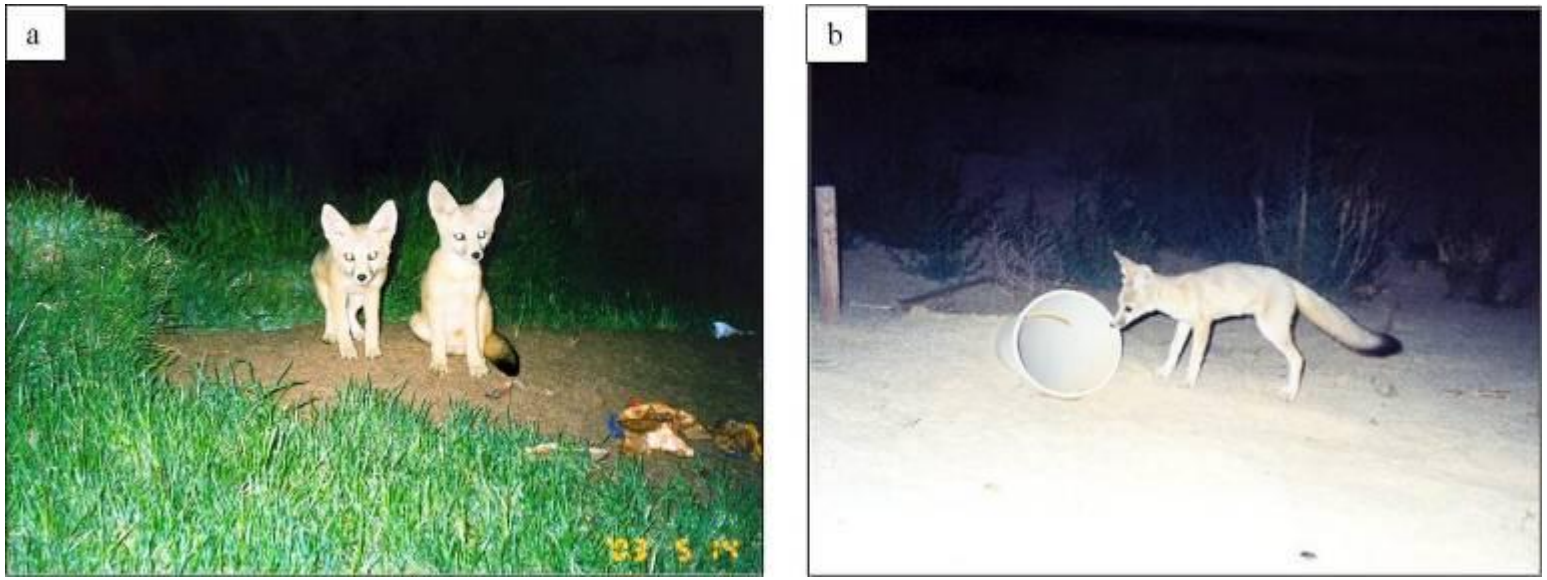
Artificial Dens;  specifications by Brian Cypher, ESRP, CSU Stanislaus.




Artificial subterranean dens for San Joaquin kit fox at Bakersfield, CA.  a) Artificial den schematic. b) PVC two-entrance chamber den under construction. c) High-density polyethylene two-entrance den.  d) PVC tunnel with floor removed longitudinally.




Artificial escape dens for San Joaquin kit fox at Bakersfield, CA. a) Escape den schematic. b) High-density polyethylene escape den under construction. c) Completed den. d) Kit fox entering escape den.




Kit fox pups at artificial subterranean dens at a golf course (a) and drainage basin (b) in Bakersfield, CA.

## Artificial Den Designs

### *Escape dens*

Designed to provide escape cover for kit foxes. Two different lengths were used to determine whether kit foxes preferred the greater seclusion associated with a longer den.

#1: A 10-ft long length of pipe placed on the surface of the ground and covered with several inches of dirt to provide thermal insulation.

#2: A 20-ft long length of pipe placed on the surface of the ground and covered with several inches of dirt to provide thermal insulation.

### *Subterranean dens*

Designed to provide escape cover as well as diurnal resting cover for kit foxes. The 2 designs used will determine preference by foxes for 1 versus 2 entrances.

#3: A 10-ft length of pipe with one end at the surface and one end buried approximately 3 ft underground. Underground end is open to allow foxes to expand the den and even create new entrances.

#4: A 3-ft length of pipe buried approximately 3 ft underground and accessed by 2 5-ft long entrance pipes.

### *Chambered dens*

Designed to provide escape cover and diurnal resting cover for kit foxes, and also provides a chamber for resting or reproduction. The 2 designs used will determine preference by foxes for 1 versus 2 entrances. Also, 2 different chamber designs were used to determine whether foxes exhibit any preference among designs.

#5: A chamber buried approximately 3 ft deep with one 5-ft long entrance pipe.

#6: A chamber buried approximately 3 ft deep with two 5-ft long entrance pipes.

Artificial dens all were constructed by hand. All complexes of 2-3 dens required approximately 8-10 person hours for construction, including the transportation of materials to each site. At 6 of the 11 sites, the holes for placement of the dens were excavated by hand. At the 5 other sites, the Bakersfield Water Resources Department provided a backhoe and crew to excavate den holes.

## Artificial Den Materials

A goal of this project was to test the use of easily obtainable, relatively inexpensive materials to construct artificial dens. Using such materials will reduce costs of artificial dens thereby increasing the potential use of this conservation strategy.

### *Den tunnels*

Four materials were used for den tunnels:

8”-diameter PVC pipe

8”-diameter corrugated galvanized pipe

8”-diameter corrugated plastic pipe

10”-diameter concrete pipe (8” not available)

In some dens, strips were cut from the bottom of PVC and plastic pipes to facilitate drainage.

For bends in tunnels, 45-degree or 90-degree elbows made of either PVC, plastic or aluminum were used. Any openings around joints were covered with a piece of thick “carpet runner” plastic to exclude dirt.

### *Den chambers*

Two types of chamber structures were used:

Plastic irrigation value boxes (approximately 30” long, 20” wide, 20” tall)

Igloo-style dog house (approximately 30” diameter at base, 24” tall)

Both chamber designs have open bottoms. Holes were cut into the sides of the chambers where tunnel pipes entered.

## 6.4 Site Protection and Maintenance (APMs)

### *6.4.1 Dens*

Artificial dens will be inspected annually by a qualified kit fox biologist for the life of the TSF Project. If repairs are necessary, they will be carried out by the TSF Project after consultation with the CDFG and the USFWS and under the direction of the qualified kit fox biologist. The kit fox habitat enhancement measures will remain in place for the life of the TSF Project, unless it is determined by the CDFG and USFWS that they are ineffective or unnecessary.

### *6.4.2 Site management*

TSF Project workers will avoid kit fox dens. If kit foxes create denning sites on the TSF Project property they will not be filled or disturbed. Mowing or weed whipping within 25 feet of active dens will be prohibited. However, grazing will be allowed within 25 feet of dens. Artificial den placement will be more than 25 feet from any TSF Project components.

### *6.4.3 Speed limits*

To avoid accidental injury to animals, a speed limit of 25 miles per hour shall be enforced on TSF Project property for all vehicles at all times. Speed limits shall be posted at the entrance gate and throughout roadways on the property.

### *6.4.4 Rodenticides and herbicides*

Use of rodenticides on the TSF Project should be prohibited and herbicides should be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds should observe labels and other restrictions, mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as any additional TSF Project-specific restrictions deemed necessary by the Service. Kangaroo rats, mice, large insects, occasional gophers, and ground squirrels will provide prey for SJKF, therefore rodent and insect control measures will be avoided to the extent practicable. Use of herbicides should be consistent with the projects weed management plan and would be utilized only for control of invasive weeds when necessary.

### *6.4.5 Pets*

Pets would not be allowed on the TSF Project. No pets would be allowed in the open space areas.

### *6.4.6 Lighting*

All exterior lighting would be placed or shielded to avoid lighting open space and solar array areas. No permanent night lighting would be allowed, except for the TSF Project's Solar Energy Learning Center, substation, and monitoring and maintenance facility. PG&E's on-site switching station would be lighted as well. Maintenance and repair, as well as limited construction activities for the TSF Project will be conducted with limited temporary task lighting.

### *6.4.7 Education*

All managers and workers for the TSF Project will be required to attend a kit fox education meeting. The meeting will be conducted by a qualified kit fox biologist and will discuss: the protections afforded kit fox as specified under state and federal Endangered Species Acts; the biology and life history of kit fox; distribution and population structure of kit fox in California and on the TSF Project site; and protective measures including protection and avoidance of disturbance of denning sites and individual kit fox.

A public education program shall provide TSF Project visitors with an informational hand out that describes the protection of kit fox as specified under state and federal endangered species acts, the biology and life history of kit fox, distribution and population structure of kit fox in California, and on-site protective measures including protection and avoidance of disturbance of denning sites and individual kit fox. Educational signage shall be located at the TSF Project's Solar Energy Learning Center. Signage shall describe the protection afforded kit fox, and provide information regarding the characteristics of the species, and potential for occurrence on site. All educational material and signage shall be approved by a qualified biologist.

### *6.4.8 Budget*

The TSF Project shall be responsible for all costs related to the conservation program as part of Operation and Maintenance (O&M) practices. The following components described in this section are proposed conservation costs.

### *6.4.9 Fences and artificial dens*

Fencing and artificial dens will be installed as part of the TSF Project construction. Fence and den maintenance and inspections will be part of Operation and Maintenance (O&M) practices.

### *6.4.10 Monitoring and research*

Camera monitoring and other monitoring of the TSF Project will occur regularly as described below. In addition, the TSF Project biologist will monitor kit fox usage of the site on a monthly basis, compiling camera and other sighting information, and making agency contacts as necessary, and will prepare an annual report summarizing findings.

Budget items include initial set up for cameras and equipment. Monitoring is to be conducted for the life of the project. Monitoring of range condition outside of the solar array fences will be conducted as prescribed in the Topaz Solar Farm Habitat Mitigation and Monitoring Plan.

### *6.4.11 Maintenance*

Over the 20 year life span of artificial dens, replacement cost is estimated to be approximately $100 per year.

### *6.4.12 Financial assurances*

The TSF Project will be responsible for all costs to install artificial dens and fund the monitoring program.

### *6.4.13 Monitoring plan*

The goal of the monitoring program will be to determine whether San Joaquin kit fox is using the TSF Project site, how many SJKF are on the TSF Project site, and where they are located. To avoid disturbance to kit fox, the primary method of survey will be remote cameras. Wireless digital cameras with active link to a base station will be used. A qualified kit fox biologist will establish remote camera stations at artificial dens and at selected roads. Camera locations will be adjusted as necessary to optimize results. Cameras will be checked weekly and images downloaded. Wildlife captured on photos will be tallied and numbers included in monitoring reports. Any occurrence of kit fox will be reported within one week to DFG and USFWS.

Kit fox scat surveys will be conducted to include the entire TSF Project site once per year for five years.

Monitoring of den sites will be conducted by the qualified kit fox biologist once per month for the first five years of the TSF project. Workers on site will be instructed to report any activity observed at den sites to the kit fox biologist. Dens will be inspected monthly to determine use. Records will be kept of den locations with respect to TSF Project components (e.g. solar arrays), fences, vegetation type and height, and adjacent open spaces. An annual survey of the TSF Project will be conducted by the qualified biologist to check fence passageways and to inspect the open space areas for sign of kit fox.

The recovery plan (USFWS 1998) specifies research of SJKF population ecology and management as one of the two necessary recovery actions. The TSF Project site provides an opportunity, through the monitoring program, to investigate many of the research topics identified in the recovery plan.

Table 4. Monitoring schedule.

| Task | Type | Equipment | Monitoring Frequency | Personnel | Reporting |
|---|---|---|---|---|---|
| Artificial den condition | Visual inspection, surface and fiber optic | | Once annually | Kit fox biologist | Annual report |
| Den utilization | Remote camera | 14 cameras, base station, computer | Weekly download, monthly maintenance | O&M | Data, all images to kit fox biologist. Information included in annual report |
| New dens | Visual inspection | | Normal daily operations | O&M, kit fox biologist | Information included in annual report |
| Kit fox population | Scat survey, DNA analysis | | Annual | Scat dogs, Center for Conservation and Evolutionary Genetics (or alternate organization with comparable expertise) | Written annual report |

### *6.4.14 Adaptive management plan*

Because there is no precedent for use of a solar farm by kit fox, it is not known if kit foxes will use the TSF Project site. Adaptive management of den sites and fence passages will be conducted when new information concerning kit fox use of the TSF Project site is obtained. Recommendations consistent with the Habitat Mitigation and Management Plan (to be prepared by Applicant as described in NEPA and CEQA documents) regarding management methods will be incorporated into the annual monitoring report and implemented as feasible.

### *6.4.15 Performance standards*

Onsite conservation measures shall be considered to be performing their designed function if passageways through fences remain open and passable and artificial dens remain open and intact. Blockages shall be cleared immediately upon discovery. Documentation of kit foxes within the solar array fence, or passing through fenced solar array areas would constitute evidence of successful fence installation. The Applicant has proposed in this CMP to provide offsite conservation lands, as described in Table 3, and CM-1, prior to securing County grading or construction permits.

SJKF utilization of the TSF Project site at the same or higher density level for five years after final completion of construction when compared to utilization levels prior to TSF Project construction will indicate a successful conservation program. If kit fox do not

occur on the TSF Project site at the same density as before construction, off-site conservation lands will still constitute a successful conservation program if habitat conditions on conservation lands are consistent with the Habitat Mitigation and Management Plan.

### *6.4.16 Monitoring reports*

A qualified kit fox biologist will submit annual monitoring reports to the County, the California Department of Fish and Game, and the U.S. Fish and Wildlife Service. Any kit fox located within fenced solar array areas will be reported to CDFG, USFWS, and the County within one week of sighting. Monitoring reports will include date of all site visits, survey methods, survey results, and recommendations.

# 7.0 Figures

- **Figure 1. Location Map**
- **Figure 2. Habitat Map**
- **Figure 3a. Genetic Analysis Species Identity Results, Alt 3B.1, 2010**
- **Figure 3b. Genetic Analysis Individual Identity Results, Alt 3B.1, 2010**
- **Figure 4. Genetic Analysis Individual Identity Results, Alt 3B.1, 2009**
- **Figure 5. SJKF Conservation Lands**
- **Figure 6. SJKF Conservation Lands and Philips-Cypher Habitat Suitability Data**
- **Figure 7. SJKF Conservation Lands and SC Wildlands Habitat Suitability Data**
- **Figure 8. SJKF Conservation Lands and SC Wildlands Terrain Ruggedness Data**
- **Figure 9. SJKF Conservation Lands and Slope Data**
- **Figure 10. Fence Detail**

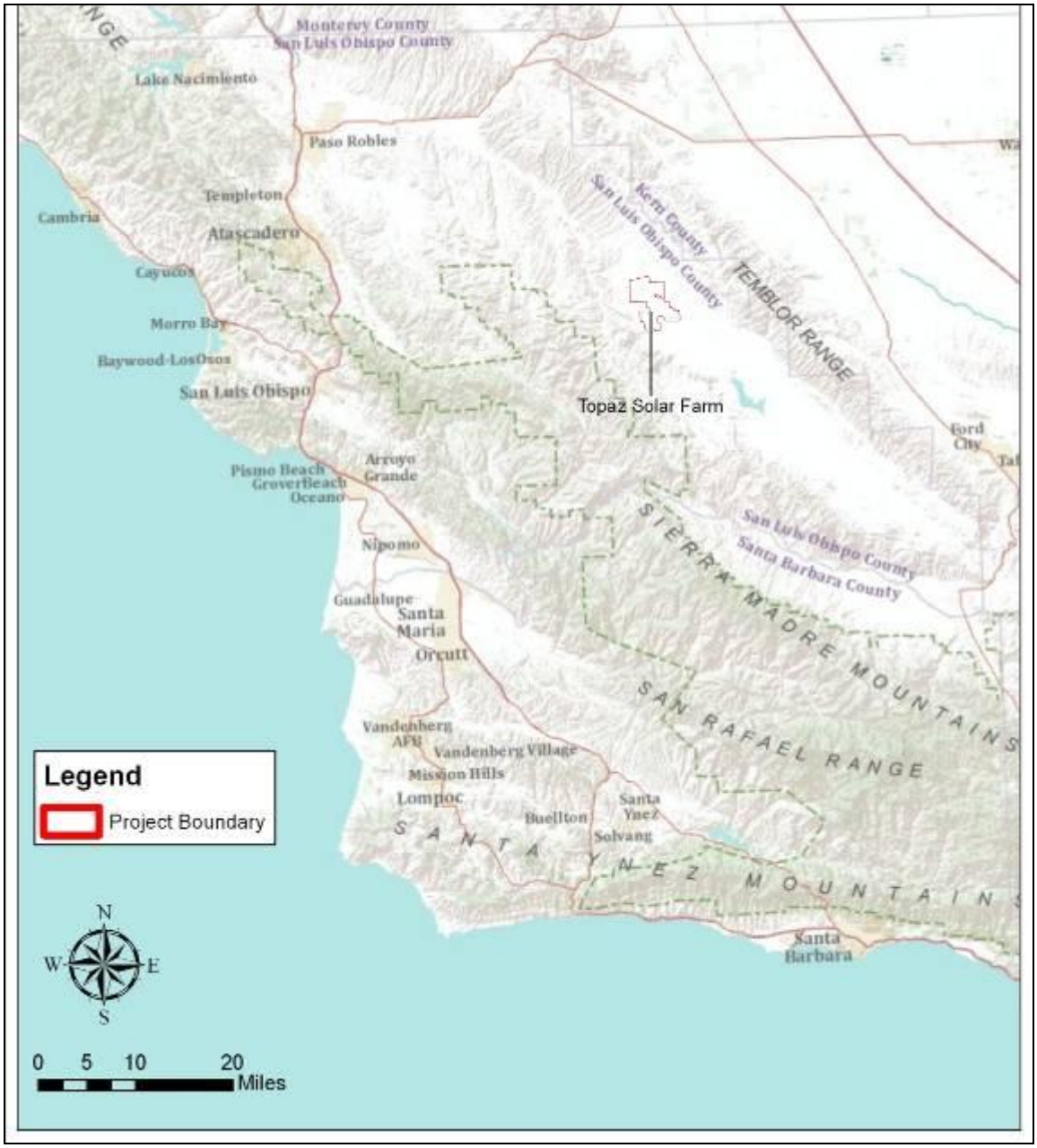



Figure 1. Location Map. The Project Site is approximately 9,700 acres in size, located in the Carrizo Plain, San Luis Obispo County. The proposed Project would be built on approximately 3,520 acres of land.

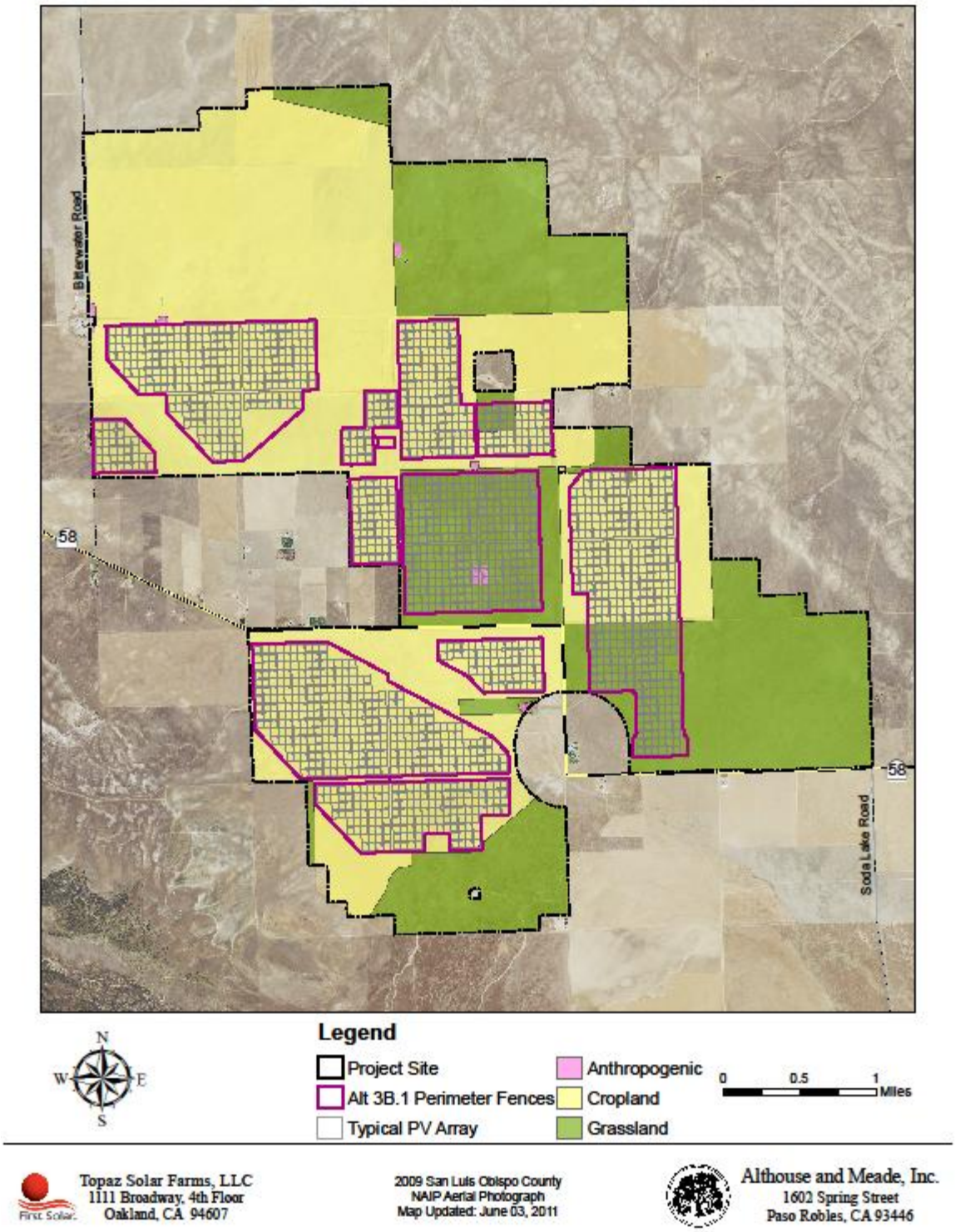



Figure 2. Habitat Map. The Project Site included all lands proposed for use in several alternatives considered. This map shows the approximately 9,700 acre Project Site. Alternative 3B.1 final layout would be smaller, approximately 3,520 acres within the Project Site.

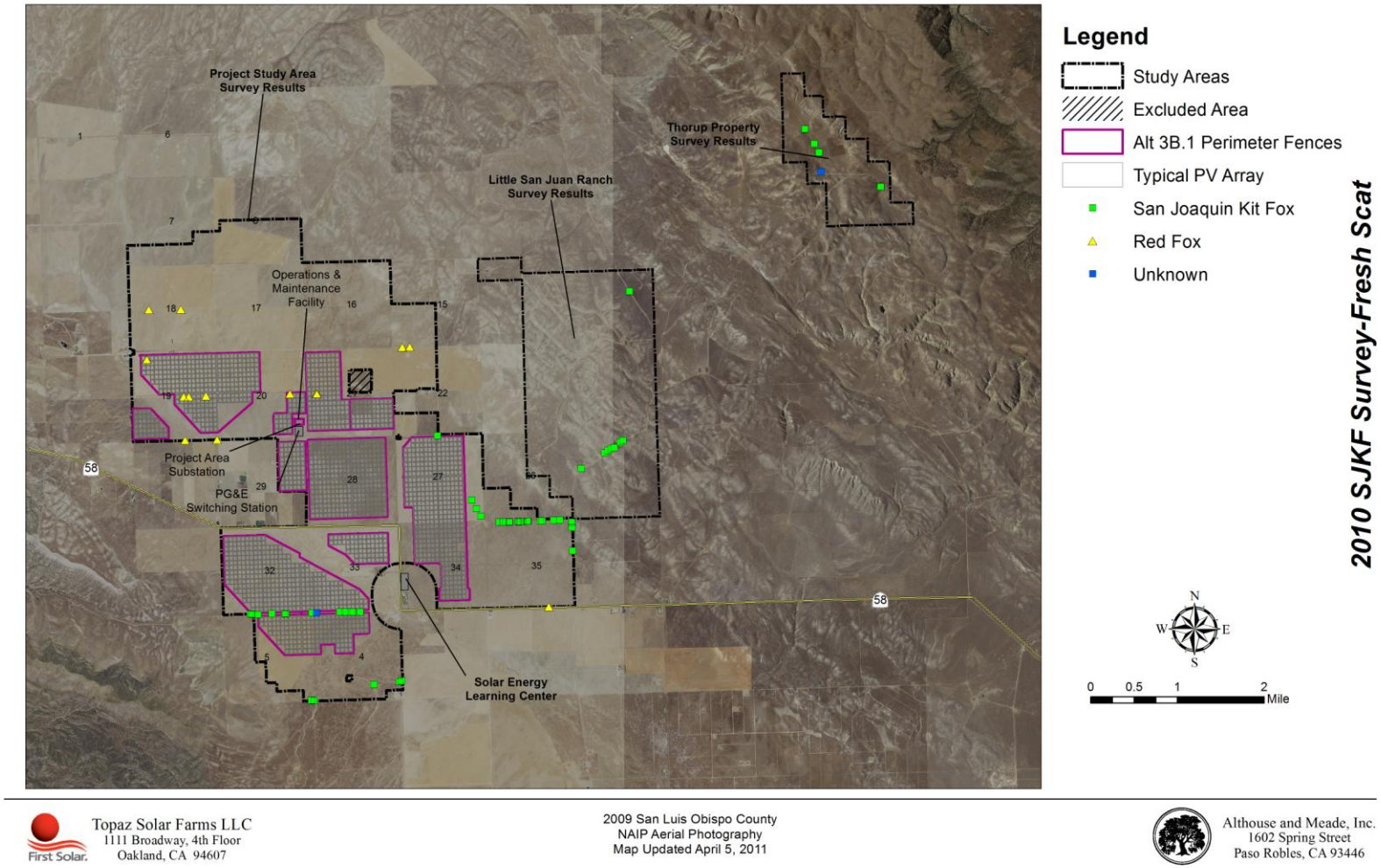



Figure 3a. Genetic analysis species identity results for kit fox, Alternative 3B.1, 2010.

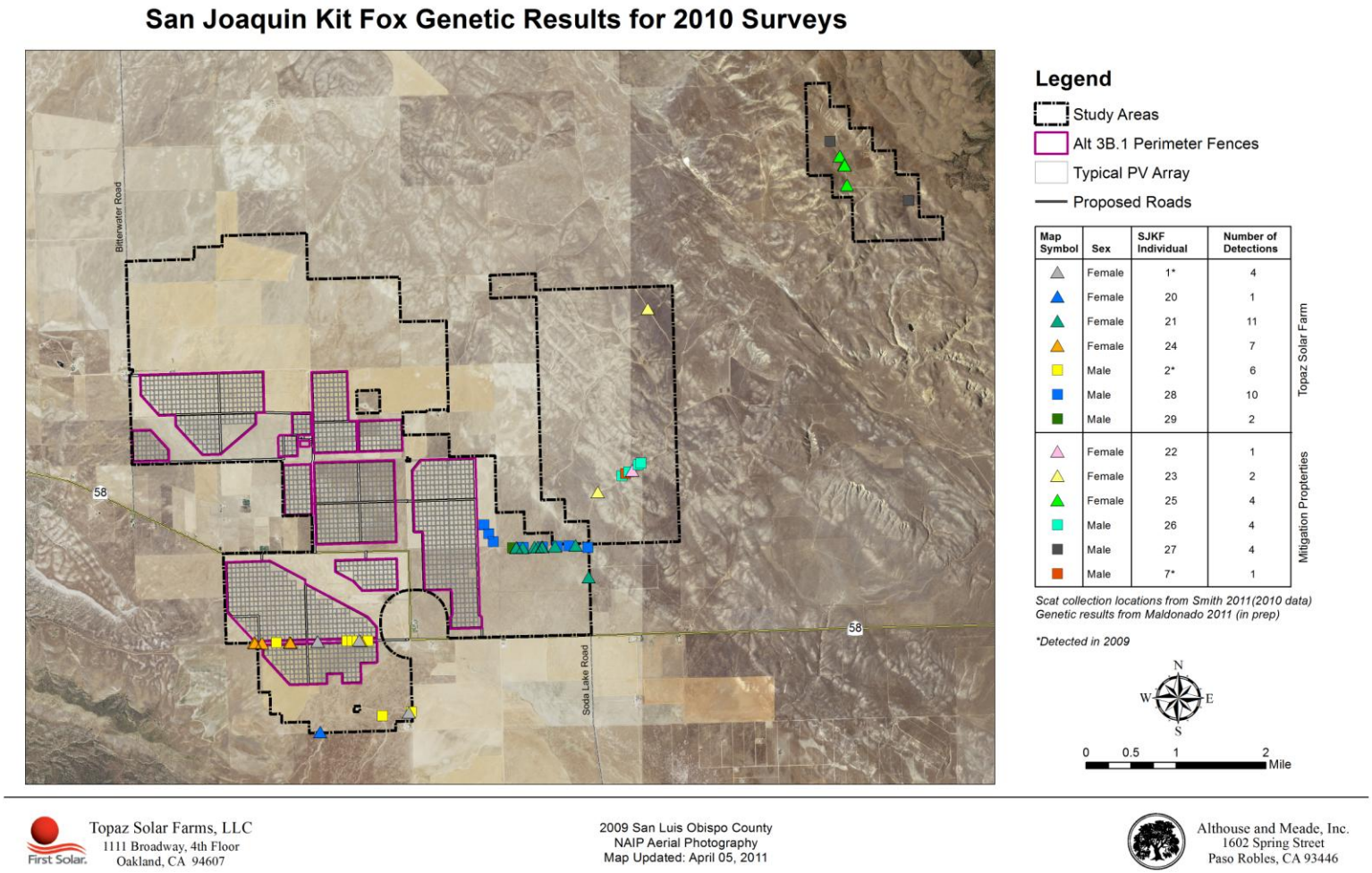
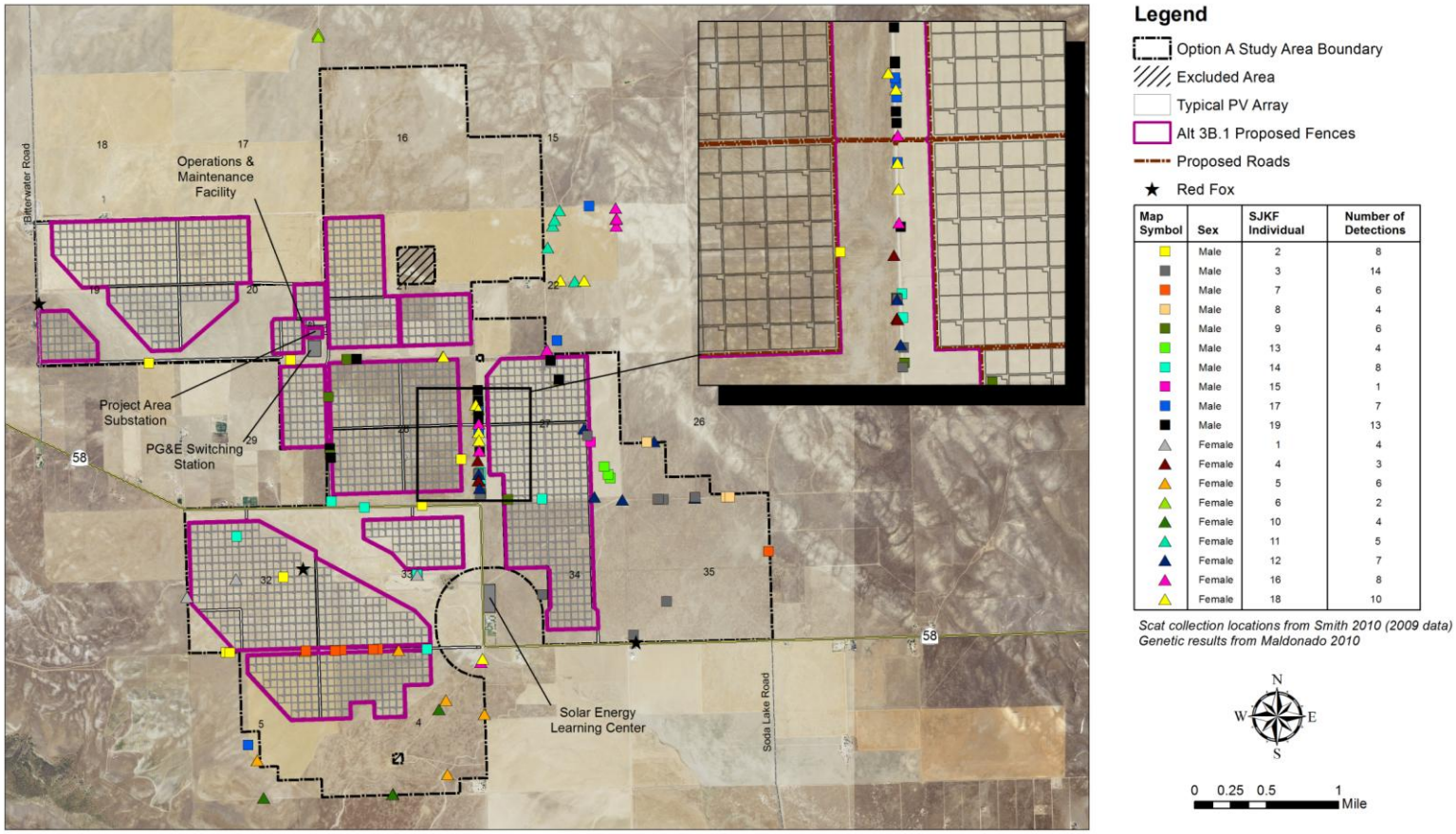



Figure 3b. Individual genetic identification of San Joaquin kit fox within the Topaz Solar Farm site, and two offsite properties, 2010 data.




| Map Symbol | Sex | SJKF Individual | Number of Detections |
|---|---|---|---|
| | Male | 2 | 8 |
| | Male | 3 | 14 |
| | Male | 7 | 6 |
| | Male | 8 | 4 |
| | Male | 9 | 6 |
| | Male | 13 | 4 |
| | Male | 14 | 8 |
| | Male | 15 | 1 |
| | Male | 17 | 7 |
| | Male | 19 | 13 |
| | Female | 1 | 4 |
| | Female | 4 | 3 |
| | Female | 5 | 6 |
| | Female | 6 | 2 |
| | Female | 10 | 4 |
| | Female | 11 | 5 |
| | Female | 12 | 7 |
| | Female | 16 | 8 |
| | Female | 18 | 10 |

Figure 4. Individual genetic identification of San Joaquin kit fox within the Topaz Solar Farm site, 2009 data.

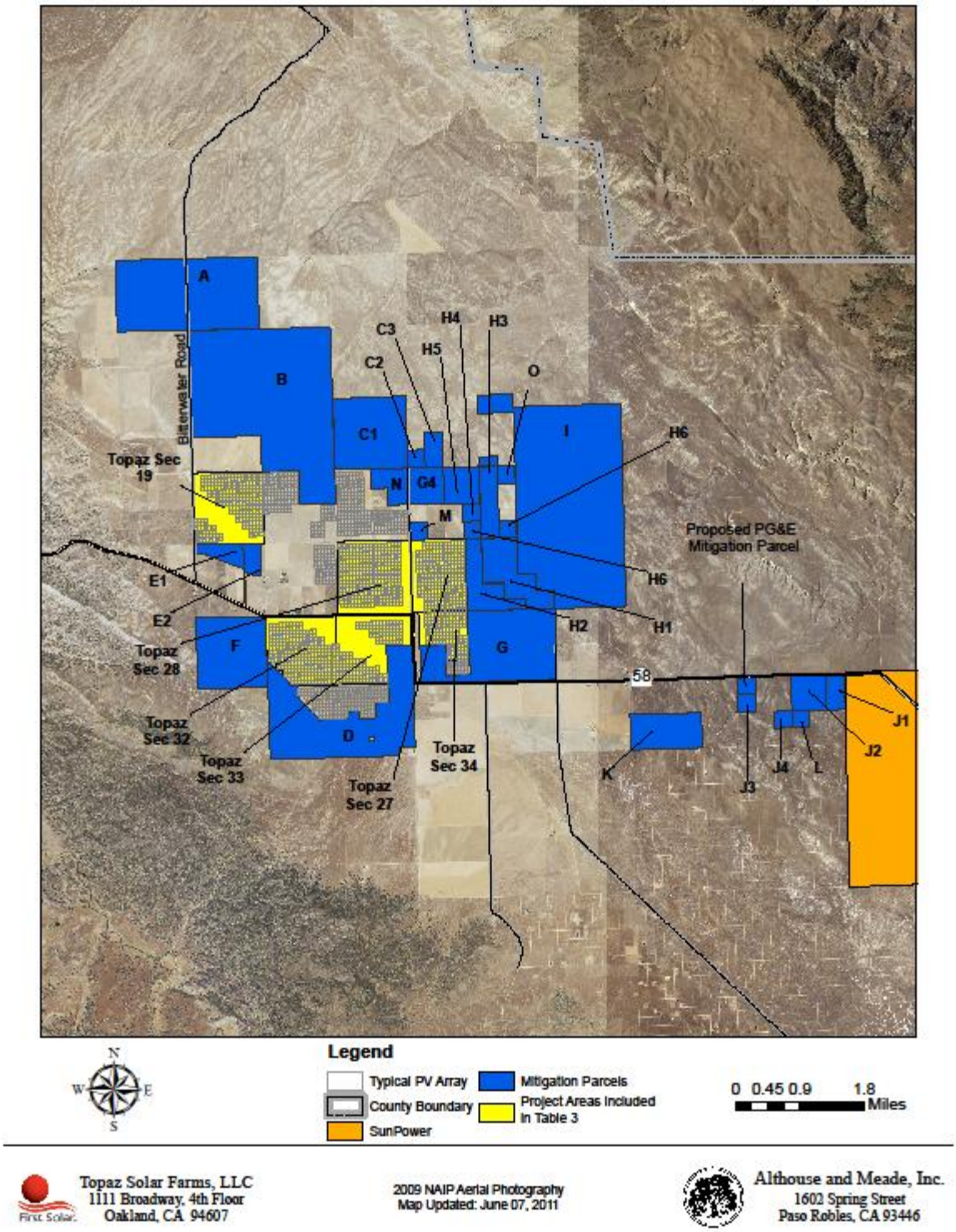



Figure 5. SJKF Potential Conservation Lands. Conservation measures would include parcels shown in blue in the conservation program. Refer to Table 3 for parcel information. PV arrays indicated are from Alternative 3B.1.

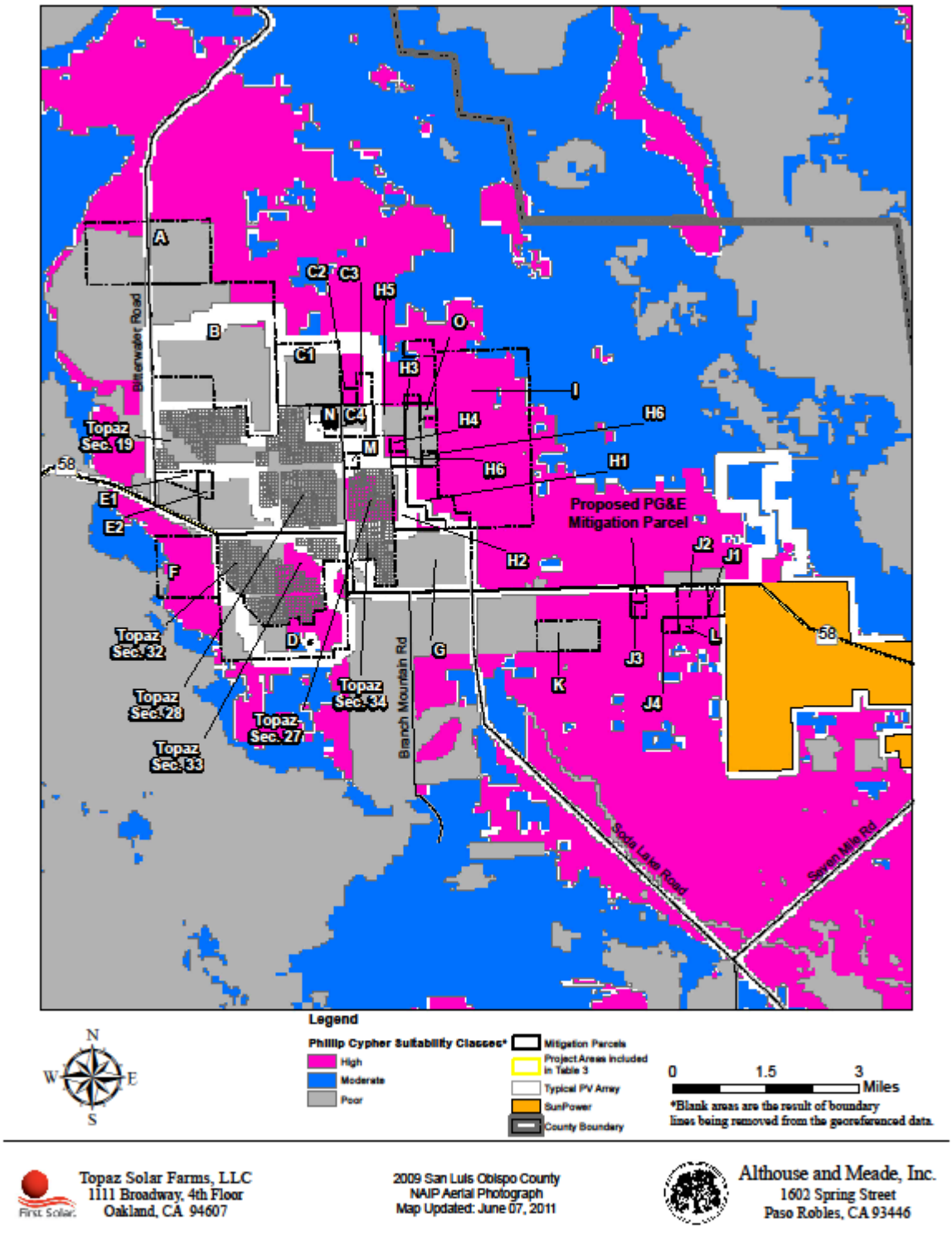



Figure 6. The Project area and conservation lands are indicated with the Philips-Cypher habitat suitability model data. Letters designating parcels are described in Table 3. PV arrays indicated are from Alternative 3B.1.

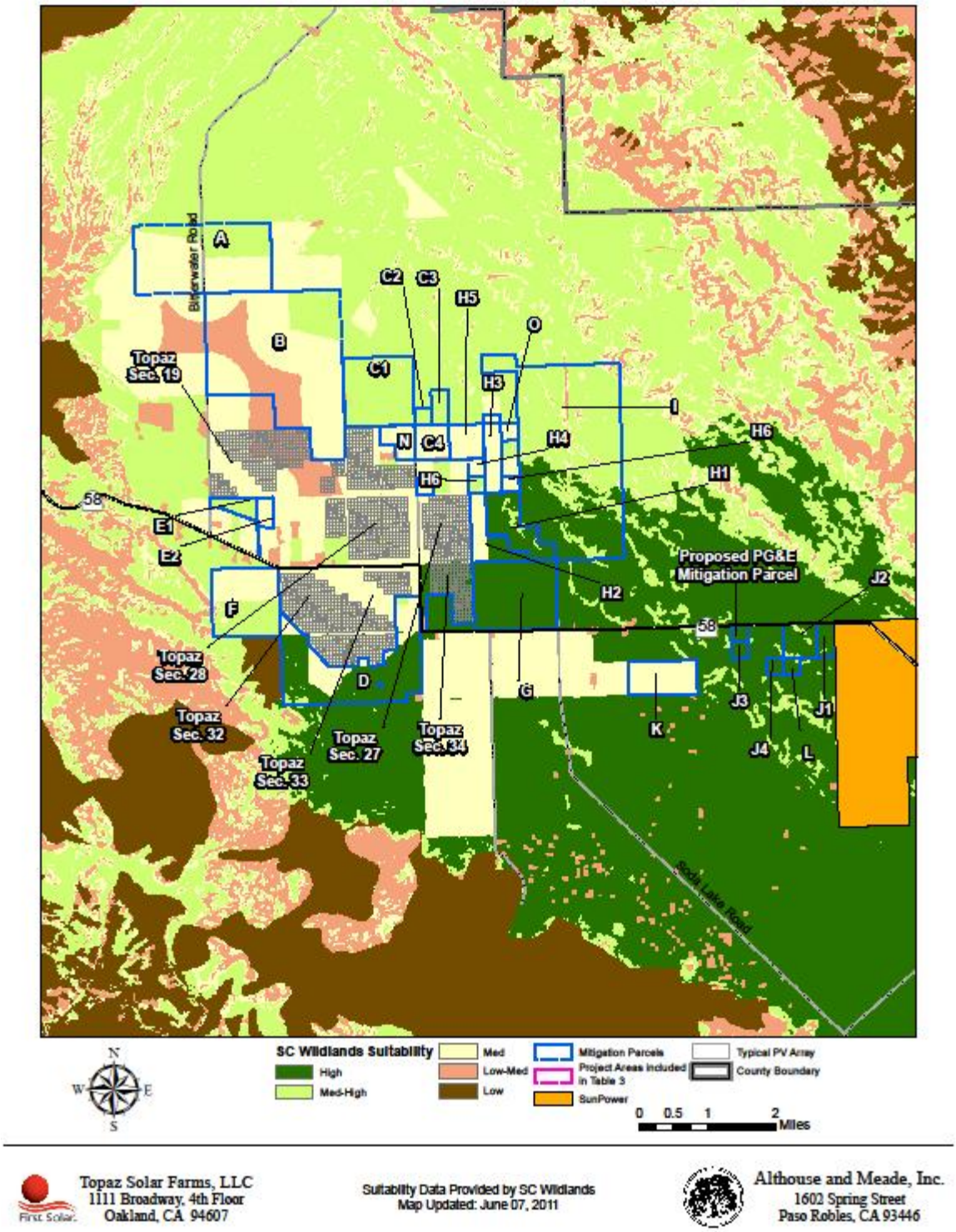



Figure 7. The Project area and conservation lands are indicated with the SC Wildlands habitat suitability model data. Letters designating parcels are described in Table 3. PV arrays indicated are from Alternative 3B.1.

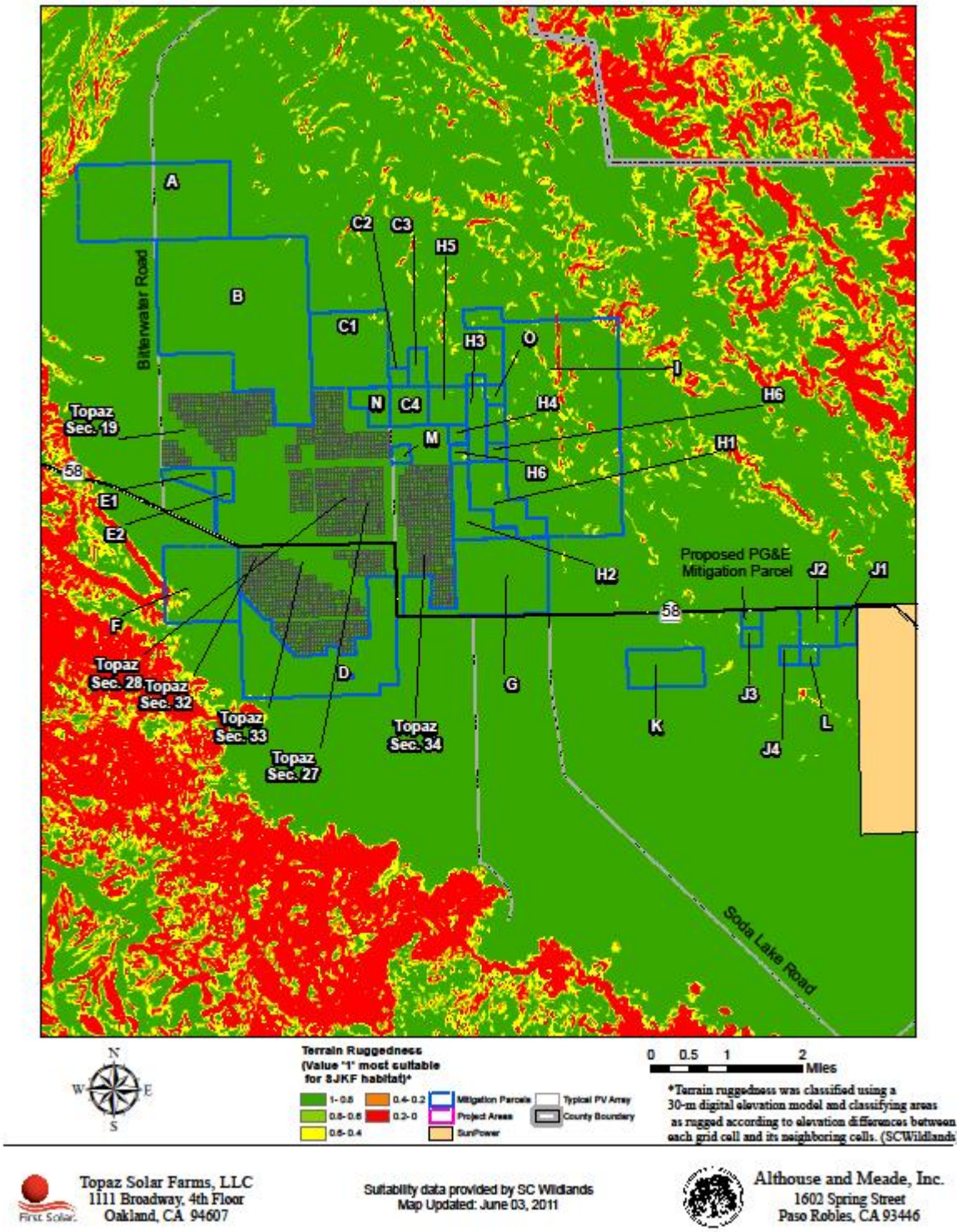



Figure 8. The Project area and conservation lands are indicated with the SC Wildlands terrain data. Letters designating parcels are described in Table 3. PV arrays indicated are from Alternative 3B.1.

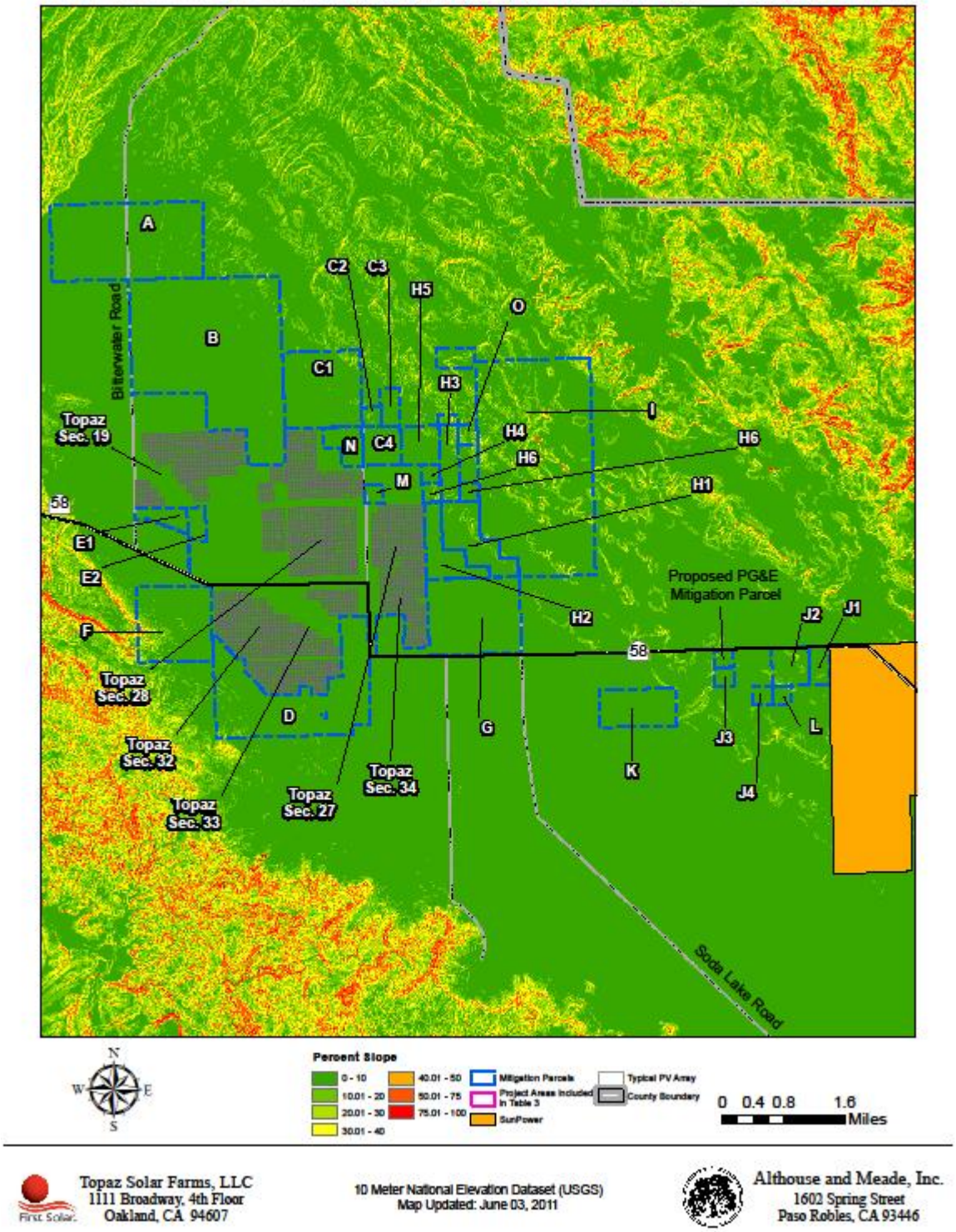



Figure 9. The Project area and conservation lands are indicated with slope data. Letters designating parcels are described in Table 3. PV arrays indicated are from Alternative 3B.1.

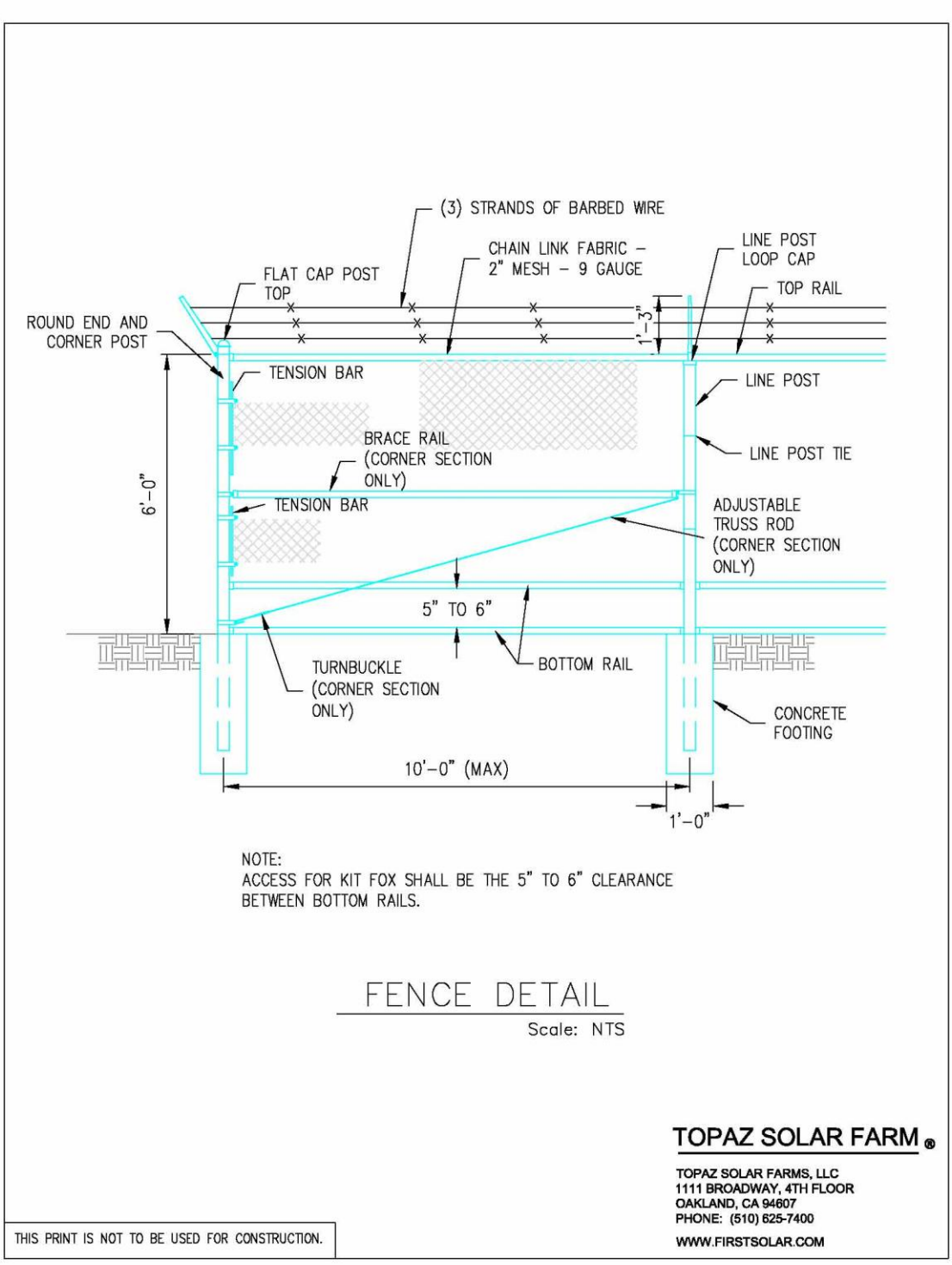



Figure 10. Detail of proposed perimeter fence for the Topaz Solar Farm. The 5 to 6 inch gap along the ground would allow kit fox to move through the fence.

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# Exhibit A - USFWS Kit Fox Protection Recommendations

**U.S. FISH AND WILDLIFE SERVICE**
**STANDARDIZED RECOMMENDATIONS**
**FOR PROTECTION OF THE SAN JOAQUIN KIT FOX**
**PRIOR TO OR DURING GROUND DISTURBANCE**

Prepared by the Sacramento Fish and Wildlife Office
June 1999

## INTRODUCTION

The following document includes many of the San Joaquin kit fox (*Vulpes macrotis mutica*) protection measures typically recommended by the U. S. Fish and Wildlife Service (Service), prior to and during ground disturbance activities. However, incorporating relevant sections of these guidelines into the proposed project is not the only action required under the Endangered Species Act of 1973, as amended (Act). Project applicants should contact the Service in Sacramento to determine the full range of requirements that apply to your project; the address and telephone number are given at the end of this document. Formal authorization for the project may be required under either section 7 or section 10 of the Act. Implementation of the measures presented in this document may be necessary to avoid violating the provisions of the Act, including the prohibition against "take" (defined as killing, harming, or harassing a listed species, including actions that damage or destroy its habitat). Such protection measures may also be required under the terms of a biological opinion pursuant to section 7 of the Act resulting in incidental take authorization (authorization), or an incidental take permit (permit) pursuant to section 10 of the Act. The specific measures implemented to protect kit fox for any given project shall be determined by the Service based upon the applicant's consultation with the Service.

The purpose of this document is to make information on kit fox protection strategies readily available and to help standardize the methods and definitions currently employed to achieve kit fox protection. The measures outlined in this document are subject to modification or revision at the discretion of the Service.

All surveys, den destructions, and monitoring described in this document must be conducted by a qualified biologist. A qualified biologist (biologist) means any person who has completed at least four years of university training in wildlife biology or a related science and/or has demonstrated field experience in the identification and life history of the San Joaquin kit fox. In addition, biologist(s) must be able to identify coyote, red fox, gray fox, and kit fox tracks, and to have seen a kit fox in the wild, at a zoo, or as a museum mount.

## SMALL PROJECTS

Small projects are considered to be those projects with small foot prints such as an individual in-fill oil well, communication tower, or bridge repair. These projects must stand alone and not be part of, or in any way connected to larger projects (i.e., bridge repair or improvement to serve a

future urban development). The Service recommends that on these small projects, the biologist survey the proposed project boundary and a 200-foot area outside of the project footprint to identify habitat features, and make recommendations on situating the project to minimize or avoid impacts. If habitat features cannot be completely avoided, then preconstruction surveys should be conducted.

Preconstruction/preactivity surveys shall be conducted no less than 14 days and no more than 30 days prior to the beginning of ground disturbance and/or construction activities or any project activity likely to impact the San Joaquin kit fox. Surveys should identify kit fox habitat features on the project site and evaluate use by kit fox and, if possible, and assess the potential impacts to the kit fox by the proposed activity. The status of all dens should be determined and mapped (see Survey Protocol).

Written results of preconstruction/preactivity surveys must be received by the Service within five days after survey completion and prior to the start of ground disturbance and/or construction activities. If a natal/pupping den is discovered within the project area or within 200-feet of the project boundary, the Service shall be immediately notified. If the preconstruction/preactivity survey reveals an active natal pupping or new information, the project applicant should contact the Service immediately to obtain the necessary take authorization/permit.

If take authorization/permit has already been issued, then the biologist may proceed with den destruction within the project boundary, except natal/pupping dens (active or inactive). Protective exclusion zones can be placed around all known and potential dens which occur outside the project footprint (conversely, the project boundary can be demarcated, see den destruction section).

**OTHER PROJECTS**

It is likely that all other projects occurring within kit fox habitat will require a take authorization/permit from the Service. This determination would be made by the Service during the early evaluation process (see Survey Protocol). These other projects would include, but are not limited to: linear projects; projects with large footprints such as urban development; and projects which in themselves may be small but have far reaching impacts (i.e., water storage or conveyance facilities that promote urban growth or agriculture, etc.).

The take authorization/permit issued by the Service may incorporate some or all of the protection measures presented in this document. The take authorization/permit may include measures specific to the needs of the project, and those requirements supersede any requirements found in this document.

STANDARD RECOMMENDATIONS 3

**EXCLUSION ZONES**

The configuration of exclusion zones around the kit fox dens should have a radius measured outward from the entrance or cluster of entrances. The following radii are minimums, and if they cannot be followed the Service must be contacted:

| | |
|---|---|
| Potential den | 50 feet |
| Known den | 100 feet |
| Natal/pupping den (occupied and unoccupied) | Service must be contacted |
| Atypical den | 50 feet |

Known den: To ensure protection, the exclusion zone should be demarcated by fencing that encircles each den at the appropriate distance and does not prevent access to the den by kit foxes. Exclusion zone fencing should be maintained until all construction related or operational disturbances have been terminated. At that time, all fencing shall be removed to avoid attracting subsequent attention to the dens.

Potential and Atypical dens: Placement of 4-5 flagged stakes 50 feet from the den entrance(s) will suffice to identify the den location; fencing will not be required, but the exclusion zone must be observed.

Construction and other project activities should be prohibited or greatly restricted within these exclusion zones. Only essential vehicle operation on existing roads and foot traffic should be permitted. Otherwise, all construction, vehicle operation, material storage, or any other type of surface-disturbing activity should be prohibited within the exclusion zones.

**DESTRUCTION OF DENS**

Disturbance to all San Joaquin kit fox dens should be avoided to the maximum extent possible. Protection provided by kit fox dens for use as shelter, escape, cover, and reproduction is vital to the survival of the species. Limited destruction of kit fox dens may be allowed, if avoidance is not a reasonable alternative, provided the following procedures are observed. The value to kit foxes of potential, known, and natal/pupping dens differ and therefore, each den type needs a different level of protection. **Destruction of any known or natal/pupping kit fox den requires take authorization/permit from the Service**.

STANDARD RECOMMENDATIONS 4

Natal/pupping dens: Natal or pupping dens which are occupied will not be destroyed until the pups and adults have vacated and then only after consultation with the Service. Therefore, project activities at some den sites may have to be postponed.

Known Dens: Known dens occurring within the footprint of the activity must be monitored for three days with tracking medium or an infra-red beam camera to determine the current use. If no kit fox activity is observed during this period, the den should be destroyed immediately to preclude subsequent use. If kit fox activity is observed at the den during this period, the den should be monitored for at least five consecutive days from the time of the observation to allow any resident animal to move to another den during its normal activity. Use of the den can be discouraged during this period by partially plugging its entrances(s) with soil in such a manner that any resident animal can escape easily. Only when the den is determined to be unoccupied may the den be excavated under the direction of the biologist. If the animal is still present after five or more consecutive days of plugging and monitoring, the den may have to be excavated when, in the judgment of a biologist, it is temporarily vacant, for example during the animal's normal foraging activities. The Service encourages hand excavation, but realizes that soil conditions may necessitate the use of excavating equipment. However, extreme caution must be exercised.

Destruction of the den should be accomplished by careful excavation until it is certain that no kit foxes are inside. The den should be fully excavated, filled with dirt and compacted to ensure that kit foxes cannot reenter or use the den during the construction period. If at any point during excavation a kit fox is discovered inside the den, the excavation activity shall cease immediately and monitoring of the den as described above should be resumed. Destruction of the den may be completed when in the judgement of the biologist, the animal has escaped from the partially destroyed den.

Potential Dens: If a take authorization/permit has been obtained from the Service, den destruction may proceed without monitoring, unless other restrictions were issued with the take authorization/permit. If no take authorization/permit has been issued, then potential dens should be monitored as if they were known dens. If any den was considered to be a potential den, but is later determined during monitoring or destruction to be currently, or previously used by kit fox (e.g., if kit fox sign is found inside), then destruction shall cease and the Service shall be notified immediately.

**CONSTRUCTION AND OPERATIONAL REQUIREMENTS**

Habitat subject to permanent and temporary construction disturbances and other types of project-related disturbance should be minimized. Project designs should limit or cluster permanent project features to the smallest area possible while still permitting project goals to be achieved. To minimize temporary disturbances, all project-related vehicle traffic should be restricted to established roads, construction areas, and other designated areas. These areas should also be

included in preconstruction surveys and, to the extent possible, should be established in locations disturbed by previous activities to prevent further impacts.

1. Project-related vehicles should observe a 20-mph speed limit in all project areas, except on county roads and State and Federal highways; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction should be minimized. Off-road traffic outside of designated project areas should be prohibited.

2. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of a project, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures under number 13 of this section must be followed.

3. Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4-inches or greater that are stored at a construction site for one or more overnight periods should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe should not be moved until the Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.

4. All food-related trash items such as wrappers, cans, bottles, and food scraps should be disposed of in closed containers and removed at least once a week from a construction or project site.

5. No firearms shall be allowed on the project site.

6. To prevent harassment, mortality of kit foxes or destruction of dens by dogs or cats, no pets should be permitted on project sites.

7. Use of rodenticides and herbicides in project areas should be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds should observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the Service. If rodent control

must be conducted, zinc phosphide should be used because of proven lower risk to kit fox.

8. A representative shall be appointed by the project proponent who will be the contact source for any employee or contractor who might inadvertently kill or injure a kit fox or who finds a dead, injured or entrapped individual. The representative will be identified during the employee education program. The representative's name and telephone number shall be provided to the Service.

9. An employee education program should be conducted for any project that has expected impacts to kit fox or other endangered species. The program should consist of a brief presentation by persons knowledgeable in kit fox biology and legislative protection to explain endangered species concerns to contractors, their employees, and military and agency personnel involved in the project. The program should include the following: a description of the San Joaquin kit fox and its habitat needs; a report of the occurrence of kit fox in the project area; an explanation of the status of the species and its protection under the Endangered Species Act; and a list of measures being taken to reduce impacts to the species during project construction and implementation. A fact sheet conveying this information should be prepared for distribution to the above-mentioned people and anyone else who may enter the project site.

10. Upon completion of the project, all areas subject to temporary ground disturbances, including storage and staging areas, temporary roads, pipeline corridors, etc. should be re-contoured if necessary, and revegetated to promote restoration of the area to pre-project conditions. An area subject to "temporary" disturbance means any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated. Appropriate methods and plant species used to revegetate such areas should be determined on a site-specific basis in consultation with the Service, California Department of Fish and Game (CDFG), and revegetation experts.

11. In the case of trapped animals, escape ramps or structures should be installed immediately to allow the animal(s) to escape, or the Service should be contacted for advice.

12. Any contractor, employee, or military or agency personnel who inadvertently kills or injures a San Joaquin kit fox shall immediately report the incident to their representative. This representative shall contact the CDFG immediately in the case of a dead, injured or entrapped kit fox. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045. They will contact the local warden or biologist.

13. The Sacramento Fish and Wildlife Office and CDFG will be notified in writing within three working days of the accidental death or injury to a San Joaquin kit fox during

project related activities. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal and any other pertinent information. The Service contact is the Chief of the Division of Endangered Species, at the addresses and telephone numbers given below. The CDFG contact is Mr. Ron Schlorff at 1416 9th Street, Sacramento, California 95814, (916) 654-4262.

Any project-related information required by the Service or questions concerning the above conditions or their implementation may be directed in writing to the U.S. Fish and Wildlife Service at:

Endangered Species Division
2800 Cottage Way, Suite W2605
Sacramento, California 95825-1846
(916) 414-6620

STANDARD RECOMMENDATIONS 8

"Take" - Section 9 of the Endangered Species Act of 1973, as amended (Act) prohibits the "take" of any federally listed endangered species by any person (an individual, corporation, partnership, trust, association, etc.) subject to the jurisdiction of the United States. As defined in the Act, take means " . . . to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." Thus, not only is a listed animal protected from activities such as hunting, but also from actions that damage or destroy its habitat.

"Dens" - San Joaquin kit fox dens may be located in areas of low, moderate, or steep topography. Den characteristics are listed below, however, the specific characteristics of individual dens may vary and occupied dens may lack some or all of these features. Therefore, caution must be exercised in determining the status of any den. Typical dens may include the following: (1) one or more entrances that are approximately 5 to 8 inches in diameter; (2) dirt berms adjacent to the entrances; (3) kit fox tracks, scat, or prey remains in the vicinity of the den; (4) matted vegetation adjacent to the den entrances; and (5) manmade features such as culverts, pipes, and canal banks.

"Known den" - Any existing natural den or manmade structure that is used or has been used at any time in the past by a San Joaquin kit fox. Evidence of use may include historical records, past or current radiotelemetry or spotlighting data, kit fox sign such as tracks, scat, and/or prey remains, or other reasonable proof that a given den is being or has been used by a kit fox. The Service discourages use of the terms "active" and "inactive" when referring to any kit fox den because a great percentage of occupied dens show no evidence of use, and because kit foxes change dens often, with the result that the status of a given den may change frequently and abruptly.

"Potential Den" - Any subterranean hole within the species' range that has entrances of appropriate dimensions for which available evidence is insufficient to conclude that it is being used or has been used by a kit fox. Potential dens shall include the following: (1) any suitable subterranean hole; or (2) any den or burrow of another species (e.g., coyote, badger, red fox, or ground squirrel) that otherwise has appropriate characteristics for kit fox use.

"Natal or Pupping Den" - Any den used by kit foxes to whelp and/or rear their pups. Natal/pupping dens may be larger with more numerous entrances than dens occupied exclusively by adults. These dens typically have more kit fox tracks, scat, and prey remains in the vicinity of the den, and may have a broader apron of matted dirt and/or vegetation at one or more entrances. A natal den, defined as a den in which kit fox pups are actually whelped but not necessarily reared, is a more restrictive version of the pupping den. In practice, however, it is difficult to distinguish between the two, therefore, for purposes of this definition either term applies.

"Atypical Den" - Any manmade structure which has been or is being occupied by a San Joaquin kit fox. Atypical dens may include pipes, culverts, and diggings beneath concrete slabs and buildings.

# Exhibit B: Fence Design for Kit Fox Passage

# PERMEABLE FENCE AND WALL DESIGNS THAT FACILITATE PASSAGE BY ENDANGERED SAN JOAQUIN KIT FOXES



**Prepared by:**

**Brian L. Cypher and Christine L. Van Horn Job**

**California State University, Stanislaus**
**Endangered Species Recovery Program**

**March 2009**

## EXECUTIVE SUMMARY

San Joaquin kit foxes (*Vulpes macrotis mutica*) are listed as federally endangered and California threatened, due largely to past and current habitat loss and degradation. This habitat degradation includes fragmentation of habitat, which sometimes results from barriers that impede movements. Such barriers can include fences and walls that are constructed for various purposes. However, certain fence and wall designs are "permeable" in that they permit passage by kit foxes. Furthermore, even impermeable designs potentially could be modified to facilitate passage by kit foxes. Because of the relatively small size of kit foxes, fences and walls can be easily modified to permit passage by foxes.

We collected images of fence and wall designs in Bakersfield, CA that were known to be permeable to kit foxes, based on direct observations of animals passing through these structures. Kit foxes are able to pass through gaps as small as 3-3.5 inches (7.5-9 cm) in one dimension (width or height). However, smaller openings may slow passage thus making foxes vulnerable to capture when being pursued by a larger predator.

Permeable fence and wall designs help to maintain connectivity between areas thereby making more habitat available for use by kit foxes. Also, it may be possible to design fencing in a manner that impedes passage by larger predators that could potentially kill kit foxes, thus providing a further benefit to foxes. The optimal fence designs and modifications for any given situation will depend upon the primary purpose of the fencing (e.g., human safety, property protection, livestock enclosure, etc.), as well as other factors such as cost.

## INTRODUCTION

The San Joaquin kit fox (*Vulpes macrotis mutica*) is a small canid endemic to central California. Although as a species kit foxes occur throughout much of the arid western United States, the San Joaquin kit fox is a distinct subspecies that is restricted to the San Joaquin Valley and select arid valleys in the adjacent Coast Ranges (U.S. Fish and Wildlife Service 1998). The historic range of the San Joaquin kit fox is not well defined. This range likely extended from southern Kern County north to Contra Costa County on the west side of the San Joaquin Valley and Stanislaus County on the east side (Grinnell et al. 1937, U.S. Fish and Wildlife Service 1998). Foxes also were known to occur on the Carrizo Plain and Cuyama Valley in San Luis Obispo County, and in the 1950s were documented in the Salinas Valley in San Luis Obispo and Monterey counties (Balestreri 1981). Foxes also were reported from select valley areas in San Benito and Santa Clara counties (U.S. Fish and Wildlife Service 1998). However, due to an ability to move long distances, it is unclear whether foxes observed in some areas represented extant populations or dispersing individuals.

The current boundaries of the range of the San Joaquin kit fox probably are not significantly different from historic boundaries. However, within those boundaries, extensive areas of habitat have been converted to agricultural, industrial, and urban uses. Consequently, within the range boundaries, the remaining habitat is much diminished and is highly fragmented (Fig. 1). The largest remaining populations occur in the southern and southwestern San Joaquin Valley and on the Carrizo Plain. Optimal habitat for San Joaquin kit foxes consists of arid shrub and shrub-grassland communities with flat to gently rolling topographic relief (U.S. Fish and Wildlife Service 1998).

The San Joaquin kit fox is listed as federally endangered and California threatened, largely due to past and current habitat loss and degradation (U.S. Fish and Wildlife Service 1998). This habitat degradation includes fragmentation of habitat. Most fragmentation results from conversion of habitat on some parcels thereby leaving smaller blocks of habitat separated by lands with uses incompatible to kit foxes. Some fragmentation also results from the construction of barriers that impede fox movements. Such barriers include canals and large roads. On a more local scale, fences and walls constructed for various purposes also can constitute barriers for kit foxes. However, certain fence designs are "permeable" in that they permit passage by kit foxes. Furthermore, even impermeable designs potentially could be modified to facilitate passage by kit foxes. Because of the relatively small size of kit foxes, fences and walls can be easily modified to permit passage by foxes. Permeable fence and wall designs help to maintain connectivity between areas thereby making more habitat available for use by kit foxes. Also, it may be possible to design fencing in a manner that impedes passage by larger predators that could potentially kill kit foxes, thus providing a further benefit to foxes. The optimal fence designs and modifications for any given situation will depend upon the primary purpose of the fencing (e.g., security from human access, livestock enclosure, etc.).

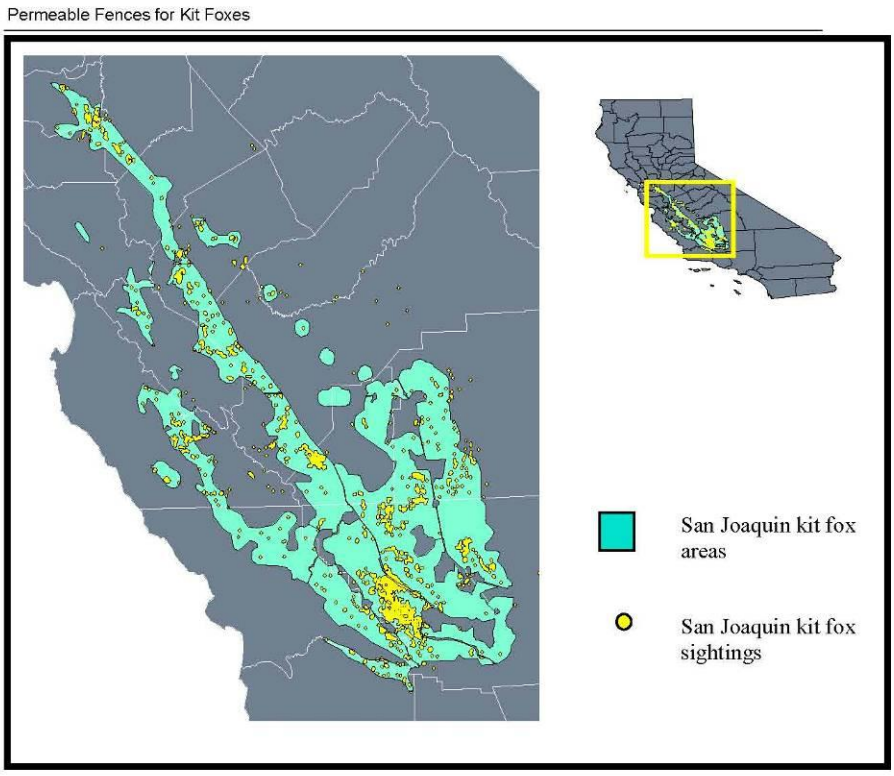



Figure 1. San Joaquin kit fox occurrences and estimated occupied areas based on these occurrences (CSUS Endangered Species Recovery Program unpublished data).

The objectives of this report are to:

1. Identify fence designs and potential modifications for fences and walls that facilitate passage by kit foxes.

2. Discuss designs and modifications that might allow passage by kit foxes but impede or prevent passage by larger predators.

## METHODS

For this effort, we collected information on fence designs and modification strategies in the city of Bakersfield, California. A sizeable kit fox population is present in Bakersfield and appears to be thriving (Bjurlin and Cypher 2005, Bjurlin et al. 2005). In this urban environment, most kit foxes encounter fences and walls on a daily basis.

Since 1997, research has been conducted on kit foxes in Bakersfield to assess their demographic and ecological patterns, and to develop conservation strategies (Cypher in press). During the course of this research, hundreds of kit foxes have been live-captured, and radio collars have been placed on many to assess survival, reproduction, den use patterns, and movements. This trapping (and subsequent release) and tracking of collared animals, along with numerous opportunistic sightings of foxes, have provided numerous observations of how foxes negotiate barriers such as fences and walls. In particular and most relevant, these observations have provided excellent insights on which fence designs permit passage by kit foxes and also on how fences and even walls might be modified to facilitate such passage.

Images of fence designs and potential modifications have been collected and compiled in this report. Along with the images, we try to provide discussion on the potential advantages and any disadvantages of each design.

## RESULTS AND DISCUSSION

***Permeable Fence Designs***

Based on our observations, kit foxes are able to negotiate many fence designs by either passing directly through spaces in the fence or passing under it. This capability is greatly enhanced by the relatively small size of kit foxes. Kit foxes are sufficiently small and flexible that they are able to get though gaps measuring 3-3.5 inches (7.5-9 cm) in width. However, when a gap is this small in height or width, it usually needs to larger in the other dimension (probably at least double) to permit passage by kit foxes.

Fencing that is generally used for livestock usually is quite permeable to kit foxes. Kit foxes have no problem passing under or through fences consisting primarily of strands of barbed wire. Such fences commonly are used to contain cattle. "Hog-wire" fencing is commonly used within the range of the San Joaquin kit fox to contain sheep. Such fencing can be variable in mesh size, but usually has mesh openings sufficiently large to permit passage by kit foxes (Fig. 2).

Chain-link fencing usually is not permeable to kit foxes. The mesh size, particularly on standard chain-link fencing, is too small to permit passage by kit foxes (Fig. 3). Larger chain-link mesh sizes exist that potentially could permit passage by kit foxes, but these

larger mesh sizes are still sufficiently small that passage by foxes likely would be difficult (Fig. 3).



Figure 2. "Hog-wire" style fencing with openings measuring 6 inches (15 cm) on each side. These openings are sufficiently large to permit passage by kit foxes.



Figure 3. Chain-link fencing. The upper left image depicts standard chain-link in which the openings are too small to permit passage by kit foxes. In the upper right image, a kit fox pup has gotten its head caught in the fence and died. The lower images depict chain-link fencing with larger openings; passage by kit foxes might be possible but would be difficult.

Use of decorative security fencing is becoming more common. Many of these fence designs have gaps that permit relatively easy passage by kit foxes as well as other animals (Fig. 4). In Bakersfield, foxes frequently have been observed passing through such fences.



Figure 4. Decorative fencing designs that are permeable to kit foxes.

Even fences with inherent designs that do not permit passage by kit foxes can be made permeable simply by raising the bottom of the fence off of the ground a few inches. Kit foxes in Bakersfield commonly are observed easily slipping under such fences (Fig. 5). Furthermore, even in situations where the fences extend down to ground level, kit foxes have created their own "modifications" that render these fences permeable. We have observed a number of instances where kit foxes have excavated a shallow scrape thereby effectively lowering the ground level and facilitating passage under the fence (Fig. 6).



Figure 5. Metal fencing design with openings too small for passage by kit foxes, but the bottom of which has been raised 4-5 inches (10-12.5 cm) off the ground thereby permitting easy under-passage by foxes.

Permeable Fences for Kit Foxes



Figure 6. Chain-link fencing installed such that the bottom of the fence is suspended off the ground. Kit foxes are able to pass under this fence, particular in locations where the ground has low spots. In the lower images, kit foxes have dug a shallow passage way under the fence so that they can access dens under the portable buildings.

Fence gates sometimes present opportunities for passage by kit foxes. Because of their construction design, gates frequently have sizeable gaps that kit foxes are able to pass through (Fig. 7). In Bakersfield, kit foxes frequently are observed entering or exiting fenced areas by way of gaps associated with gates. Gaps that foxes passed through were at least 3 inches (7.5 cm) wide. Similarly, kit foxes will readily use gaps created in fences, either by accident or on purpose (Fig. 7).




Figure 7. Gaps in fence gating that permit passage by kit foxes. In the lower right image, a kit fox is passing through a gap in chain-link fencing.

Some fences are constructed with a cement curb or foundation (Fig. 8). Such fences effectively prevent kit foxes from simply excavating a shallow passage way to pass under the fence. In some instances, foxes have excavated larger, deeper passages underneath the cement foundations (Fig. 8). This entails considerable effort and the size of these excavations increase the probability that property owners will backfill, particularly if there is concern that the excavation will compromise the fence.



Figure 8. Images of cement foundations under fences that inhibit passage by kit foxes. In the lower images, kit foxes have excavated passage ways underneath cement foundations.

***Wall Permeability***

Walls tend to present a significant challege to kit foxes. Foundations for walls typically extend well into the ground making it difficult for foxes to excavate passage ways under these structures. Wall designs rarely have openings sufficient to permit passage by kit foxes, although there are occasional exceptions (Fig. 9).



Figure 9. Openings in a wall designed to permit water drainage, but that also permits passage by kit foxes.

On one occasion, a new wall being constructed in Bakersfield was modified specifically to allow passage by kit foxes (Fig. 10). Two tunnels were incorporated into the wall and these served as simple yet highly effective passage ways for kit foxes. The cost and additional effort to incorporate these structures was negligible, and did not compromise the primary purpose of the wall, which was to protect human safety by excluding access to a canal. Designs and modifications that pass through a wall versus under it may be preferable because foxes are more likely to use passages if they can see through to the other side.



Figure 10. Images of a wall that was constructed along a canal where it bordered a golf course. In the upper left image, a kit fox den is visible at the lower right; this fox family group also used dens over in the canal. Passage ways that were 12 inches (30 cm) in diameter) were incorporated into the wall to permit passage by kit foxes. In the lower right image, a kit fox is using one of the new passage ways.

***Exclusion of Larger Predators***

Several larger predators are known to kill kit foxes, primarily as a mechanism to reduce competition for resources (Cypher et al. 2001). These predators include coyotes (*Canis latrans*), bobcats (*Lynx rufus*), non-native red foxes (*Vulpes vulpes*), and badgers (*Taxidea taxus*). Coyotes and bobcats in particular are a significant threat to kit foxes, both because they are relatively abundant and they are more likely to pursue a kit fox specifically to kill it. Red foxes are relatively uncommon in natural habitats within the range of the kit fox, and badgers probably rarely pursue foxes.

In the process of rendering fences and walls more permeable to kit foxes, at times it may be desireable to exclude passage by larger predators. This raises two issues that warrant consideration in designing fences and walls that are permeable to kit foxes. First, when passage ways are incorporated into fence and wall designs, these structures should be sufficiently frequent and of dimensions that facilitate rapid passage by kit foxes in the event that they are being pursued by a larger predator. To that end, fence designs such as the larger chain-link size depicted in Figure 3 probably are not optimal designs for use in building permeable fences for kit foxes. A kit fox will not be able to rapidly negotiate such passage ways thereby increasing the probability of capture by a pursuing predator.

A second consideration is that passage ways potentially can be designed or modified to reduce or restrict use by larger predators. For example, passage ways that are narrow in width (4-6 inches; 10-15 cm) but sufficiently tall (at least 12 inches; 30 cm) should allow kit foxes to rapidly pass through, but structures with these dimensions should significantly impede if not completely prevent passage by a larger predator. Openings of 6 inches or less are considered impassable to coyotes (Wade 1982, Huot and Bergman 2007). Furthermore, larger passage ways with larger dimensions can be modified to constrict the opening down to dimensions that allow use by kit foxes, but that inhibit or prevent use by larger predators. As an example, the Endangered Species Recovery Program has installed numerous artificial dens for kit foxes, and routinely uses pieces of rebar in front of the entrances as a strategy to discourage entry by larger predators (Fig. 11).

One final note, to exclude coyotes from an area, fences or walls need to be at least 6 feet (2 m) high, due to the excellent jumping and climbing ability of this species. Also, to prevent coyotes from digging under fences, a buried "apron" of fencing material extending up to 3 feet (1 m) out from the fence may be advisable (Timm et al.2007).



Figure 11. Rebar installed at the entrance to an artificial kit fox den to discourage entry by larger predators.

## SUMMARY

Because of their relatively small size, flexibility, and adaptability, kit foxes are able to pass through relatively small openings. This has significant consequences for conservation because barriers such as new fences and walls can easily be designed and existing structures can easily be modified to render them permeable for kit foxes. Furthermore, incorporating passage ways for kit foxes should be achievable through relatively inexpensive means and in a manner that does not compromise the primary purpose for constructing barriers (e.g., human safety, protection of property).

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# DRAFT HABITAT MITIGATION AND MONITORING PLAN

# Habitat Mitigation and Monitoring Plan

## Resource Management Plan

**for the**

## Topaz Solar Farm Conservation Lands

San Luis Obispo County
California



Prepared for
**Topaz Solar Farms, LLC**
1111 Broadway, 4th Floor
Oakland, California 94607

by

**ALTHOUSE AND MEADE, INC.**
**BIOLOGICAL AND ENVIRONMENTAL SERVICES**
1602 Spring Street
Paso Robles, California 93446
(805) 237-9626

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# 1.0 Introduction

The Topaz Solar Farm Project (Project) has secured conservation/mitigation lands in the Carrizo Plain region to off-set the loss of grassland and cropland communities and protected wildlife and plant species habitats due to Project development. To conserve land and provide full mitigation for actual and potential impacts of the Topaz Solar Farm, Topaz Solar Farm LLC has secured options to acquire approximately 12,000 acres of important habitat for animal and plant species in the Carrizo Plain, and will establish a Preserve to protect natural lands in perpetuity. This Habitat Mitigation and Monitoring Plan and Resource Management Plan (HMMP) provides information and management guidance to appropriately manage lands in the Preserve, and is intended to satisfy County of San Luis Obispo (County), California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS) requirements under State and federal law.

As part of its conditions of approval of the CUP (Conditional Use Permit) for the Project, the County adopted mitigation measures that are based on the Topaz Solar Farm Final Environmental Impact Report (Aspen 2011). These conditions require compensatory mitigation for loss of habitat in general (MM BR-1.4), and loss of habitat specific to certain special status plant and wildlife species determined to be affected by the Project (MM BR-17.2, MM BR-22.2). This Habitat Mitigation and Monitoring Plan and Resources Management Plan (HMMP) is required by MM BR-16.3. The Alternative 3B.1 Topaz Solar Farm project configuration, which is the layout approved in the CUP, is utilized in this Plan.

This Plan provides management goals and tasks for the Topaz Solar Farm Preserve (Preserve) that are necessary to satisfy the habitat enhancement and species protection requirements of the CDFG 2081 take authorization and the USFWS Biological Opinion and incidental take statement. The Management Plan provided in this document prescribes specific goals, tasks, and responsibilities to achieve desired protection and benefit to native species.

Topaz has secured lands outside of the Project to serve as conservation and mitigation lands for Project impacts. These off-site lands secured by the Project, composed of approximately 12,147 acres of mitigation lands as part of the conservation package for kit fox, are referred to as Conservation Lands, or the Preserve, in this HMMP. The Conservation Lands exceed all mitigation requirements imposed by the County conditions of approval for the Project, provide full mitigation under the California Endangered Species Act (CESA), and provide the basis for a no jeopardy decision under the Federal Endangered Species Act (ESA). The Conservation Lands will provide certainty for protection of kit fox movement and habitat in the northern Carrizo Plain.

In all, the Project will preserve in perpetuity a total of 12,147 acres of Conservation Lands. Approximately 7,240 acres of the Conservation Lands have been extensively studied for biological resources by the applicant's biologists as part of the California Environmental Quality Act review by the County of San Luis Obispo. Preliminary surveys have been conducted on the remaining 4,907 acres of Conservation Lands in 2011.

### 1.1 Purpose of the Habitat Mitigation and Monitoring Plan

The purpose of this HMMP is to provide landowners, easement holders, and wildlife agencies with regulatory oversight a concise document describing approved management procedures for restoring, enhancing, maintaining, and monitoring sensitive biological resources on the Topaz Solar Farm Preserve. In addition, procedures are outlined for maintenance of Preserve infrastructure such as roads and fences.

This document provides a summary of Project habitat impacts and mitigation requirements, descriptions of Preserve lands, an overview of biological resources on the Preserve, an overview of enhancement and protection measures, a management plan, a monitoring plan, and a PAR analysis and information regarding the funding mechanism.

The HMMP is the document prepared to meet County of San Luis Obispo Condition of Approval 65, "Prepare a Habitat Mitigation and Monitoring Plan".

Approximately 1,400 acres of land owned by Topaz Solar Farms LLC that is composed of interstitial areas between fenced array areas of the Project is called Stewardship Land. For operational and regulatory reasons, these land areas will not be the subject of a conservation easement and are not part of the 12,147 acre land mitigation package that has been proposed to the County and wildlife agencies. Stewardship Lands will not be managed according to this Habitat Mitigation and Monitoring Plan but will be restored by Topaz according to the approved Habitat Restoration and Revegetation Plan and maintained according to the approved Vegetation Management Plan (see Althouse and Meade, Inc. 2011b).

### 1.2 Project Phasing

The Project may be divided into up to six phases for construction, and each phase will receive separate construction permits. If a Condition of Approval is required to be completed prior to issuance of construction permit, final inspection, or occupancy, it is only required prior to issuance of the construction permit, final inspection, or occupancy for the applicable phase of the Project. Conservation and mitigation land acquisition will correspond with project phasing.

## 2.0 Summary of Habitat Impacts and Mitigations

Project habitat impacts and mitigations described in Table 1, below, are from the Topaz Solar Farm Final Environmental Impact Report (FEIR) (Aspen 2011). Four impact types require compensatory mitigation (Table 1). The San Joaquin kit fox is the "umbrella" species under which all other biological resource compensatory mitigation requirements are nested. In addition, as described in Section 1.0, the Applicant has proposed additional conservation land for the San Joaquin kit fox, as described in the CDFG Incidental Take Permit and the Biological Opinion and Incidental take Statement from the USFWS.

TABLE 1. TOPAZ FEIR PROJECT HABITAT IMPACTS AND MITIGATION REQUIREMENTS.

| FEIR Biological Impact | Compensatory Mitigation Requirement | TSF Project Impacts | Mitigation Land Requirements | Mitigation Proposed |
|---|---|---|---|---|
| **Impact AG-2** | **MM BR 2.1 (Condition 35)** 1:1 off-site replacement agricultural land (or 3:1 if replacement land is restricted to managed grazing) | 3,510 acres | At least 3,510 acres (or 10,530 acres if land is restricted to managed grazing) | 10,530 acres nested within kit fox mitigation lands |
| **Impact BR-1** Construction activities would result in temporary and permanent losses of vegetation. | **MM BR-1.4** 1:1 off-site replacement grassland or cropland to be converted to grassland<br>1:1 off-site replacement grassland | 2,675 acres<br>835 acres | 3,510 acres | Acreage nested within kit fox mitigation lands |
| **Impact BR-17** The project could result in the loss of San Joaquin kit fox. | **MM BR-17.2** 4:1 off-site replacement for impacts to annual grassland<br>2:1 off-site replacement for impacts to cropland near natal dens<br>1:1 off-site replacement for impacts to cropland (minus 2:1 acreage) | 835 acres<br>497 acres<br>2,178 acres | 3,340 acres<br>994 acres<br>2,178 acres | 6,512 acres protected in perpetuity off-site |
| **Impact BR-19** The project would result in the loss of Special-Status plant species. | **MM BR-19.2** 1:1 off-site replacement for impacts exceeding 10% of onsite population | 1.4 acres | 1.26 acres* | Permanent protection of off-site population consisting of approximately 1000 plants on 1.5 acres |
| **Impact BR-22** The project would result in the loss of burrowing owl. | **MM BR-22.2** 6.5 acres of suitable habitat per pair on-site or off-site replacement | 2 pairs | 13 acres | 13 acres nested within kit fox mitigation lands |
| **Impact BR-21** | **MM BR-21.1** Spadefoot toad | 0.25 acres | 0.5 acres | 0.5 acres within project area |
| **Total Off-site Compensatory Mitigation Obligation** | | | | **10,530 acres** |

*Mitigation is required by MM BR-19.2 only for that portion of the population that exceeds 10%. Onsite population is 100% impacted, so mitigation is 90% of 1.4 acres, or 1.26 acres.

### *2.1.1 San Joaquin kit fox*

The primary driver of off-site mitigation land preservation for the Project is loss of habitat for the endangered San Joaquin kit fox (SJKF) due to Project construction and operation. A total of 10,530 acres of off-site mitigation land is required by the FEIR to compensate for loss of 3,510 acres of kit fox habitat (Table 1). The 5,635 acres of additional Conservation Land protected for the species brings the Conservation Land total to 12,147 acres in the northern Carrizo Plain region of San Luis Obispo County.

### *2.1.2 Temporary and permanent losses of vegetation*

Temporary and permanent losses of vegetation require 1:1 off-site compensatory mitigation, such that the loss of 835 acres of annual grassland and 2,675 acres of cropland require a total of 3,510 acres of off-site mitigation land (Table 1). However, this requirement can be "nested" with mitigation requirements for other species, such as for kit fox. No additional land is required for mitigation for temporary and permanent losses of vegetation because the kit fox mitigation requirement is larger, and is composed of appropriate habitat.

### *2.1.3 Special status plants*

The only special status plant requiring compensatory mitigation for Project impacts is the round-leaved filaree (*California macrophylla*). Round-leaved filaree is not listed under the federal or California Endangered Species Acts. It is a California Native Plant Society List 1B.1 species. The Project would impact one colony composed in 2010 of approximately 100 plants occurring sparsely over an area of approximately 1.4 acres (59,661 square feet). The compensatory mitigation requirement is off-site land containing at least 100 round-leaved filaree plants over an area of at least 1.26 acres (Table 1). In April 2011, approximately 1,000 round-leaved filaree plants were mapped occurring over an area of approximately 1.5 acres (64,700 square feet) on Parcel E1 of the Conservation Lands (refer to Figure 7, Section 10.0). Management of this colony provides an off-site mitigation ratio of greater than one to one, which exceeds the FEIR requirements.

### *2.1.4 Burrowing owl*

Based on 2010 survey data, the Project would displace 2 pairs of nesting burrowing owls. The compensatory mitigation requirement is 6.5 acres of preserved land for each pair, to be composed of equal or better quality habitat than the impacted habitat (13 acres total). This requirement would be fulfilled on kit fox compensatory mitigation lands. Survey data from March 2011 indicates numerous pairs of burrowing owls are present on the Conservation Lands (refer to Figure 6, Section 8.0).

### *2.1.5 Spadefoot toad*

Spadefoot toad was identified in two agricultural ponds located within the Project Site. If these two agricultural ponds are removed for the Project, new pond habitat will be created at a 2:1 ratio. The agricultural ponds are approximately 0.25 acres in total, so new pond habitat would be 0.5 acre.

### *2.1.6 Agricultural mitigation*

The Project would occupy approximately 3,500 acres of land that has been utilized for agriculture, either by farming dryland grain or cattle production. Mitigation for impacts to agriculture consists of preserving land at a 3 to 1 ratio if agricultural use is limited to grazing on the mitigation lands. The Project will provide 10,500 acres of land as agricultural mitigation nested within kit fox mitigation lands that will be subject to managed grazing.

# 3.0 Description of Preserve Lands

Preserved lands managed under this HMMP consist of natural grassland and cropland that will be restored to natural grassland. Management goals and tasks are provided to accomplish the restoration of cropland and the maintenance of grassland as highly valuable habitat for native species of the Carrizo Plain. Conservation Lands are located around the Project Site (Figure 1, Section 8.0), and are a mix of cropland and grassland (Figure 2).

## 3.1 Baseline Condition of Conservation Land Parcels

The 12,147 acres of Topaz Conservation Lands are comprised of numerous private parcels situated on all sides of the Project (Figure 1). These lands are strategically situated around the Project where land preservation would provide certainty in maintaining the movement corridor for kit fox and other animals moving into or out of the northern Carrizo Plain. The Conservation Lands consist of approximately 7,000 acres of grasslands and 5,200 acres of croplands, plus small areas of wetlands, buckwheat scrub, vernal pools, and anthropogenic habitats. Topography is flat in the southern and western parcels, increasing to rolling grassy hills in the northern and eastern parcels. Land use is similar to the Project Site, with some parcels actively dry-farmed and others used as rangeland. Occupied residences are located on Parcels C1, and D, and an abandoned home is located on Parcel I and one on Parcel D.

Areas mapped as cropland include Parcels that currently support active grain crops. With the above average rainfall in 2011, these sites typically have average vegetation height well over 18 inches. Also included are sites that were not planted in 2011 but have been actively farmed in recent years. These parcels continue to have characteristics of actively farmed fields, including distinct plow lines, a high percentage of regrowth of crop species such as barley or oats, and very low diversity of plant species. Cover of non-cultivated grasses and forbs in these areas is typically low, and presence of agricultural weeds is common.

Areas mapped as grassland include Parcels that were once farmed, but have lain fallow long enough to form annual grassland habitat. These sites generally have not been plowed in the previous five years, allowing sufficient naturalized and native non-cultivated annual plant species to recruit. Average vegetation height is typically shorter than in cultivated fields, ranging from 6 to 12 inches in 2011, with some areas of wild oats up to 18 inches. Many of these annual grasslands have been grazed periodically,

reducing thatch and controlling height of some of the more aggressive non-native species. Some parcels, such as Parcel I, that have not been grazed recently have a high percentage of weedy species that increase average height to 14 to 18 inches.

The Conservation Lands include a substantial portion of parcels that are flat or nearly so, with slopes less than 9 percent. Some of the parcels extend into the lower foothills adjacent to the Temblor Range, and include occasional hills with moderate slopes. On these parcels, wide, gently sloped valleys are typical between the steeper slopes.

Dominant geology consists of sedimentary rock formations, although some igneous rock intrusions are present in the southwest corner of the Conservation Lands. Soils are typically clay loams and loams in the surface horizon, with occasional sandy surface layers, particularly in washes and ephemeral drainages on gentler slopes.

Most drainages on the Conservation Lands are inconspicuous and swale-like, although where slopes are steeper, defined bed and bank are present, sometimes with steep incised banks. Nearly all drainages ultimately flow south toward Soda Lake, joining the main drainage identified on the Project Site. This main drainage crosses some of the Conservation Lands in the west and south. One drainage in the northwest corner of the Conservation Lands flows west into Carnaza Creek, ultimately flowing into San Juan Creek and northwest toward the Salinas River.

TABLE 2. TOPAZ CONSERVATION LAND PARCELS. For explanation of RDM see Section 6.4.1.

| Parcel Label | Habitat Description | Land Use | Federal Contract Lands | Biological Surveys | Listed Species | Burrowing Owl | Rare Plants | Size (~acres) | Target RDM |
|---|---|---|---|---|---|---|---|---|---|
| A | Cropland with small grassland area, flat | Dry-farmed grain; Rangeland | WAL CRP | Complete | None | No | NaJa | 1290 | 750 |
| B | Cropland with small grassland area, flat | Dry-farmed grain; Rangeland | WAL | Complete | SJKF | No | AtCV | 2400 | 750 |
| C1 | Grassland with tall grass, few small hills | Rangeland | No | Complete | SJKF | Yes | No | 656 | 750 |
| C2 | Grassland with low hills | Rangeland | No | Complete | SJKF | Yes | No | 40 | 750 |
| C3 | Grassland, flat | Rangeland | No | Complete | SJKF presumed | Yes | No | 82 | 750 |
| C4 | Cropland with low hills | Dry-farmed grain | No | Complete | SJKF 2009 Natal Den | No | No | 165 | 750 |
| D | Grassland, small cropland areas, flat | Rangeland; Dry-farmed grain | No | Complete | SJKF 2010 Natal Den; VPFS | Yes | NaJa AsMa NaNR EsRh JuLu ErSp LaMu LaFe | 1150 | 750 |
| E1 | Grassland | Rangeland | No | Preliminary | SJKF | No | CaMa | 95 | 1000 |
| E2 | Cropland | Dry-farmed grain | No | Preliminary | None | No | No | 70 | 1000 |
| F | Grassland with some hills | Rangeland | CRP DCP | Preliminary | SJKF presumed | No | No | 623 | 750 |
| G | Grassland, flat | Rangeland | GRP | Complete | SJKF | Yes | LaMu | 930 | 750 |
| H1 | Grassland, flat | Rangeland | No | Preliminary | SJKF presumed | Yes | AsMa | 343 | 500 |
| H2 | Cropland and grassland, flat | Rangeland; Dry-farmed grain | No | Complete | SJKF | Yes | No | 246 | 500 |
| H3 | Cropland, hilly | Dry-farmed grain | No | Complete | SJKF | Yes | No | 162 | 750 |

| Parcel Label | Habitat Description | Land Use | Federal Contract Lands | Biological Surveys | Listed Species | Burrowing Owl | Rare Plants | Size (~acres) | Target RDM |
|---|---|---|---|---|---|---|---|---|---|
| H4 | Cropland, flat | Dry-farmed grain | No | Complete | SJKF | Yes | No | 40 | 750 |
| H5 | Cropland, low hills | Dry-farmed grain | No | Complete | SJKF | Yes | No | 165 | 750 |
| H6 | Half grass, half cropland | Rangeland Dry-farmed grain | No | Preliminary | SJKF presumed | TBD | TBD | 75 | 750 |
| I | Grassland with low hills | Rangeland | WAL | Preliminary | SJKF | Yes | AsMa | 2714 | 1000 |
| J1 | Grassland, mostly flat | Rangeland | No | Preliminary | SJKF; GKR | Yes | No | 84 | 500 |
| J2 | Grassland, mostly flat | Rangeland | No | Preliminary | SJKF | No | AsMa | 158 | 500 |
| J3 | Grassland, mostly flat | Rangeland | No | Preliminary | SJKF | No | No | 41 | 500 |
| J4 | Grassland, mostly flat | Rangeland | No | Preliminary | SJKF; GKR | Yes | AsMa | 39 | 500 |
| K | Cropland, flat | Dry-farmed grain | No | Preliminary | TBD | No | No | 319 | 750 |
| L | Grassland, mostly flat | Rangeland | No | Preliminary | TBD | TBD | TBD | 40 | 500 |
| M | Cropland, flat | Dry-farmed grain | No | Preliminary | SJKF presumed | TBD | TBD | 40 | 750 |
| N | Cropland, flat | Dry-farmed grain | No | Preliminary | TBD | TBD | TBD | 120 | 750 |
| O | Cropland and grassland, flat | Dry-farmed grain; Rangeland | No | Preliminary | TBD | TBD | TBD | 60 | 750 |
| **Total Conservation Land Acreage** | | | | | | | | **12,147** | |

**Rare Plant Abbreviations:**
AsMa: Astragalus macrodon, List 4.3
LaMu: Layia munzii, List 1B.2
CaMa: California macrophylla, List 1B.1
EsRh: Eschscholzia rhombipetala, List 1B.1
ErSp: Eryngium spinosepalum, List 1B.2
AtCV: Atriplex coronata var. vallicola, List 1B.2
JuLu: Juncus luciensis, List 1B.2
LaFe: Lasthenia ferrisiae, List 4.2
NaNR: Navarretia nigelliformis ssp. radians, List 1B.2
NaJa: Navarretia jaredii, List 4.3

**Animal Abbreviations**
SJKF = San Joaquin kit fox
GKR = Giant kangaroo rat
VPFS = Vernal pool fairy shrimp

**Federal Contract Lands Abbreviations:**
WAL: Williamson Act Lands
CRP: Conservation Reserve Program
DCP: Direct and Counter-Cyclical Program
GRP: Grassland Reserve Program

## 3.2 Habitat Types on the Conservation Lands

Annual grassland and cropland are the primary habitat types on the 12,147 acres of Conservation Lands. Small percentages of bunchgrass grassland, vernal pool, buckwheat scrub, wetland, non-wetland pool and ephemeral pool, and anthropogenic habitat occur on Conservation Lands. Conservation Lands are contiguous with the Project Site except for four parcels that are several miles to the east.

### *3.2.1 Annual grassland*

Annual grassland habitat comprises approximately 7,000 acres, or 58 percent, of the Conservation Lands. The vegetation composition is variable depending upon soils, topography, land use, etc. Dominant grass species are introduced annuals such as soft-chess brome (*Bromus hordeaceus*), wild oat (*Avena fatua*), red-top brome (*Bromus madritensis* ssp. *rubens*), rattail fescue (*Vulpia myuros*), and to a lesser degree, foxtail barley (*Hordeum murinum*) and ripgut brome (*Bromus diandrus*). Native grasses are present in low abundance, the most common species being annual fescue (*Vulpia microstachys*).

The eastern parcels, J1 through J4, are generally composed of short-grass conditions on level terrain, or with few low rolling hills. The flats on these parcels have kit foxes, giant kangaroo rats, and burrowing owls. The northeast parcels have more relief, were not actively grazed in 2010, and in general have taller grasses and more thatch build-up. Kit foxes were present, as were burrowing owls. Southern parcels have short-grass conditions that support kit foxes and burrowing owls. Annual grasslands on Conservation Lands north of the Project have variable topography with regular grazing; kit foxes and burrowing owls are present in low abundance.

### *3.2.2 Bunchgrass grassland*

Bunchgrass grassland occurs in small isolated areas of the Conservation Lands that have not been tilled due to steep topography. The primary bunchgrass grassland area identified to date is located in the northeast corner of Parcel I, comprising an area of approximately 24.2 acres. The dominant bunchgrass is one-sided bluegrass (*Poa secunda*). Density is variable, but is estimated to be between 10 and 50 percent cover in mapped areas. Bunchgrass habitat also occurs on Parcel J2, on north-facing slopes along an ephemeral drainage. Because these areas have not been tilled, the bunchgrass grasslands are characterized by a higher diversity of native wildflowers, including perennial species such as larkspur (*Delphinium* sp.), biscuit root (*Lomatium utriculatum*), and blue dicks (*Dichelostemma capitatum*).

Parcel F has patches of slender needlegrass (*Nassella cernua*), a native bunchgrass typical of the region. The patches occur on small knolls where soils are thin and other annual grass species are not competitive. These patches are noteworthy, but were determined to be too small to map independently, and are mostly included in the buckwheat scrub habitat type.

### *3.2.3 Cropland*

Cropland habitat comprises approximately 5,200 acres, or 43 percent, of the Conservation Lands. The cropland habitat designation includes fields planted to grain and fields left bare during rotation. Farming on the parcels utilizes a summer fallow program. Summer fallow is the practice of idling farmland and removing weeds for up to 14 months to allow soil moisture to increase. Farming operations are conducted on a large scale utilizing 400 to 500 horsepower all-wheel drive tractors pulling 50 foot wide implements. Plowing is usually accomplished using a chisel plow that runs from 24 to 12 inches in depth depending upon soil moisture and condition. The typical two year cycle farming regime consists of plowing ground in the fall or winter after first rains. The fields are plowed again just prior to sowing, sometimes in the same operation. Crops are often sprayed (as they were in 2010) with selective herbicides that can include dicoticides and oaticides. A harvesting machine (combine) cuts the fields and harvests the grain in late spring or summer depending on the year, and cattle are turned into the field to graze into the fall. The cut field is plowed again in fall after rains. This cropland is then plowed again during the spring to remove vegetation that grows during the winter, and is left fallow over the summer. In some years, two plowing passes, one in winter and one in late spring, are necessary to remove vegetation. The purpose of this every-other year summer fallow method is to preserve two years of soil moisture for every one year of crop produced. In the fall, the fallow land is plowed after the first rains, starting the cycle again. At any one time approximately half of the land is plowed bare and half is planted to grain. Areas that are left fallow for several years or more support naturally recruited annual grasslands.

Barley and wheat, non-irrigated grain crops planted in alternate years, are harvested for grain and then the stubble is used for cattle grazing.

Fields that are plowed in the spring or fall and left unplanted through the following spring and summer tend to grow agrestal weeds. Some of these plants are native to the area, but most are naturalized (non-native, naturally recruiting) annual herbs and grasses. Early in the spring, vegetation is short, which allows establishment of ground squirrel den complexes. If rainfall totals are average or above, as was the case in 2007-2008, 2009-2010, and 2010-2011, fields left fallow more than one season become densely vegetated with annual grasses and forbs that can reach five feet in height. Tall dense vegetation limits use of these areas by kit fox. With less than average rainfall, as in the winter of 2008-2009, vegetation in fallow fields and annual grasslands is typically less than two feet in height.

Cropland habitat supports few native plant species, and is generally low quality wildlife habitat. Although wildlife use of the cropland habitat is limited, coyotes, red fox, pronghorn, and elk are regular inhabitants. Farm fields are used as resting and feeding areas for elk and pronghorn antelope and as late season grazing habitat when bindweed (*Convolvulus arvensis*), a preferred forage plant, becomes common. From mid spring into summer the plowed ground typically hosts an abundant growth of bindweed, an introduced perennial herb with a deep persistent taproot that sprouts green leafy growth year after year. Bindweed provides summer forage for pronghorn antelope and tule elk, and the cropland fields in Parcels A and B are considered by the California Department of Fish and Game (CDFG) to be important summer habitat areas for these species.

Pronghorn antelope and tule elk commonly feed and rest in these fields (refer to BR Maps 3 and 4 in Section 13.0). Common reptiles, small mammals, and birds may forage in plowed fields, but the lack of cover increases the likelihood of predation and reduces food supply.

### *3.2.4 Vernal pool*

Vernal pool habitat occurs over approximately 2.1 acres of the Conservation Lands. Vernal pools occur in topographic depressions that are isolated from drainages and do not, under normal circumstances, experience flow of water. Vegetation typically consists of several species from a suite of plant species strongly affiliated with vernal pools in the region, including hair grass (*Deschampsia danthonioides*), water starwort (*Callitriche marginata),* water pygmyweed (*Crassula aquatica*), mousetails (*Myosurus minimus, M. sessilis),* woolly marbles (*Psilocarphus brevissimus*, *P. chilensis*), inch-high rush (*Juncus uncialis),* pillwort (*Pilularia americana*) and alkali plagiobothrys (*Plagiobothrys leptocladus*). Many of these pools also support another species of woolly marbles (*P. oregonus*), toad rush (*Juncus bufonius*), wandering speedwell (*Veronica peregrina*), loosestrife (*Lythrum hyssopifolia*), and adobe allocarya (*Plagiobothrys acanthocarpus*), but these species also occur in other mesic habitat types and do not have a high fidelity to vernal pool habitat.

Vernal pools on site also had strong indication of wetland hydrology via biotic crusts, algal mats, and oxidized rhizospheres, as well as clear indication of hydric soils. As determined by surveys (Althouse and Meade, Inc. 2010c), many vernal pools on the Conservation Lands support fairy shrimp (*Branchinecta* spp.) and other aquatic invertebrates including seed shrimp, backswimmers, and Daphnia. A few of the larger pools also support breeding Western spadefoot toads.

Adjacent upland habitat surrounding undisturbed vernal pools supports a variety of wildflowers and grasses, including *Vulpia microstachys*, *Bromus madritensis* ssp. *rubens*, *Erodium cicutarium*, *Lasthenia gracilis*, *Microseris douglasii* ssp. *tenellus*, and *Castilleja* ssp. In farmed vernal pools, surrounding vegetation is predominantly cultivated barley.

### *3.2.5 Buckwheat scrub*

Buckwheat scrub occurs on steep grassy slopes at the western edge of Parcel F, where the ground has not been tilled. The dominant buckwheat species is the elongate buckwheat (*Eriogonum elongatum*), a native perennial sub-shrub. Also present are California buckwheat (*Eriogonum fasciculatum*) and naked buckwheat (*Eriogonum nudum*). Approximately 51.5 acres of buckwheat scrub were mapped on the Conservation Lands.

### *3.2.6 Wetland*

Wetlands are generally uncommon on the Conservation Lands. All wetland types on the Conservation Lands are seasonal: channel wetlands, ephemeral wetland depressions, and vernal pools. Ephemeral drainages generally lack wetland vegetation, hydrology and hydric soils, except in depressional areas that experience prolonged ponding and/or soil saturation.

### *3.2.7 Natural non-wetland pools and ephemeral wetland pools*

Naturally occurring pools that do not meet wetland criteria due to absence of hydric soils and/or non-dominance of hydrophytic vegetation occur on the Conservation Lands. Some hydrophytic plant species such as *Plagiobothrys leptocladus*, *Plagiobothrys acanthocarpus*, and *Psilocarphus oregonus* are present in low quantities but do not form dominant cover. Upland species are present in equal or greater quantities, including such species as *Plagiobothrys canescens*, *Chamomilla suaveolens*, *Erodium cicutarium*, and *Microseris douglasii* ssp. *douglasii*. Despite lacking dominance of hydrophytic vegetation, in years with above average rainfall, some of these naturally occurring non-wetland pools provide habitat for common aquatic invertebrates, and larger pools provide potential breeding habitat for spadefoot toads.

Some isolated pools occur on Conservation Lands that do not meet criteria for vernal pools, although they do support wetland vegetation, have hydric soils, and wetland hydrology. These pools are described as ephemeral wetland depressions. Typical vegetation includes Polygonum arenastrum, Psilocarphus oregonus, Veronica peregrina, Plagiobothrys acanthocarpus and Chamomilla suaveolens. Ephemeral wetland depressions are not considered vernal pools because they lack plant species with high fidelity to vernal pools in the vicinity (refer to Section 3.2.4, above). Ephemeral wetland depressions vary in size from approximately 250 square feet to nearly 5,000 square feet.

Vegetation is sparse and stunted in the ephemeral wetland depressions. Some pools contain clear redoximorphic features such as oxidized rhizospheres and redoximorphic concentrations in the soil matrix and pore linings. Others lack clear indication of hydric soils, probably due to a number of factors, including high soil pH, which interferes with formation of visible iron oxides; low carbon, which slows microbial activity that usually generates redoximorphic features in soil; and ephemeral nature of the pools.

The presence of ponded water in the ephemeral wetland depressions appears to be very limited, but may be suitable breeding habitat in some years for the Western spadefoot toad, a California Species of Special Concern, and is potential habitat for common and federally listed fairy shrimp.

### *3.2.8 Anthropogenic*

All areas within the Conservation Lands that are heavily influenced by human development are mapped and described as anthropogenic habitat. Anthropogenic habitat includes abandoned and occupied ranch compounds and other structures. Approximately 10 acres of anthropogenic habitat occurs on the Conservation Lands. Several of the ranch compounds are planted with ornamental trees and shrubs, which create areas of tree canopy and shrub understory that are otherwise entirely lacking in the vicinity. A variety of bird species utilize the vegetated portions of the anthropogenic habitat for nesting, wintering, and general foraging. Loggerhead shrikes nest in landscape trees, and migrant species such as warblers, hummingbirds, flycatchers and orioles find temporary refuge.

# 4.0 Biological Resources

Biological resources associated with approximately 7,240 acres of the Conservation Lands have been extensively studied. The results of the various studies are summarized in the Biological Report for the Topaz Solar Farm (Althouse and Meade, Inc. October 2009) and in the Final Biological Report for the Topaz Solar Farm (Althouse and Meade, Inc. July 2010). Biological surveys of the remaining 4,899 acres of Conservation Lands have been conducted at a reconnaissance level as of May 2011. Special status species known or expected to occur on the Conservation Lands are listed in Table 3.

TABLE 3. SPECIAL STATUS SPECIES ON CONSERVATION LANDS.

| Elements | Status Code* | Present on Conservation Lands? |
|---|---|---|
| **Federal and California ESA Listed Species** | | |
| **San Joaquin Kit Fox** *Vulpes macrotis mutica* | FE, ST | Present |
| **Longhorn Fairy Shrimp** *Branchinecta longiantenna* | FE | Not Present |
| **Vernal Pool Fairy Shrimp** *Branchinecta lynchi* | FT | Present |
| **Nelson's Antelope Squirrel** *Ammospermophilus nelsoni* | ST | TBD |
| **Blunt-nosed Leopard Lizard** *Gambelia sila* | FE, SE | TBD |
| **Giant Kangaroo Rat** *Dipodomys ingens* | FE, SE | Present |
| **Kern Primrose Sphinx Moth** *Euproserpinus euterpe* | FT | TBD |
| **San Joaquin Woollythreads** *Monolopia congdonii* | FE, CNPS List 1B.1 | TBD |
| **California Jewelflower** *Caulanthus californicus* | FE, SE, CNPS List 1B.1 | TBD |
| **CDFG: California Species of Special Concern** | | |
| **Grasshopper sparrow** *Ammodramus savannarum* | SSC | Present |
| **California Legless Lizard** *Anniella pulchra* | SSC | Not Present |
| **Pallid bat** *Antrozous pallidus* | SSC | Roosts Not Present |
| **Short-eared Owl** *Asio flammeus* | SSC | Present |
| **Burrowing Owl** *Athene cunicularia* | SSC | Present |
| **Mountain Plover** *Charadrius montanus* | SSC | Present |
| **San Joaquin Whipsnake** *Coluber flagellum ruddocki* | SSC | Presumed Present |
| **Short-nosed Kangaroo Rat** *Dipodomys nitratoides brevinasus* | SSC | TBD |

| Elements | Status Code* | Present on Conservation Lands? |
|---|---|---|
| **Loggerhead Shrike** *Lanius ludovicianus* | SSC | Presumed Present |
| **Tulare Grasshopper Mouse** *Onychomys torridus tularensis* | SSC | TBD |
| **Blainville's (Coast) Horned Lizard** *Phrynosoma blainvillii* | SSC | TBD |
| **Oregon Vesper Sparrow** *Pooecetes gramineus affinis* | SSC | TBD |
| **Western Spadefoot Toad** *Spea hammondii* | SSC | Present |
| **American Badger** *Taxidea taxus* | SSC | Present |
| **CNPS Listed Plants** | | |
| **Oval-leaved Snapdragon** *Antirrhinum ovatum* | List 4.3 | TBD |
| **Salinas Milk-vetch** *Astragalus macrodon* | List 4.3 | Present |
| **Lost Hills Crownscale** *Atriplex coronata* var. *vallicola* | List 1B.1 | Present |
| **Round-leaved Filaree** *California macrophyllum* | List 1B.1 | Present |
| **Lemmon's Jewelflower** *Caulanthus lemmonii* | List 1B.2 | TBD |
| **Gypsum-loving Larkspur** *Delphinium gypsophilum* ssp. *gypsophilum* | List 4.2 | TBD |
| **Spiny-sepaled Button Celery** *Eryngium spinosepalum* | List 1B.2 | Present |
| **Diamond-petaled California Poppy** *Eschscholzia rhombipetala* | List 1B.1 | Present |
| **Santa Lucia Dwarf Rush** *Juncus luciensis* | List 1B.2 | Present |
| **Ferris' Goldfields** *Lasthenia ferrisiae* | List 4.2 | Present |
| **Munz's Tidy-tips** *Layia munzii* | List 1B.2 | Present |
| **Showy Madia** *Madia radiata* | List 1B.1 | TBD |
| **Paso Robles Navarretia** *Navarretia jaredii* | List 4.3 | Present |
| **Shining Navarretia** *Navarretia nigelliformis* ssp. *radians* | List 1B.2 | Present |

*Status codes:
FE = Federally Endangered
FT = Federally Threatened
FPT = Federally Proposed Threatened
SE = State Endangered
ST = State Threatened
SSC = California Species of Special Concern
FP = Fully Protected
CNPS = California Native Plant Society

## 4.1 San Joaquin Kit Fox

The San Joaquin kit fox (SJKF) is a small, tan colored fox with large ears that are set close together, slim body with long slender legs, narrow nose, and long, bushy tail tapering slightly toward the tip. San Joaquin kit foxes inhabit grasslands and scrublands, many of which have been extensively modified agricultural mosaics of row crops, irrigated pastures, orchards, vineyards, and grazed annual grasslands. Oak woodland, alkali sink scrubland, and vernal pool and alkali meadow communities also provide habitat for kit foxes. Dens are scarce in areas with shallow soils because of the proximity to bedrock, high water tables, or impenetrable hardpan layers. Kit foxes are active year-round and are primarily nocturnal. Dens are used for housing and protection. One fox may use several dens, particularly during the summer months. Females may change natal and pupping dens one or two times per month. Kit foxes construct their own dens, but they can also enlarge or modify burrows constructed by other animals, such as ground squirrels, badgers, and coyotes. They also den in human-made structures, such as culverts, abandoned pipes, and banks in roadbeds. Most dens, especially natal and pupping dens, have at least two entrances.

San Joaquin kit fox are present on the Conservation Lands (Figure 3). Observations include numerous scat detections in 2009 and 2010 for Parcels B, C, C-2, C-4, H-1, H-2, H-5, I, G, F, D, and E. Wildlife cameras detected SJKF on Parcels C, H-1, G, and H-5. Known dens were observed on Parcels G, H-2, and D. Natal dens were confirmed on Parcels C-4, H-5, and Parcel D. Active kit fox dens, scat and tracks were observed on Parcels J2 and J4 during preliminary biological surveys conducted in March 2011.

## 4.2 Giant Kangaroo Rat

The Giant Kangaroo Rat (GKR) is the largest of the kangaroo rats, with five toes on hind feet, a dusky nose, whitish cheeks, and blackish eyelids. The tail tuft is dark in appearance, with mixed dark and light hairs (Kays and Wilson 2002). It inhabits the arid southwestern edge of central California's San Joaquin Valley and adjacent valleys and plateaus of the Inner Coastal Ranges, including the Carrizo Plain. Giant kangaroo rats are described by the Endangered Species Recovery Program (ESRP) as inveterate diggers that frequently remodel their burrows, closing old entrances and creating new ones. These burrows also provide potential shelter for the federally listed endangered blunt-nosed leopard lizard, state-listed threatened Nelson’s antelope squirrel, and other animals.

Reconnaissance level surveys of Conservation Lands in early 2011 detected giant kangaroo rat precincts and potential precincts in four locations (Figure 4) on parcels located southeast of the Project: Parcels J1, J2, J3, and J4. Some of the Conservation Land parcels, totaling 7,240 acres and including Parcels A, B, C1, C2, C3, C4, D, G, H2, H3, H4, H5, and half of H6, were included in baseline biological resource studies conducted during the California Environmental Quality Act (CEQA) review. Giant kangaroo rat precincts were not detected on these parcels.

## 4.3 Listed Fairy Shrimp

The **longhorn fairy shrimp** (*Branchinecta longiantenna*) is listed as endangered under the federal Endangered Species Act; it has no state listing status. "Longhorn fairy shrimp have been observed in few known pools, generally located on the eastern edge of the Central Coast Mountain Region. Specifically, longhorn fairy shrimp have been observed in sandstone depression pools west of Tracy, California, as well as in claypan pools around the borders of Soda Lake in San Luis Obispo County and in alkaline grassland and Valley Saltbush Scrub pools located on The Nature Conservancy's Preserve in the Soda Lake area (USFWS 1994). Longhorn fairy shrimp have appeared in pools from late December to mid-May in basins filled by winter and spring rains, with required water temperatures ranging from 10-18 $^{o}$C (sandstone pools) to 10-29 $^{o}$C (claypan pools). However, little is known regarding the specific water chemistry (TDS, alkalinity, and/or pH) required for hatching and surviving for extended periods of time. It has been assumed that, like other Central Valley endemics, larvae of longhorn fairy shrimp hatch soon after winter and spring rains fill the pools with water temperatures at approximately 10 $^{o}$C, and require temperatures to remain at approximately 15-20 $^{o}$C to attain maturity. If conditions are optimal, maturation is reached in 23 days, but more typically requires 43 days. If pools remain for an extended period of time, longhorn fairy shrimp have been observed in pools for up to 147 days (Eriksen and Belk 1999)." (Excerpted from Advantage Environmental Consultants 2010).

The **vernal pool fairy shrimp** (*Branchinecta lynchi*) is listed as a threatened species under the federal Endangered Species Act; it has no state listing status. "The vernal pool fairy shrimp has been observed in a variety of vernal pools from December to early May in the Central Valley of California, and to the central and southern Coast Ranges from Solano County to Ventura County, California (USFWS 1994). They are also found in disjunct populations in the South Coast Mountains Region in a wide variety of habitats. Habitats include sandstone outcrops in Contra Costa and Santa Barbara counties, but the more typical habitat is small swales, earth slumps, or basalt-flow depression basins with a grassy or muddy bottom (Eriksen and Belk 1999). Vernal pool fairy shrimp inhabit vernal pools that vary in size from 0.56 $m^2$ (1.84 $ft^2$) to over 10 ha (24.71 acres) and have low to moderate total dissolved solids (TDS) and alkalinity, and neutral pH. Vernal pool fairy shrimp mature rapidly and can reach reproductive age in 18 days under optimal conditions, however, 41 days is more common. Vernal pool fairy shrimp are the shortest lived fairy shrimp, with a maximum lifespan of 139 days (mean = 90 days) (Eriksen and Belk 1999)." (Excerpted from Advantage Environmental Consultants 2010).

Habitats containing longhorn fairy shrimp were not found on the Conservation Lands. Longhorn fairy shrimp could occur on Conservation Lands in the future if appropriate vernal pools occur. Vernal pools were not found during surveys in Spring 2011 following above average winter rains.

Habitats containing vernal pool fairy shrimp were found on the Conservation Lands in Parcel D in vernal pool habitat (Figure 5). Vernal pool fairy shrimp could also occur on additional Conservation Lands in the future if appropriate vernal pools occur.

## 4.4 Nelson's Antelope Squirrel

Nelson's antelope squirrel (Ammospermophilus nelsoni) also known as the San Joaquin antelope squirrel, is listed as a threatened species in the state of California. It inhabits the arid grassland, shrubland, and alkali sink habitats of the San Joaquin Valley and adjacent foothills, including some portions of the Carrizo Plain. Antelope squirrels are active year-round and live in burrows that they construct themselves or that are modifications of kangaroo rat burrows. They are most active above ground between April 1 and September 30. Their diet consists mainly of insects, but also includes green vegetation, fungi, and seeds.

Moderately appropriate habitat is present in some areas of the Conservation Lands for Nelson's antelope squirrel, particularly in the southeastern parcels. Nelson's antelope squirrel has not been detected on the Conservation Lands as of June 2011.

## 4.5 Mountain Plover

Mountain plover (*Charadrius montanus*) is a California Species of Special Concern that winters in California and nests in short-grass prairie habitats from Wyoming to New Mexico. In California, the CDFG listing status is for wintering birds. The U.S. Fish and Wildlife Service (USFWS) recently determined that Mountain plover does not warrant listing as Threatened.

The wintering population in California accounts for approximately 50 percent of the total mountain plover population (Andres 2009). Mountain plovers prefer short grass habitats such as heavily grazed pastures, burned fields, fallow fields, and tilled fields (without furrows). Historic wintering colonies in the Central Valley of California were often associated with kangaroo rat precincts and California ground squirrel den complexes (Andres 2009). Wintering (non-breeding) mountain plovers are highly nomadic. Mountain plovers occur regularly in the Carrizo Plain National Monument in low to moderate numbers (a few hundred) primarily from November through March.

Mountain plovers were observed foraging on Parcel G of the Conservation Lands on four occasions between January and March 2010, with a high count of 17 birds observed in the eastern end in March. Suitable habitat is present elsewhere on the Conservation Lands, where small numbers of mountain plovers are expected to forage seasonally and opportunistically.

## 4.6 Burrowing Owl

Burrowing Owl (*Athene cunicularia*) is a California Species of Special Concern that prefers open, dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Burrowing owls usually nest in abandoned burrows of ground squirrels, badgers, or other small mammals, although they may dig their own burrow in soft soil. Primarily nocturnal, the burrowing owl hunts insects, small mammals, and birds from a perch or in low flights. During daylight hours they are often seen perched conspicuously at the entrance to their burrow. Rosenberg (2007) conducted a study in grassland habitats of the Carrizo Plain National Monument and found burrowing owl nests were present at an average density of one nest per 1.4 square kilometers (346 acres)

of suitable nesting habitat. Nesting territories are generically defined as a 100-meter radius around an occupied nest in which the owls regularly utilize satellite burrows (Rosenberg 2007). Burrowing owls show high site fidelity from year to year.

A pair of burrowing owls was observed at a likely nest den on Parcel I in 2011. Additional burrowing owl dens were also observed on Parcels I, H-1, H-2, C, C-2, C-3, G, D, J-4, and J-1 (see Figure 6). Additional burrowing owl nests are likely to occur on Conservation Lands but were not confirmed during 2011 reconnaissance-level surveys.

## 4.7 Other Special Status Wildlife

Other special status wildlife known from the region, including grasshopper sparrow, golden eagle, American badger, and short-eared owl, could occur on Conservation lands and Stewardship lands. Golden eagle are likely to forage but unlikely to nest. American badger have been observed in areas with plentiful ground squirrels and friable soils. Grasshopper sparrow are likely to utilize short grassland and may nest where appropriate habitats are present. Short-eared owl typically prefer tall grass habitats, and may occasionally nest where appropriate tall grass habitat is present. Tall grass habitat is limited in the Carrizo Plain region.

A pair of short-eared owls were observed on Parcel K during reconnaissance level surveys in 2011. The owls were observed in a barley field in which average grass height was over 24 inches. American badgers were detected at several locations of the Conservation Lands parcels. A juvenile golden eagle was observed soaring over Parcel G on several occasions in 2010. Singing male grasshopper sparrows were detected on Conservation Lands in 2011.

## 4.8 Special Status Plants

Special status plants found on the Preserve include Diamond-petaled California poppy (*Eschscholzia rhombipetala*) List 1B.1, Ferris' goldfields (*Lasthenia ferrisiae*) List 4.2, Munz's tidy-tips (*Layia munzii*) List 1B.2, Oval-leaved snapdragon (*Antirrhinum ovatum)* List 4.2, Paso Robles navarretia (*Navarretia jaredii*) List 4.3, Salinas milk-vetch (*Astragalus macrodon*) List 4.3, Santa Lucia dwarf rush (*Juncus luciensis*) List 1B.2, Shinning navarretia (*Navarretia nigelliformis* ssp. *radians*) List 1B.2, Spiny-sepaled button celery (*Eryngium spinosepalum*) List 1B.2, Round-leaved filaree (*California macrophylla*) List 1B.1, and Lost Hills crownscale (*Atriplex coronata* var. *vallicola*) List 1B.2. See Figure 7 for locations.

# 5.0 Overview of Enhancement and Protection Measures

## 5.1 Best Management Practices

- Minimize activities on Conservation Lands at night;
- Maintain vehicle speed at 20 mph or lower;
- Keep vehicles and equipment on established ranch roads, where feasible;
- Prohibit use of rodenticides;
- Avoid SJKF dens, kangaroo rat precincts, other sensitive biological resources;
- Avoid vernal pools and other sensitive habitats;
- Minimize mowing activities during the bird nesting season, from March 15 to July 15;
- Minimize activities that affect grassland vegetation; and
- Implement measures to improve visibility of fences to wildlife.

## 5.2 General Habitat Enhancements

The Conservation Lands contain approximately 5,200 acres of active dry-farmed grain fields described as cropland habitat. All farming operations on these lands will cease, and tasks described in this document (Section 6) will be implemented to convert cropland to annual grassland habitat suitable for use by SJKF and other wildlife. Refer to Section 6.4.2 for more detail on habitat restoration.

## 5.3 San Joaquin Kit Fox Enhancements

Tasks and goals are specified in Section 6 of this document that will enhance habitat for San Joaquin kit fox. Details are provided with respect to optimum grassland condition for kit fox and protection measures that serve to enhance survival of this endangered species.

### *5.3.1 Grazing*

Managed cattle grazing will be utilized as a primary range management technique on the Preserve to promote conditions suitable for San Joaquin kit fox and other wildlife. Grazing practices will be carefully monitored, and intensity will be regularly adjusted, to meet Residual Dry Matter (RDM) targets (refer to Table 2 for Parcel-specific RDM targets). Refer to Section 6.4.1 for more detail on grazing.

### *5.3.2 Artificial dens*

Escape dens are simple devices made of lengths of pipe that can protect kit fox from coyotes. Predation from coyotes is a significant cause of kit fox mortality in the Carrizo Plain. Installation of escape dens will be conducted as part of the Preserve management to provide additional protection for kit fox. Some escape dens will be installed outside of the array fences of the Topaz project site, and may be in those Conservation Lands adjacent to Topaz perimeter fences. Management of Conservation Lands will include maintenance of escape dens.

## 5.4 Wildlife Movement Corridor Enhancements

### *5.4.1 Fence removal and modification*

Topaz CUP Condition of Approval 79, "Prepare and implement a pronghorn friendly fencing plan", specifies that fences within the project site allow for movement of pronghorn antelope. This Pronghorn Friendly Fencing Plan is provided in the Habitat Restoration and Revegetation Plan for Topaz Solar Farm, and shows fences that will be removed or enhanced.

Topaz CUP Condition of Approval 80, "Establish Fencing Plan to create fence removal or modification incentives," specifies that a total of 10 miles of existing fence will be enhanced or removed to improve wildlife passage in areas within the Carrizo Plain region. Enhancements include increasing visibility and passage for pronghorn, elk, SJKF, and other wildlife. Figure 8 in Section 10.0 of this document is the Fencing Plan that meets Condition of Approval 80. Tasks specified in this HMMP (Game Animal Task 1a, Habitat Restoration Task 3a, 4a, 5a), address fence removal and enhancement.

## 5.5 Pronghorn Antelope and Tule Elk Enhancements

Pronghorn antelope utilize grassland and cropland habitats throughout the Preserve. Fawning grounds are located in the northwest portion of Preserve, in Parcel B. Foraging habitat is regularly occupied in Parcels D and G in the south. Seasonal movements of pronghorn antelope are expected, with animals moving between the Carrizo Plain National Monument, California Valley, and Cholame Valley groups (CDFG 2008a). CDFG records indicate antelope are present over a distance of approximately 85 miles from the Cholame Valley in the north to the Cuyama Valley in the south.

Pronghorn movements through the Conservation Lands are presently determined by fence location. They make regular movements through permanent fence openings, and take advantage of gates that are left open. In order to pass through a fence where no opening exists, pronghorn prefer to go under as opposed to over. Preferred passages are typically in swales where the distance between the ground and the bottom fence wire is 18 inches or greater. Suitable movement passages for pronghorn are presently uncommon on Preserve lands with pronghorn trails leading to a few fence crossing sites.

The summer range of the local (north of Highway 58) tule elk herd includes agricultural lands at the north end of the Preserve, although some elk may be present during any month of the year. Elk do not presently move through the Project site to access foraging areas. Elk are absent from the southern and western parcels of the Preserve. The amount

of barbed-wire fencing that is present is a deterrent, and the elk primarily forage and move through the foothills of the Temblor Range east of the Project site. Approximately 75 elk are regularly observed foraging and bedding on Parcel I.

Pronghorn and elk habitat enhancements on the Preserve will consist of increasing permeability of the landscape by enhancing or removing fences, and increasing shrub and forb browse habitat by seeding *Atriplex* species and forb species. Refer to Section 7.3.10 for more detail on game mammal management.

# 6.0 Conservation Land Management Plan

## 6.1 Management Goals and Environmental Impacts

### 6.1.1 *Responsibilitie*s

Responsibility for accomplishing tasks is with the Preserve owners (Property Owners) through the Preserve Manager (person designated by Property Owners as responsible for implementation of management tasks). The Preserve Manager shall be a person qualified in rangeland management with proven experience managing arid grasslands and scrublands that support rare species. Cattle operations will be conducted by the Property Owners or their designated cattle operator as approved by the Preserve Manager and will follow management goals and tasks as described in this Management Plan. Tasks related to biological resources will be the responsibility of the Preserve Manager, who will arrange contracts with appropriate personnel as listed in the Task List (Table 8).

### *6.1.2 Management and Monitoring Goals*

1. Conservation Lands will be managed to conserve, enhance, or restore, as appropriate, habitat supporting the species of interest. The Management Plan identifies specific goals and tasks to meet this objective;

2. Maintain and improve habitat to the benefit and promotion of sensitive species, including San Joaquin kit fox, giant kangaroo rat, and fairy shrimp, as based on the best scientific information available.

3. Monitor species populations, habitat condition and rangeland conditions on Conservation Lands.

4. Utilize data from monitoring and other appropriate sources to inform management decisions.

5. Provide annual report of Conservation to CDFG, USFWS, and the County of San Luis Obispo.

## 6.2 Definitions of Terms Used in This Plan

1. Element: An element refers to any biological unit, public use activity, or facility maintenance program as defined below for which goals have been prepared and presented within this plan.

2. Biological Elements: These elements consist of species, habitats, or communities for which specific management goals have been developed within the plan. Biological elements in this management plan are considered in the context of their habitat, and include ecosystem function in the structure of the management plan.

3. Public Use Elements: Public use elements are any recreational, scientific, or other use activity appropriate to and compatible with the purposes for which this property was acquired.

4. Facility Maintenance Element: This is a general purpose element describing the maintenance and administrative program which helps maintain orderly and beneficial management of the area.

5. Biological Goal: A biological goal is the statement of intended results of management based upon the feasibility of maintaining, enhancing or restoring species populations and/or habitat.

6. Public Use Goal: A public use goal is the statement of the desired type and level of public use compatible with the biological element goals previously specified within the plan.

7. Tasks: Tasks are the individual projects or work elements which implement the goal and are useful in planning operation and maintenance budgets.

8. Threshold: A specific condition that triggers implementation of a specific task. By means of inclusion in this Plan all tasks meet the threshold for implementation and must be accomplished as described. For some tasks a specific condition threshold is stated in the task description that when met triggers additional or unscheduled tasks.

## 6.3 Biological Elements: Goals and Environmental Impacts

This section prescribes management goals, tasks and thresholds, where applicable, for biological elements located on the Topaz Solar Farm Preserve. For each biological element we provide a description, the general long-range goals, and the operations and maintenance tasks required to complete each goal. Management tasks have been designed to minimize the potential for negative environmental impact. We have not identified any management goals that conflict with other management goals. A list of Biological Elements is provided (Table 4) followed by discussion of each element.

TABLE 4. BIOLOGICAL ELEMENTS

| Element | Status Code* | Primary Management Goal |
|---|---|---|
| **San Joaquin Kit Fox** *Vulpes macrotis mutica* | FE, ST | Maintain and enhance habitat |
| **Blunt-nosed Leopard Lizard** *Gambelia sila* | FE, SE | Monitor for presence |
| **Giant Kangaroo Rat** *Dipodomys ingens* | FE, SE | Maintain and enhance habitat |
| **Listed Fairy Shrimp** *Branchinecta ssp*. | FE, FT | Maintain and enhance habitat |
| **Nelson's Antelope Squirrel** *Ammospermophilus nelsoni* | ST | Monitor for presence |
| **Mountain Plover** *Charadrius montanus* | SSC | Maintain and enhance habitat |
| **Burrowing Owl** *Athene cunicularia* | SSC | Maintain and enhance habitat |
| **Other Special Status Birds** | -- | Maintain and enhance habitat |
| **Special Status Amphibians** | -- | Maintain and enhance habitat |
| **CDFG Managed Game Animals** | None | Maintain and enhance habitat |
| **Special Status Plants** | -- | Maintain and enhance habitat |
| **Habitat Types** | -- | Maintain and enhance habitat |

### *6.3.1 Biological Element: San Joaquin Kit Fox*

The TSF Project is located within the Carrizo Plain core SJKF population, which is one of three core populations in California. All three core populations are geographically distinct, and together with about a dozen smaller satellite populations comprise the entire SJKF metapopulation (USFWS 1998).

**SJKF Goal 1: Maintain and enhance habitat on the Preserve in a condition appropriate for use by San Joaquin kit fox based on the best scientific information available.**

SJKF Task 1a: The Preserve owners and Preserve Manger shall be responsible for causing cattle grazing to occur on Preserve Lands annually, as needed, to promote habitat conditions preferred by San Joaquin kit fox and other native grassland plants and animals. Grazing intensity shall be managed so that lands are not overgrazed or undergrazed, and Residual Dry Matter (RDM) remains above the levels specified in this Plan in Table 2. Adaptive management practices will be implemented as needed to account for seasonal variations and to correct non-compliance conditions.

SJKF Threshold 1a: If spring grass production is estimated as sufficient to result in Residual Dry Matter (RDM) amounts greater than 2,000 lbs. per acre, the pasture must be grazed.

SJKF Threshold 1b: For each grassland area, at least 50% of the area shall meet or exceed the Fall Residual Dry Matter (RDM) goals (refer to Section 6.4.1); and no more than 25% of the area shall fall below the minimum.

SJKF Remedial Activities 1b: If grasslands do not meet the minimum Fall RDM goals at any time, livestock will be removed from the pasture until thresholds are met. If minimum RDM goals are not met for two years in a row, or three years out of five, then the grassland area will not be grazed for the remainder of that grazing year.

**SJKF Goal 2: Manage the Preserve to reduce the impact of predators on San Joaquin kit fox.**

SJKF Task 2a: The Preserve Manager, in consultation with CDFG wildlife biologists, shall coordinate appropriate depredation activities when predation of SJKF is identified as above normal. Include detected incidents of predation of kit fox in Annual Report (Section 7.2).

**SJKF Goal 3: Maintain artificial escape dens installed as part of the Topaz Solar Farm applicant proposed measures on Preserve lands.**

SJKF Task 3a: Inspect condition of each escape den pipe, soil cover, and entrance once every three years.

Threshold 3a: Pipe or entrance way are degraded or enlarged, soil covering pipe is eroded exposing pipe, soil covers pipe by less than eight inches.

Task 3b: If escape dens are not functioning to allow kit fox entrance and exclude larger canids, repair escape den.

**SJKF Goal 4: Monitor the population of San Joaquin kit fox on the Preserve**

SJKF Task 4a: Conduct annual monitoring surveys on the Preserve to examine presence, population trends, and behavior of San Joaquin kit fox. Include survey results in Annual Report. Surveys for San Joaquin kit fox will be performed two nights between June and September, annually by qualified biologists. Surveys will consist of night-time eyeshine survey conducted from moving vehicles. Transect routes on existing ranch roads through the Preserve will be established and traversed nightly for two nights. Sightings of San Joaquin kit fox will be recorded with number of animals, location and distance from observer noted. Once established the same survey route shall be used each year to allow comparison of kit fox numbers.

**SJKF Goal 5: Evaluate data collected and discuss in relation to SJKF and the management of its habitat.**

SJKF Task 5a**:** The Topaz Preserve Annual Report shall be prepared under the direction of the Preserve Manager, and shall include information on the status of San Joaquin kit fox on the Preserve, and data from the Carrizo Plain National Monument kit fox surveys as a reference population. The Annual Report shall including information from Topaz baseline biological studies, Topaz Solar Farm kit fox monitoring (see Topaz Solar Farm SJKF Conservation Plan), annual monitoring surveys (SJKF Task 1a), maps of documented localities, analysis of the monitoring information, comparison of population trends, conclusions and discussion including an evaluation of current management practices, and recommendations.

### *6.3.2 Biological Element: Blunt-nosed Leopard Lizard*

**BNLL Goal 1: Monitor Preserve lands once every five years for the presence of BNLL.**

BNLL Task 1a: Conduct visual inspections throughout the Preserve for BNLL. Inspections shall be once in five years, and may be performed concurrent with other monitoring tasks. If BNLL is found on the Preserve, include this information in the Annual Report with monitoring data, analysis, and recommendations.

### *6.3.3 Biological Element: Giant Kangaroo Rat*

GKR has been identified on Parcels J1 and J4 of the Preserve. Suitable habitat is present elsewhere on the Preserve. Management of habitat conditions suitable for GKR will be accomplished by implementation of SJKF Task 1a.

**GKR Goal 1: Identify giant kangaroo habitat on the Preserve.**

GKR Task 1a: Conduct monitoring surveys on the Preserve once every five years for giant kangaroo rat presence. Walking surveys to inspect the Preserve for GKR precincts will be conducted by a qualified biologist. Trapping will not be conducted. Include survey results in Annual Report.

GKR Task 1b: After completion of each five-year monitoring survey, prepare a map of all known localities of listed GKR on the Preserve. Include map in the following Annual Report.

**GKR Goal 2: Evaluate data collected and discuss in relation to GKR and the management of its habitat.**

GKR Task 2a: The Annual Report shall include information, as available, on the status of the giant kangaroo rat on the Preserve, including information from monitoring surveys, analysis of the monitoring information, conclusions and discussion.

**GKR Goal 3: Maintain habitat on the Preserve in condition appropriate for use by GKR.**

GKR Task 3a: Implement a vegetation management strategy to promote habitat conditions preferred by GKR and other rare grassland species. Use of prescribed grazing is the primary tool which will be utilized to influence vegetative biomass and species composition of the arid grasslands that comprise the Preserve. Adaptive management practices will be implemented as needed to account for seasonal variations and to correct non-compliance conditions.

### *6.3.4 Biological Element: Listed Fairy Shrimp*

One species of federally-listed fairy shrimp has been documented on the Preserve: vernal pool fairy shrimp (*Branchinecta lynchi*). The vernal pool fairy shrimp is known from numerous vernal pools occurring in Parcel D of the Conservation Lands.

**Fairy Shrimp Goal 1: Preserve and protect fairy shrimp habitat on the Preserve.**

FS Task 1a: Control access by cattle to fairy shrimp habitat during wet conditions when standing water is present or soil is saturated. Prevent cattle from congregating in vernal pools during the wet season. Fencing options shall be utilized, if necessary.

### *6.3.5 Biological Element: Nelson's Antelope Squirrel*

The Nelson's antelope squirrel has not been detected on the Preserve. Moderately suitable habitat is present in some areas.

**Antelope Squirrel Goal 1: Monitor Preserve lands once every five years for the presence of Nelson's antelope squirrel colonies.**

AS Task 1a: Conduct visual inspections throughout the Preserve for Nelson's antelope squirrel colonies. Inspections shall be once in five years, and may be performed concurrent with other monitoring tasks. If Nelson's antelope squirrel is found on the Preserve, include this information in the Annual Report with monitoring data, analysis, and recommendations.

### *6.3.6 Biological Element: Mountain Plover*

Mountain plovers utilize habitat on the Conservation Lands for periodic winter foraging. Mountain plovers prefer topographically flat areas with short-grass conditions, such as are present on Parcels D and G.

**Mountain Plover Goal 1: Monitor the mountain plover wintering population on the Preserve.**

Mountain Plover Task 1a: Conduct monitoring surveys on the Preserve once every five years for mountain plover presence concurrent with wintering bird surveys. Include survey results in Annual Report.

### *6.3.7 Biological Element: Burrowing Owl*

Wintering and nesting burrowing owls are present on the Preserve. Burrowing owls require suitable mammal burrows and moderately short grass conditions.

**Burrowing Owl Goal 1: Maintain upland grassland habitat in appropriate condition for use by burrowing owl.**

BO Task 1a: Implement a vegetation management strategy to promote habitat conditions preferred by burrowing owl and other rare species. Burrowing owls tend to prefer grassland areas with lower biomass. Use of prescribed grazing is the primary tool which will be utilized to influence biomass and species composition of the arid grasslands of the Preserve.

**Burrowing Owl Goal 2: Monitor the burrowing owl population on the Preserve.**

BO Task 2a: Conduct surveys of the Preserve at five year intervals to determine burrowing owl nesting locations. Include survey results in the corresponding Annual Report.

### *6.3.8 Biological Element: Other Special Status Birds*

A number of special status birds are known to utilize habitats on the Preserve for wintering, foraging or nesting. Grasshopper sparrows and short-eared owls prefer tall-grass areas of the Preserve for nesting. Golden eagle, Swainson's hawk, northern harrier, ferruginous hawk, and bald eagle are raptors that likely forage on the Preserve opportunistically and seasonally.

**Special Status Birds Goal 1: Monitor use of the Preserve by special status birds.**

SSB Task 1a: Conduct bird surveys once every five years on the Preserve in a manner suitable to detect special status bird species. The surveys shall be conducted by a qualified biologist. Include results in corresponding Annual Report.

### *6.3.9 Biological Element: Special Status Amphibians*

Western spadefoot toad (*Scaphiopus hammondii*) is a DFG California Species of Special Concern. Spadefoot toad upland habitat and aquatic breeding habitat is present on the Preserve in very limited locations where vernal pools and puddles form. Suitable habitat for the California tiger salamander (*Ambystoma californiense*) is not present. Restoration of existing croplands to annual grasslands will benefit special status amphibians.

**Special Status Amphibians Goal 1: Maintain breeding ponds and upland grassland habitat associated with breeding ponds in appropriate condition for use by Western spadefoot toad and other special status amphibians.**

SSA Task 1a: Control access to ephemeral pools during wet conditions. Prevent cattle from entering ephemeral pools during the wet season. Fencing options shall be considered, if necessary.

**Special Status Amphibians Goal 2: Monitor special status amphibian populations on the Preserve.**

SSA Task 2a: Survey suitable ephemeral aquatic habitat for presence of Western spadefoot toad or other special status amphibians once every five years to determine presence or absence. Include survey results in the corresponding Annual Report.

### *6.3.10 Biological Element: CDFG Managed Game Animals*

Pronghorn and tule elk occur on the Preserve. Habitats on the Preserve are suited to supporting these special game mammals.

**Game Animals Goal 1: Maintain and enhance habitat for pronghorn and elk on the Preserve.** Improving permeability over Conservation Lands will be accomplished by removing fences where practical and enhancing remaining fences to allow easier passage by pronghorn and elk. Increased forb and shrub cover obtained by seeding former agricultural fields with native shrubs and forbs will provide summer forage habitat for pronghorn. Shrub cover using *Atriplex* spp. at a density of approximately five percent will give pronghorn cover for fawns, and summer forage.

GA Task 1a: Implement fence enhancement and removal as per Fencing Plan (Figure 8), and Habitat Restoration tasks to increase permeability across the landscape. Fence enhancement shall include removing wildlife mesh, changing bottom wire to non-barbed wire, raising bottom wire to 18 inches, changing top wire to smooth for fences above 42 inches, changing top wire to smooth where practical, or setting top wire to a maximum height of 42 inches. The second wire down should be at twelve inches below the top wire. Fence removal shall be implemented for cross-fencing that is not required for grazing management. Fence removal and enhancement can be incremental over five years.

GA Task 1b: Seed as per producer's recommendation approximately one-half pound per acre each of *Atriplex polycarpa* and *Atriplex spinosa* over 1,280 acres of existing cropland (Sections 17 and portions of 7 and 18).

GA Task 1c: Maintain shrub cover at approximately 5% of total cover utilizing grazing management. Adjust timing and duration of grazing on property to allow establishment of shrubs and maintenance of shrub habitat.

### *6.3.11 Biological Element: Rare Plants*

Eleven rare plant species are known to occur on the Preserve. No listed species have been documented on the Preserve, however moderately suitable habitat is present.

**Rare Plant Goal 1: Investigate the distribution and abundance of rare plants on the Preserve.**

RP Task 1a: A qualified botanist shall conduct seasonally appropriate surveys for rare plants on the Preserve once every five years. Identify important populations of special status plants on the Preserve and recommend adaptive management strategies, if necessary to promote population health and growth. Monitoring protocols are outlined in Section 7.0. Include survey results in Annual Report.

### *6.3.12 Biological Element: Habitat Types*

TABLE 5. CONSERVATION LAND HABITAT TYPES.

| Habitat Type | Primary Management Goal | Management Methods |
|---|---|---|
| **California Annual Grassland** | Maintain and enhance habitat | Grazing; exotic plant control |
| **Cropland** | Restore to annual grassland | Seeding; grazing; mowing; exotic plant control |
| **Vernal Pool** | Maintain and enhance habitat | Grazing; fencing |
| **Buckwheat Scrub** | Maintain and enhance habitat | Grazing |
| **Wetland** | Maintain and enhance habitat | Grazing; fencing |
| **Natural Non-wetland Pool and Ephemeral Wetland Depression** | Maintain and enhance habitat | Grazing; fencing |
| **Anthropogenic** | Maintain and enhance habitat | Remove debris |

#### A. California Annual Grassland

Conservation Lands are comprised of approximately 7,000 acres of annual grassland habitat. Annual grasslands on the Preserve are a critical component of endangered species habitat, and the long-term preservation of this habitat is vital to maintaining and improving populations of endangered species.

**Grassland Goal 1: Maintain and enhance grassland habitat in condition appropriate for use by San Joaquin kit fox and other arid grassland species.**

Grassland Task 1a: Implement a vegetation management strategy to promote habitat conditions preferred by San Joaquin kit fox and other arid grassland species. Use of prescribed grazing is the primary tool which will be utilized to influence biomass and species composition of the arid grasslands of the Preserve.

**Grassland Goal 2: Protect rare plant populations on the Preserve.**

Grassland Task 2a: Install protective fencing, adjust grazing regime, or implement other recommendations regarding management rare plant populations as determined by routine monitoring surveys.

**Grassland Goal 3: Minimize presence of noxious weeds on the Preserve.**

Grassland Task 3a: Implement management strategies to minimize or eliminate populations of noxious weeds on the Preserve (refer to Section 6.4.3).

**Grassland Goal 4: Monitor grassland habitat annually throughout the Preserve during fall months to ensure RDM targets are met** (see Section 7.2).

**Grassland Goal 5: Monitor grassland habitat throughout the Preserve to collect data on species composition, which will be used to inform the adaptive management process and direct grazing practices as needed.**

Grassland Task 5a: Conduct vegetation sampling once every five years in grassland areas throughout the Preserve. Use the stratified random sampling methodology as described by Elzinga, et al. (1998). Data collected for each quadrat sample will be percent cover of native and non-native plant species, and percent cover of grass and forb species. Sampling and analysis will be conducted by a qualified botanist with appropriate sampling and statistical skills. Include results in the corresponding Annual Report.

## B. Buckwheat Scrub

Buckwheat scrub habitat is located on Parcel F of the Preserve. Buckwheat scrub contains a significant component of slender needlegrass, a native bunchgrass, and a large population of Heerman's kangaroo rat. This scrub habitat should be maintained in its native condition. It presently occurs on hilltops and hillsides, and is in a stable condition that is not expected to change significantly under natural conditions.

**Buckwheat Scrub Goal 1: Maintain buckwheat scrub in locations where it is naturally occurring.**

Buckwheat Scrub Task 1a: Implement a vegetation management strategy to maintain buckwheat scrub habitat. Use of prescribed grazing is the primary tool which will be utilized to limit growth of introduced annual grasses and promote growth of native bunchgrasses.

## C. Vernal Pools

A significant vernal pool complex occurs on Parcel D of the Preserve that contains listed fairy shrimp, rare plants, and breeding amphibians. Isolated vernal pools also occur in other areas of the Preserve. Maintaining and enhancing vernal pool habitat is a critical component of endangered species management.

**Vernal Pool Goal 1: Protect and enhance vernal pool habitat for use by rare species and wildlife.**

Vernal Pool Task 1a: Restrict cattle impacts on vernal pools during winter and spring breeding seasons for aquatic organisms. Avoid grazing vernal pool areas when vernal pools are saturated. Fencing options shall be considered, if necessary. Implement an adaptive grazing strategy that includes grazing during periods of no water in order to minimize dominance of introduced grasses.

Vernal Pool Task 1b: Coordinate exotic aquatic species eradication with the CDFG and the USFWS, if exotic aquatic species are discovered.

Vernal Pool Task 1c: Protect aquatic habitats by avoiding the use of pesticides on the Preserve lands. If pesticides must be used, all uses shall conform to protective measures recommended by the Department of Pesticide Regulation and the State

Water Quality Resources Control Board with respect to surface and ground water protection.

### D. Bunchgrass Grassland

Slender needlegrass (*Nassella cernua*) and/or bluegrass (*Poa secunda*) dominated grassland are native grassland types that are increasingly uncommon in the Carrizo Plain region. The combination of ranching and agricultural use of the Preserve lands for the past century has promoted a dominance of non-native annual grass species. Still, some patches dominated by these species persist on the Preserve. These locations can serve as source populations to promote an increase in the distribution and abundance of these native grass community types.

**Bunchgrass Goal 1: Increase the distribution and abundance of perennial native bunchgrass.**

Bunchgrass Task 1a: Use grazing practices that consider the timing of flower and seed production of bunch grasses to avoid damage to the adult plants, maximize reproductive output, and facilitate germination and establishment of new plants. Maintain RDM at or above levels prescribed in this Plan. Use of prescribed grazing is the primary tool which will be utilized to promote bunchgrass grassland habitat.

## 6.4 Management Elements: Goals and Environmental Impacts

The Preserve will be managed in perpetuity. Management actions are required on a limited basis to maintain the grazing program, to implement habitat restoration and revegetation, and, if necessary, to control introduced or predatory species. Five Management Elements are prescribed for the Preserve (Table 6).

TABLE 6. MANAGEMENT ELEMENTS

| Management Element | Primary Management Goal |
|---|---|
| **Grazing Program** | Enhance habitat for rare species |
| **Habitat Restoration and Revegetation** | Convert cropland to grassland |
| **Noxious Weed Control** | Eliminate noxious weed infestations |
| **Feral Animal Control** | Minimize population size |
| **Predatory Animal Control** | Implement depredation as needed |

### *6.4.1 Management Element: Grazing Program*

Implement grazing as a management tool to influence vegetative biomass in grassland habitats throughout the Preserve. Vegetative biomass will be managed in order to successfully attain each of the grazing goals outlined below. Residual dry matter (RDM) will be utilized to measure grazing intensity on Preserve lands. Target amounts are provided for each parcel in Table 2. RDM amounts are based on recommendations from the University of California, Division of Agriculture and Natural Resources, and the California Rangelands Research and Information Center (Bartolome et al, 2002).

**Grazing Goal 1: Enhance habitat for endangered, rare, and common species, and managed game mammals.**

Grazing Task 1a: The Preserve manager shall direct the grazing program to meet RDM targets specified for each parcel of the Preserve (refer to Table 2). RDM targets are designed with respect to naturally occurring conditions in each parcel, and will preserve habitat quality in those areas for specific endangered, rare, and common species and managed game mammals. Grazing intensity shall be managed so that lands are not overgrazed or undergrazed, and Residual Dry Matter (RDM) remains above the levels specified in this Plan in Table 2. Adaptive management practices will be implemented as needed to account for seasonal variations and to correct non-compliance conditions.

Grazing Threshold 1a: If spring grass production is estimated as sufficient to result in Residual Dry Matter (RDM) amounts greater than 2,000 lbs. per acre, the pasture must be grazed.

Grazing Threshold 1b: For each grassland area, at least 50% of the area shall meet or exceed the Fall Residual Dry Matter (RDM) goals (refer to Section 6.4.1); and no more than 25% of the area shall fall below the minimum.

Grazing Remedial Activities 1b: If grasslands do not meet the minimum Fall RDM goals at any time, livestock will be removed from the pasture until thresholds are met. If minimum RDM goals are not met for two years in a row, or three years out of five, then the grassland area will not be grazed for the remainder of that grazing year.

Grazing Task 1b: Assess range condition based on rainfall amounts in the winter and spring. Adjust stocking rates as appropriate to meet fall RDM goals.

**Grazing Goal 2: Promote recruitment of native plant species, especially perennial grasses and wildflowers.**

Grazing Task 2a: Grazing shall be utilized throughout the Preserve to minimize growth of introduced grasses and promote growth and reproduction of native perennial grasses and wildflowers.

**Grazing Goal 3: Manage fuel load to minimize risk of fire.**

Grazing Task 3a: The Preserve manager shall direct the grazing program to meet fire management goals, as outlined in Section 6.4.1.

**Grazing Goal 4: Provide adequate ground cover to prevent wind and water erosion of soils.**

Grazing Task 4a: If RDM monitoring data collected annually in the fall determines any area is less than the RDM target, the Preserve manager shall direct the grazing program such that adequate ground cover is maintained to prevent wind and water erosion of soils.

**Grazing Goal 5: Promote improved soil aggregate stability through increased soil organic matter, roots, and fungal associations.**

Grazing Task 5a: This goal is met if minimum RDM targets are met annually. No specific monitoring shall be required for this goal.

**Grazing Goal 6: Provide adequate cover to stabilize former croplands.**

Grazing Task 6a: Restoration of croplands will require managed grazing that may include no grazing for the first one or two years after cessation of plowing. The Preserve manager shall ensure appropriate grazing intensity is provided on restoration lands (refer to Section 6.4.2).

**Grazing Goal 7: As necessary, build new fences to protect Preserve lands and manage grazing.**

Grazing Task 7a: If necessary, as determined by the Preserve Manager, fence with pronghorn friendly fence (refer to Figure 8) up to two miles on the northern boundary of Sections 1 and 6, for livestock management.

### *6.4.2 Management Element: Habitat Restoration*

Habitat restoration designed to convert croplands to annual grasslands on the Preserve is a requirement of the Project conditions of approval. Parcels on the Preserve that were voluntarily removed from active dry-farming by the landowner and subsequently grazed annually generally reverted to annual grassland habitat after about five years (i.e. Parcel C1). However, the lack of direct restoration management resulted in dominance of tall wild oats (*Avena fatua*) and/or high densities of tall forbs such as Vicia, Amsinckia, Descurainia, and Hirschfeldia. Habitat restoration on the Preserve will consist of specific management techniques designed to restore croplands to annual grasslands in less than five years that are composed of a higher proportion of native species, and that support a biomass better suited to local wildlife.

**Habitat Restoration Goal 1: Implement habitat restoration measures designed to convert existing croplands to annual grassland habitat suitable for rare, endangered, and common wildlife and plants of the Carrizo region.**

Habitat Restoration Task 1a: End farming on all Preserve Lands. Allow natural recovery of grassland habitat.

Habitat Restoration Task 1b: Utilize managed grazing to promote native plant species growth and inhibit introduced plant species. Conduct grazing as needed to reach RDM targets for restored croplands.

**Habitat Restoration Goal 2: Create natural vegetation communities with approximately 5% cover of shrubs suitable as browse and cover for pronghorn.**

Habitat Restoration Task 2a: Seed 1,280 acres of existing cropland (Sections 17 and portions of 7 and 18) as per producer's recommendation, approximately one pound each of *Atriplex polycarpa*, *Atriplex spinosa,* and *Atriplex canescens*.. See also Game animal Task 1b.

Habitat Restoration Task 2b: Maintain shrub cover at approximately 5% of total cover utilizing grazing management. Adjust timing and duration of grazing on property to allow establishment of shrubs and maintenance of shrub habitat. See also Game animal Task 1c.

Habitat Restoration Task 2c: At five years from seeding, conduct a survey through *Atriplex* scrub habitat area to determine density of *A. polycarpa, A. spinosa, and A. canescens.* A qualified biologist shall conduct the study utilizing a line transect method with at least 30 quadrate data points. Quadrate size should be at least 100 square meters (10 m x 10 m), or at a scale sufficient to detect *Atriplex* plants.

Threshold: Less than 1% cover of *Atriplex* species after five years

Remedial action: If less than 1% cover of *Atriplex* scrub is measured, apply as per producers instruction in appropriate seasonal conditions, an additional pound of *A. polycarpa and A. canescens* seed to the scrub habitat area where any *Atriplex* has grown. No further seed application will be required.

**Habitat Restoration Goal 3: Monitor grassland habitat throughout the Preserve to collect data on species composition, which will be used to inform the adaptive management process and direct grazing practices as needed.**

Habitat Restoration Task 3a: Conduct vegetation sampling annually in restoration areas throughout the Preserve. Use the stratified random sampling methodology as described by Elzinga, et al. (1998). Data collected for each quadrat sample will be percent cover of native and non-native plant species, and percent cover of grass and forb species. Sampling and analysis will be conducted by a qualified botanist with appropriate sampling and statistical skills. Include results in the corresponding Annual Report. See also Grassland Task 5a.

**Habitat Restoration Goal 4: Remove fences that are not necessary for grazing management.**

Habitat Restoration Task 4a: Identify all internal fences on the Preserve and determine which fences are essential for grazing management (see Figure 8 for guidance). Remove all non-essential internal fences within five years of Preserve establishment.

**Habitat Restoration Goal 5: Enhance fences for wildlife movement at perimeter and any remaining internal fences on the Preserve.**

Habitat Restoration Task 5a: Enhance Preserve fences within five years of Preserve establishment by replacing lower wire with unbarbed wire, and raising the lower wire to 18". Replace any top barbed wire over 42 inches high with smooth wire. Change all top wire to smooth wire if practical for livestock containment. Top two wires should be at least 12" apart to prevent entanglement. Utilize currently accepted wildlife friendly fencing practices consistent with Game Animals Task 1a for enhancement of existing fences and installation of any new fencing. On new fences as appropriate, install white vinyl fence visual markers on wire strands at a rate of seven three-inch markers per post interval, four on top wire, three on next wire down (see Figure 8 for guidance).

**Habitat Restoration Goal 6: Research Opportunities**

Task 6a: Allow appropriate research vetted by the Department of Fish and Game and the USFWS to be conducted on the natural community present on the Preserve. The Preserve Manager shall review proposals from qualified researchers that provide written protocol for proposed research on the Preserve, and submit to DFG and USFWS for review and approval. Proposed research shall only be considered if it is consistent with the other management goals in this HMMP.

**Habitat Restoration Goal 7: Allow removal of abandoned structures**

Task 7a: Allow abandoned structures and compounds to be removed and disposed of consistent with County demolition permits and standards.

### *6.4.3 Management Element: Noxious Weed Control*

Noxious weeds occur on the Preserve, including but not limited to those species listed in Table 7. Weed management objectives are:

A. Control widespread CDFA List C and Cal-IPC Moderate and Limited rated species to prevent spread into uninfested areas (yellow starthistle, tocalote, bindweed, tansy mustard, perennial mustard, alkali mallow, Russian thistle, puncture vine)

B. Prevent introduction of new weedy species

**Weed Goal 1: Monitor and control weeds on CDFG List A, CDFG List B, CDFA List C, and Cal-IPC Moderate and Limited rated species from the Preserve.**

Weed Task 1a: Conduct weed surveys once every five years, concurrent with botanical surveys conducted per Rare Plant Task 1a. Map infestations of noxious weeds. Include weed map, corresponding data, and management recommendations in the Annual Report.

Weed Task 1b: The Preserve manager shall implement approved management techniques to control infestations of noxious weeds identified in the Annual Report.

Weed Task 1c: Prevent introduction of new weedy species.

TABLE 7. WEEDY SPECIES. Weed ratings are from California Department of Food and Agriculture (CDFA), Cal-IPC, or San Luis Obispo County Weed Management Area (SLO WMA).

| **Scientific Name**<br>Common Name<br>Plant Family | **Weed Rating** | **Typical Methods for Control** | **Level of Management** |
|---|---|---|---|
| ***Aegilops triuncialis***<br>Barbed oatgrass<br>Poaceae | CDFA B<br>Cal-IPC High<br>SLO WMA "Alert" | Cut and bag flowering heads for small infestations. Monitor and treat with herbicide if re-infestation occurs. | Eradicate |
| ***Ailanthus altissima***<br>Tree of heaven<br>Simaroubaceae | CDFA C<br>Cal-IPC Moderate<br>SLO WMA "Worst Invader" | Mechanical removal; treat stumps with herbicide. Treat resprouts with herbicide. Monitor for 3 years. | Eradicate |
| ***Amaranthus albus***<br>Tumbleweed amaranth<br>Amaranthaceae | No rating. Included for management goals only. | Graze/ mow to control height and reduce abundance; collect and compost tumbleweeds to reduce fuel load along fences. | Control |
| ***Centaurea melitensis***<br>Tocalote<br>Asteraceae | CDFA C<br>Cal-IPC Moderate<br>SLO WMA "Other" | Graze/ mow to control height. Limit soil disturbance to control infestation of new areas. | Control |
| ***Centaurea solstitialis***<br>Yellow-star thistle<br>Asteraceae | CDFA C<br>Cal-IPC High<br>SLO WMA "Worst Invader" | Graze/ mow to control height. Limit soil disturbance to control infestation of new areas. | Control |
| ***Chondrilla juncea***<br>Skeleton weed<br>Asteraceae | CDFA A<br>Cal-IPC Moderate<br>SLO WMA "Other" | Pull up and bag individuals for small infestations. Monitor site for seedlings, pull and bag or treat with herbicide, as necessary. | Eradicate |
| ***Convolvulus arvensis***<br>Field bindweed<br>Convolvulaceae | CDFA C<br>(Cal-IPC Evaluated and Not Listed) | Graze. | Control |
| ***Descurainia sophia***<br>Tansy mustard<br>Brassicaceae | Cal-IPC Limited | Graze/mow to control height. | Control |
| ***Hirschfeldia incana***<br>Perennial mustard<br>Brassicaceae | Cal-IPC Moderate | Graze/mow to control height. | Control |
| ***Lepidium latifolium***<br>Perennial peppercress<br>Brassicaceae | CDFA B<br>Cal-IPC High<br>SLO WMA "Worst Invader" | Mechanical removal of individuals for small infestations. Bag removed seed heads if seed has set, and any root fragments[1]. Consult a PCA for large infestations. | Eradicate |

[1] Perennial peppercress regenerates from root fragments.

| **Scientific Name**<br>Common Name<br>Plant Family | **Weed Rating** | **Typical Methods for Control** | **Level of Management** |
|---|---|---|---|
| ***Salsola damascena*** **[= *S. vermiculata*]**<br>Damascus saltwort | No rating. Included for management goals only. | Monitor for new infestation. Consult PCA immediately if new infestations are discovered. This species can be distinguished from Russian thistle because it is perennial, not annual. | Prevent Infestation |
| ***Salsola tragus***<br>Russian thistle<br>Chenopodiaceae | CDFA C<br>Cal-IPC Limited<br>SLO WMA "Other" | Graze and mow to control existing populations. Early grazing that affects young leaves is most effective. Collect and compost tumbleweeds as necessary to reduce fuel load. Herbicide can be applied in areas requiring additional control. | Control |
| ***Sisymbrium orientale***<br>Oriental mustard<br>Brassicaceae | No rating. Included for management goals only. | Graze/mow to control height. | Control |
| ***Solanum eleagnifolium***<br>White horsenettle<br>Solanaceae | CDFA B<br>SLO WMA "Other" | Mechanical removal or herbicide treatment. Bag removed fruits and roots. | Eradicate |
| ***Tamarix parviflora***<br>Salt-cedar<br>Tamaricaceae | CDFA B<br>Cal-IPC High<br>SLO WMA "Other" | Mechanical removal; treat stumps with herbicide. Treat resprouts and monitor for 3 years. | Eradicate |
| ***Tribulus terrestris***<br>Puncture Vine<br>Zygophyllaceae | CDFA C<br>SLO WMA "Other" | Mechanical removal where foot and tire traffic would disperse seeds; herbicide if necessary | Control |

### *6.4.4 Management Element: Fire Management*

Grass fires occur in the Carrizo Plain, and have resulted in the loss of range, grain fields, and structures. Plowed ground helps to control the movement of fire through grassland and cropland areas, and is a normal fire fighting and prevention strategy on ranches in the area. Plowing for fire breaks has not been regularly performed on the Preserve, and is not a preferred fire management practice. If fire breaks in areas not described below are deemed necessary, surveys for rare species shall be conducted prior to plowing on Preserve lands.

Potential impacts of plowing include the loss of animals by entombment as heavy equipment passes overhead, or injury or death from the plowing implement and tractor. Typically a disc plow that penetrates the ground surface to approximately 8 inches is used. Plowing for firebreaks occurs in the early summer after annual plants have died. Impacts to grasslands from plowing include the removal of living perennial plants, and the likely increase of weed species.

Maintaining fuel loads at less than 1000 pounds per acre (fuel load height of 2 to 8 inches) significantly reduces flame length and suppression effort in the event of a wildland fire.

**Fire Goal 1: Use grazing to manage fuels and reduce fire hazard potential.**

Fire Task 1a: Implement a vegetation management strategy to promote habitat conditions preferred by San Joaquin kit fox and other arid grassland species, and to reduce fuel load. The vegetation management strategy for fire management will be consistent with other Tasks in this HMMP (SJKF 1a, Grazing Task 1a, etc.). Use of managed grazing is the primary tool which will be utilized to influence fuel loads on the Preserve.

**Fire Goal 2: Use mechanical methods to control fuel load in emergency situations.**

Fire Task 2a: Protect the Preserve lands from imminent fire by plowing fire breaks along Preserve boundaries.

Fire Task 2b: Survey for rare and endangered species prior to implementing mechanical fuel load control methods. Avoid all giant kangaroo rat precincts and potential kit fox dens.

**Fire Goal 3: Conduct annual firebreak plowing in one area.**

Fire Task 3a: Plow a firebreak no wider than 32 feet on each side of Bitterwater Road once per year on Sections 1, 6, 7, and the north half of 18. Total firebreak distance is 3.5 miles and the area is 13.6 acres. Limit plowing depth to six inches.

### *6.4.5 Management Element: Feral Animal Control*

Hunting will not be allowed on the Preserve, except as deemed appropriate by current regulations and the Preserve manager to control feral animals. If removal of feral animals becomes necessary to protect rare species or sensitive natural communities, the Preserve manager, in cooperation with the CDFG, may conduct a feral animal control program.

**Feral Animal Control Goal 1: Minimize populations of feral animals, such as wild pigs or cats that could result in adverse affects on native wildlife species and habitat.**

Feral Animal Control Task 1: If feral animal populations are deemed problematic to proper Preserve function, the Preserve manager shall work with CDFG to design and implement a feral animal control program.

### *6.4.6 Management Element: Predatory Animal Control*

Coyotes and introduced red foxes are known predators of the endangered San Joaquin kit fox. Kit foxes have evolved in coexistence with coyotes, and although predation does occur, it is generally at low levels unless the local coyote population exists at abnormally high densities. Red foxes, being introduced only in the last few centuries, are direct competitors with kit fox. Red foxes generally do not compete well with kit foxes on the

floor of the Carrizo Plain, however they are present on and around the Preserve lands, especially in association with croplands.

All other predator-prey interactions on the Preserve are considered a natural part of the ecosystem, and shall not be managed.

**Predatory Animal Control Goal 1: Minimize populations of predatory animals on the Preserve that are deemed a threat to the continued existence of rare and endangered species such as the SJKF.**

Predatory Animal Control Task 1a: If predation of rare and endangered species is determined to be a threat to their continued existence, the Preserve Manager shall work with CDFG to design and implement a predatory animal control program. Depredation activities are allowed on the Preserve if conducted directly under the supervision of the CDFG in consultation with the USFWS. Depredation activities will not be conducted by Preserve owners, Preserve Manager or Preserve personnel.

## 6.5 Maintenance Elements: Goals and Environmental Impacts

Facility maintenance includes elements that support cattle grazing operations, and access throughout the Preserve (Table 8). Cattle operations are an essential component of the management plan for maintenance of appropriate habitat for rare species. Access via ranch roads, fences, and watering facilities are necessary to conduct cattle operations. Fences also protect the Preserve from cattle on neighboring ranches. The Preserve will support tasks required to and maintain facilities.

TABLE 8. MAINTENANCE ELEMENTS.

| Maintenance Element | Primary Management Goal |
|---|---|
| **Ranch Roads** | Maintain as needed |
| **Fences** | Maintain as needed |
| **Cattle Watering Facilities** | Maintain as needed |

### *6.5.1 Maintenance Element: Ranch Roads*

The existing ranch roads on the Preserve allow access for environmental monitoring, rare species management, and cattle operations. Existing ranch roads within the Preserve lands may require yearly maintenance to repair storm damage. The intensity of work necessary varies greatly from year to year depending on the severity of storms. Heavy rainfall amounts in short time periods typically cause the most damage to roads. The Preserve may need to maintain access on some roads to allow Preserve managers, owners and biologists to document and monitor rare species habitat.

**Ranch Roads Goal 1: Maintain roads as necessary for management access.**

Ranch Roads Task 1a: Use a road grader or other implement to maintain existing ranch roads in good working condition.

**Ranch Roads Goal 2**: **Protect special status animal species from road maintenance operations.**

Ranch Roads Task 2a: If road grading operations will consistently disturb more than six inches of ranch road bed depth, a qualified biologist familiar with all of the special status animal species in the Preserve shall survey the roadway work area immediately prior to maintenance using heavy equipment.

Ranch Roads Task 2b**:** If special status animal species are found in or near the work area, or are suspected to have the potential to enter the work area and be at risk, work will be postponed or suspended until such time as the work will have no potential to affect rare species.

### *6.5.2 Maintenance Element: Watering Facilities*

Cattle troughs are presently located throughout the Preserve. Condition of the troughs varies from very good to very poor. Improving the distribution of watering sites on the Preserve lands will reduce localized impacts from cattle grazing, thereby maintaining and improving habitat for rare species. Improvements to the quality of existing troughs will be required periodically.

**Watering Facilities Goal 1: Maintain cattle watering facilities by regular inspections of equipment, pipes, and troughs, and repair as needed.**

Watering Facilities Task 1a: Preserve manager will conduct regular inspections and repairs to watering facilities, as needed, as part of the on-going managed grazing operation.

**Watering Facilities Goal 2: Installation of watering sites.**

Water Facilities Task 2a: Where allowed and appropriate install watering facilities usable by cattle, elk, and antelope. Maximum density is one per square mile.

### *6.5.3 Maintenance Element: Fences*

The Preserve will provide funding for fence construction and maintenance required for protection of sensitive habitats, and to upgrade fencing for improved wildlife passage.

**Fence Goal 1: Maintain perimeter fencing of the Preserve.**

Fence Task 1a: Inspect and repair annually to maintain fences on the Preserve identified as essential for range management. Tighten slack wire areas to avoid entanglement of wildlife. Replace visual fence markers if missing (see Habitat Restoration Task 5a).

# 7.0 Monitoring Plan

Monitoring of biological, management and maintenance tasks is necessary to demonstrate successful restoration or maintenance and long-term preservation of Preserve lands, and is required by County Condition of Approval 65 (MM BR-16.3). This Monitoring Plan utilizes tasks specified in Section 6.0, and provides additional tasks for monitoring and reporting. The Monitoring Plan guides acquisition and presentation of information that reports the status of Preserve resources of interest and whether management objectives are being met.

Four primary monitoring categories are utilized in this HMMP:

1. General implementation monitoring to track whether HMMP tasks have been completed for that year.
2. Biological monitoring to evaluate the status of the specific species which are found on the Preserve and which are management targets.
3. Management activities monitoring to evaluate the status of management tasks for grazing, habitat restoration, fire management, and other required elements.
4. Maintenance activities monitoring to identify maintenance needs regarding ranch roads, cattle watering facilities, and fences.

## 7.1 General Implementation Monitoring

Tasks specified in this plan are to be implemented according to the frequency, duration, and timing as per task descriptions. Appropriate personnel and the Responsible Party are listed in the Task List (Section 8.0). Monitoring includes completion of the Task Checklist verifying appropriate completion of each Preserve task and inclusion in the Annual Report. The Preserve Manager is responsible for reporting on whether each task, if required for the particular year that is the subject of the annual report, has been implemented.

**General Monitoring Goal 1: Conduct annual monitoring of Preserve** .

General Monitoring Task 1: Utilize the Management Plan Task List (Table 9) for annual inspections to determine if required tasks have been completed. Review task list and note status of all tasks for the year. Include completed checklist in Annual Report.

**General Monitoring Goal 2: Produce an Annual Report for the Preserve.**

General Monitoring Task 2a: The Annual Report for the Topaz Solar Farm Preserve shall be written by the Preserve Manager and presented to the County of San Luis Obispo, the California Department of Fish and Game, and the United States Fish and Wildlife Service. The report shall be prepared to professional standards and sent as a printed document or electronic documents to the agencies

by February 1st of the year following reporting period. Information in the report shall include a discussion of Preserve condition, status of special status species, a residue pattern map showing range condition, results from tasks that require reporting, and a checklist showing completion or status of Task Checklist.

## 7.2 Biological Monitoring

Biological resource monitoring tasks are described above in the Biological Resources section of this HMMP. Biological monitoring tasks shall be accomplished as described in each Task, and results shall be included in the Annual Report.

In addition, County of San Luis Obispo Condition of Approval 65 (MM BR-16.3g) requires development of a strategy for monitoring indirect impacts to vegetation and wildlife from alteration of solar and hydric regimes as a result of solar modules.

The monitoring strategy for indirect impacts to vegetation and wildlife from alteration of solar and hydric regimes as a result of solar modules is provided in the Topaz Solar Farm Habitat Restoration and Revegetation Plan, and the Vegetation Management Plan.

## 7.3 Management Activities Monitoring

Management activities include tasks outlined above in Section 6. Monitoring will be conducted as specified in those tasks. No additional tasks are required.

## 7.4 Rangeland Condition Monitoring

Rangeland condition monitoring is a necessary component of the HMMP, and provides information directly related to proper management of habitat, and success of rare species. The primary tool to assess rangeland condition is visual inspection by a qualified Rangeland Manager.

**Rangeland Monitoring Goal 1:** Provide rangeland condition information for evaluation of grazing activity

Rangeland Monitoring Task 1a: A qualified rangeland technician or Certified Range Manger shall conduct annual site inspections over the entire Preserve to assess rangeland condition. RDM inspections shall be before fall rains and will assess RDM for comparison with target values on each Preserve parcel. Spring biomass assessments shall be conducted in the spring. Include results in Annual Report.

Rangeland Monitoring Threshold 1a: For grassland pasture area, at least 50% of the pasture area shall meet or exceed the Fall Residual Dry Matter (RDM) goals (refer to Table 2, Section 6.4.1); and no more than 25% of the area shall fall below the minimum.

Rangeland Monitoring Remedial Activities 1a: If grasslands do not meet the minimum Fall RDM goals at any time, livestock will be removed from

the pasture until thresholds are met. If minimum RDM goals are not met for two years in a row, or three years out of five, then the grassland area will not be grazed for the remainder of that grazing year.

Rangeland Monitoring Task 1b: Assess rangeland condition based on rainfall amounts in the winter and spring, and rangeland biomass in the spring. Adjust stocking rates as appropriate to meet fall RDM goals.

Rangeland Monitoring Threshold 1a: If spring grass production is estimated as sufficient to result in Residual Dry Matter (RDM) amounts greater than 2,000 lbs. per acre, the pasture must be grazed.

# 8.0 Task List

Table 9. . SUMMARY OF HMMP TASKS. A summary of tasks required by this HMMP is provided, including how each task is categorized and included in PAR analysis, the persons to conduct each task, and the persons responsible to make sure the task is completed.

| Task | Plan reference | Source element | PAR category | PAR element | Task conducted by | Responsible party |
|---|---|---|---|---|---|---|
| **Biological Elements** | | | | | | |
| **SJKF Task 1a**<br>**Maintain kit fox habitat** | 6.3.1 | San Joaquin kit fox | HM<br>BS | Grazing | Manager<br>Cattle operator | Preserve Manager |
| **SJKF Task 2a**<br>**Coordinate depredation** | 6.3.1 | San Joaquin kit fox | BS | Other | Preserve Manager | Preserve Manager |
| **SJKF Task 3a**<br>**Inspect escape dens** | 6.3.1 | San Joaquin kit fox | BS | Wildlife biologist | Qualified biologist | Preserve Manager |
| **SJKF Task 3b**<br>**Repair escape dens** | 6.3.1 | San Joaquin kit fox | BS | Wildlife Biologist | Qualified biologist | Preserve Manager |
| **SJKF Task 4a**<br>**Monitor kit fox** | 6.3.1 | San Joaquin kit fox | BS | Wildlife biologist | Qualified biologist | Preserve Manager |
| **SKJF Task 5a**<br>**Evaluate kit fox status** | 6.3.1 | San Joaquin kit fox | **BS** | Wildlife biologist | Qualified biologist | Preserve Manager |
| **BNLL Task 1a**<br>**Look for BNLL** | 6.3.2 | Blunt-nosed leopard lizard | BS | Wildlife biologist | Qualified biologist | Preserve Manager |
| **GKR Task 1a**<br>**Look for GKR** | 6.3.3 | Giant kangaroo rat | BS | Wildlife biologist | Qualified biologist | Preserve Manager |
| **GKR Task 1b**<br>**Map GKR** | 6.3.3 | Giant kangaroo rat | BS | Wildlife biologist | Qualified biologist | Preserve Manager |

| Task | Plan reference | Source element | PAR category | PAR element | Task conducted by | Responsible party |
|---|---|---|---|---|---|---|
| **GKR Task 2a**<br>**Discuss in annual report** | 6.3.3 | Giant kangaroo rat | BS | Wildlife Biologist | Qualified biologist | Preserve Manager |
| **GKR Task 3a**<br>**Manage grassland** | 6.3.3 | Giant kangaroo rat | HM< | Other | Cattle operator | Preserve Manager |
| **FS Task 1a**<br>**Protect fairy shrimp pools** | 6.3.4 | Fairy shrimp | HM | Other | Cattle operator | Preserve Manager |
| **AS Task 1a**<br>**Look for antelope squirrel** | 6.3.5 | Antelope squirrel | BS | Wildlife biologist | Qualified biologist | Preserve Manager |
| **MP Task 1a**<br>**Look for mountain plover** | 6.3.6 | Mountain plover | BS | Wildlife biologist | Qualified biologist | Preserve Manager |
| **BO Task 1a**<br>**Maintain burrowing owl habitat** | 6.3.7 | Burrowing owl | HM | Other | Cattle operator | Preserve Manager |
| **BO Task 2a**<br>**Look for burrowing owls** | 6.3.7 | Burrowing owl | BS | Wildlife biologist | Qualified biologist | Preserve Manager |
| **BO Task 3a**<br>**Discuss in annual report** | 6.3.7 | Burrowing owl | R | Annual report | Qualified biologist | Preserve Manager |
| **SSB Task 1a**<br>**Look for and report special status birds** | 6.3.8 | Special status birds | BS | Wildlife biologist | Qualified biologist | Preserve Manager |
| **SSA Task 1a**<br>**Protect toad pools** | 6.3.9 | Special status amphibians | HM | Other | Preserve Manger/ cattle operator | Preserve Manager |
| **SSA Task 2a**<br>**Look for amphibians** | 6.3.9 | Special status amphibians | BS | Wildlife biologist | Qualified biologist | Preserve Manager |

| Task | Plan reference | Source element | PAR category | PAR element | Task conducted by | Responsible party |
|---|---|---|---|---|---|---|
| **Game Animals Task 1a Fence enhancement and removal** | 6.3.10 | Game animals | SC/M | Fence | Fence contractor | Preserve Manager |
| **Game Animals Task 1b Seed salt bush** | 6.3.10 | Game animals | HR | Seeding | Farmer | Preserve Manager |
| **Game Animals Task 1c Maintain shrub cover** | 6.3.10 | Game animals | HM | Other | Cattle operator | Preserve Manager |
| **Rare Plants Task 1a Identify rare plant populations** | 6.3.11 | Rare plants | BS | Plant ecologist | Qualified biologist | Preserve Manager |
| **Grassland Task 1a Graze grassland per standards** | 6.3.12 | Annual grassland | HM | Other | Cattle operator | Preserve Manager |
| **Grassland Task 2a Protect rare plants** | 6.3.12 | Annual grassland | BS HM OM | Plant ecologist Other Administrative | Preserve Manager | Preserve Manager |
| **Grassland Task 3a Control noxious weeds** | 6.3.12 | Annual grassland | HR | Exotic plant control | Herbicide applicator | Preserve Manager |
| **Grassland Task 5a Assess grassland condition** | 6.3.12 | Annual grassland | HM | Manage grazing | Qualified biologist | Preserve Manager |
| **Buckwheat Scrub Task 1a Maintain buckwheat habitat** | 6.3.12 | Buckwheat scrub | HM | Other | Cattle operator | Preserve Manager P |
| **Vernal Pool Task 1a Time grazing to protect pools** | 6.3.12 | Vernal pool | HM | Other | Cattle operator | Preserve Manager |
| **Vernal Pool Task 1b. Remove exotic aquatic animals** | 6.3.12 | Vernal pool | BS | Wildlife biologist | Qualified biologist | Preserve Manager |

| Task | Plan reference | Source element | PAR category | PAR element | Task conducted by | Responsible party |
|---|---|---|---|---|---|---|
| **Vernal Pool Task 1c Avoid pesticides** | 6.3.12 | Vernal pool | OM | Administrative | Preserve Manager | Preserve Manager |
| **Bunchgrass Task 1a Manage grazing** | 6.3.12 | Bunchgrass grassland | HM | Mange grazing | Cattle operator | Preserve Manager |
| **Management Elements** | | | | | | |
| **Grazing Task 1a. Meet RDM targets** | 6.4.1 | Grazing | HM | Manage grazing | Cattle operator | Preserve Manager |
| **Grazing Task 1b Predict range condition, adjust stocking rate** | 6.4.1 | Grazing | HM | Manage grazing | Cattle operator | Preserve Manager |
| **Grazing Task 2a Promote native plants** | 6.4.1 | Grazing | HM | Manage grazing | Cattle operator | Preserve Manager |
| **Grazing Task 3a Fire management** | 6.4.1 | Grazing | HM | Manage grazing | Farmer | Preserve Manager |
| **Grazing Task 4a Prevent erosion** | 6.4.1 | Grazing | HM | Manage grazing | Farmer | Preserve Manager |
| **Grazing Task 5a Promote soil stability** | 6.4.1 | Grazing | HM | Manage grazing Other | Cattle operator | Preserve Manager |
| **Grazing Task 6a Manage restoration areas** | 6.4.1 | Grazing | HM | Manage grazing | Cattle operator | Preserve Manager |
| **Grazing Task 7a Fence construction** | 6.4.1 | Grazing | HM | Manage grazing | Contractor | Preserve Manager |
| **Habitat Restoration Task 1a End farming** | 6.4.2 | Habitat restoration | HR | Preliminary plan | Preserve Manager | Preserve Manager |

| Task | Plan reference | Source element | PAR category | PAR element | Task conducted by | Responsible party |
|---|---|---|---|---|---|---|
| **Habitat Restoration Task 1b Increase native species** | 6.4.2 | Habitat restoration | HR HM | Plant ecologist Other | Cattle operator | Preserve Manager |
| **Habitat Restoration Task 2a Seed salt bush** | 6.4.2 | Habitat restoration | HR | Seeding | Farmer | Preserve Manager |
| **Habitat Restoration Task 2b Maintain shrub cover** | 6.4.2 | Habitat restoration | HM | Other | Cattle operator | Preserve Manager |
| **Habitat Restoration Task 2c Measure salt bush density, remediate if necessary** | 6.4.2 | Habitat restoration | BS | Plant ecologist | Qualified biologist | Preserve Manager |
| **Habitat Restoration Task 3a Assess grassland condition** | 6.4.2 | Habitat restoration | HM | Manage grazing | Rangeland manager | Preserve Manager |
| **Habitat Restoration Task 4a Remove fences** | 6.4.2 | Habitat restoration | HR | Fence removal | Contractor | Preserve Manager |
| **Habitat Restoration Task 5a Enhance fences** | 6.4.2 | Habitat restoration | HR | Fence enhancement | Contractor | Preserve Manager |
| **Habitat Restoration Task 6a Allow appropriate research** | 6.4.2 | Habitat restoration | OM | Administrative | Biologists | Preserve Manager |
| **Habitat Restoration Task 7a Allow demolition of abandoned compounds** | 6.4.2 | Habitat restoration | OM | Administrative | Contractor | Preserve Manager |
| **Weed Task 1a Weed surveys** | 6.4.3 | Weeds | BS | Plant ecologist | Qualified biologist | Preserve Manager |
| **Weed Task 1b Control infestations** | 6.4.3 | Weeds | HR | Exotic plant control | Farmer/ herbicide applicator | Preserve Manager |

| Task | Plan reference | Source element | PAR category | PAR element | Task conducted by | Responsible party |
|---|---|---|---|---|---|---|
| **Weed Task 1c Prevent introductions** | 6.4.3 | Weeds | BS | Project management | Preserve Manager | Preserve Manager |
| **Fire Task 1a Grazing** | 6.4.4 | Fire management | HM | Other | Cattle operator | Preserve Manager |
| **Fire Task 2a Emergency fire breaks** | 6.4.4 | Fire management | HM | Fire breaks | Farmer | Preserve Manager |
| **Fire Task 2b Endangered species avoidance** | 6.4.4 | Fire management | BS | Wildlife biologist | Preserve manager/ biologist/ operator/ or owner | Preserve Manager |
| **Fire Task 3a Bitterwater fire break** | 6.4.4 | Fire management | HM | Fire breaks | Farmer | Preserve Manager |
| **Feral animal control Task 1a Consult with DFG,** | 6.4.5 | Feral animal control | BS | Project management | DFG/ Federal trapper | Preserve Manager |
| **Predatory Animal Task 1a Consult with DFG** | 6.4.5 | Predatory animal control | BS | Project management | Preserve Manager | Preserve Manager |
| **Maintenance Elements** | | | | | | |
| **Ranch Roads Task 1a Maintain roads** | 6.5.1 | Ranch roads | HM | Grader | Contractor | Preserve Manager |
| **Ranch Roads Task 2a Survey for special status animals** | 6.5.1 | Ranch roads | HM | Bio surveys | Qualified biologist | Preserve Manager |
| **Ranch Roads Task 2b Protect special status animals** | 6.5.1 | Ranch roads | HM | Grader | Contractor | Preserve Manager |
| **Water Facilities Task 1a Regular maintenance** | 6.5.2 | Watering facilities | WM | Water delivery | Contractor | Preserve Manager |

| Task | Plan reference | Source element | PAR category | PAR element | Task conducted by | Responsible party |
|---|---|---|---|---|---|---|
| **Water Facilities Task 2a Install watering sites** | 6.5.2 | Watering facilities | WM | Water delivery | Contractor | Preserve Manager |
| **Fence Task 1a Maintain fences** | 6.5.3 | Fences | HM | Maintain perimeter fences | Contractor | Preserve Manager |
| **Monitoring Plan** | | | | | | |
| **General Monitoring Task 1a Complete annual checklist** | 7.1 | General monitoring | R | Annual report | Preserve Manager | Preserve Manager |
| **General Monitoring Task 2a Annual Report** | 7.1 | General monitoring | R | Annual Report | Preserve Manager | Preserve Manager |
| **Rangeland Monitoring Task 1a Rangeland inspection** | 7.4 | Rangeland monitoring | R | Range inspections | Certified Range Manager | Preserve Manager |
| **Rangeland Monitoring Task 1b Assess rangeland condition** | 7.4 | Rangeland monitoring | R | Range inspections | Certified Range Manager | Preserve Manager |
| **Rangeland Monitoring Task1a Adjust stocking rate** | 7.4 | Rangeland monitoring | R HM | Range Inspections Other | Cattle Operator | Preserve Manager |
| **Adaptive Management** | | | | | | |
| **Adaptive Management Task 1a Assimilate and report** | 8.1.1 | Adaptive management | R | Annual report | Qualified biologist/ Preserve Manager | Preserve Manager |
| **Adaptive Management Task 1b Implement approved changes** | 8.1.1 | Adaptive management | R HM | Annual work plan Mange grazing | Preserve Manager | Preserve Manager |

## 8.1 Preserve Management Element: Adaptive Management

### *8.1.1 Adaptive management program*

The purpose of an adaptive management program is to integrate management and monitoring to facilitate progress toward the biological goals and objectives of the Preserve. Adaptive management provides flexibility to Managers so that unforeseen or unusual events, conditions, or circumstances can be quickly addressed and the goals of protecting and promoting species that are the reason for the Preserve are fulfilled.

As discussed in Section 7.0, during implementation of the Preserve Management Plan, several types of monitoring will be used.

1. Implementation monitoring to track whether commitments in Management Plan have been completed for that year.

2. Biological monitoring to evaluate the status of the specific species which are found on the Preserve Conservation Bank and which are management targets.

3. Grazing management compliance monitoring, to determine whether Residual Dry Matter goals are being met.

4. Monitoring of maintenance tasks.

### *8.1.1 Performance plan*

Information gathered via the monitoring program is intended to document achievement of goals. If goals are not met, then a process of considering whether to institute changes in monitoring and/or management will be triggered. For some Management Plan Tasks in Section 6.0, specific thresholds are provided, and triggers for remedial actions are specified. For other Tasks, changes of management practices may be appropriate because of information gathered regarding the status of species and habitats on the Preserve. Such changes could include discovery of new species on the Preserve; or as a result of new listing of species.

Proactive management. The Preserve will be managed as described in the Management Plan in Section 6. It identifies management actions which will be undertaken to manage the Preserve in such a way as to promote the array of species that are associated with this habitat type, with emphasis on the species which are identified as of interest on the property (see Section 4.0).

The primary goal in management is to enhance and maintain habitat which is utilized for San Joaquin kit fox and the other species associated with the Carrizo Plains grasslands found on the property, utilizing grazing by livestock as the primary management tool. It is anticipated that proactive management will maintain or increase the distribution and abundance of the target species, as well as enhance knowledge of their ecologies. In the event that the conservation objectives are not attained, adjustment of tasks or alternate

tasks recommended by the Preserve Manager, the CDFG, the USFWS, or the County of San Luis Obispo will be incorporated into this HMMP, after review and approval by the agencies. The Preserve Manager may allocate additional effort and resources as available, as deemed necessary by the Preserve Manager and approved by CDFG, to specific tasks that present unusual, unique, or unforeseen need for action to protect or promote native species or natural habitat.

**Adaptive Management Goal 1: Utilize information generated on the Preserve and the best scientific information to adjust Preserve management to the benefit of rare native species**.

Adaptive Management Task 1a: Review available information from monitoring tasks and studies conducted on the Preserve and in the Carrizo Plain, along with pertinent scientific information regarding species and habitats on the Preserve. Make recommendations in the Annual Plan for review by CDFG, the USFWS, and the County of San Luis Obispo, if modifications to Management Plan would improve management for rare species on the Preserve.

Adaptive Management Task 1b: If concurrence from all reviewing agencies is obtained for recommended changes in management on the Preserve, implement changes.

# 9.0 PAR Analysis and Funding Mechanism

# 10.0 Figures

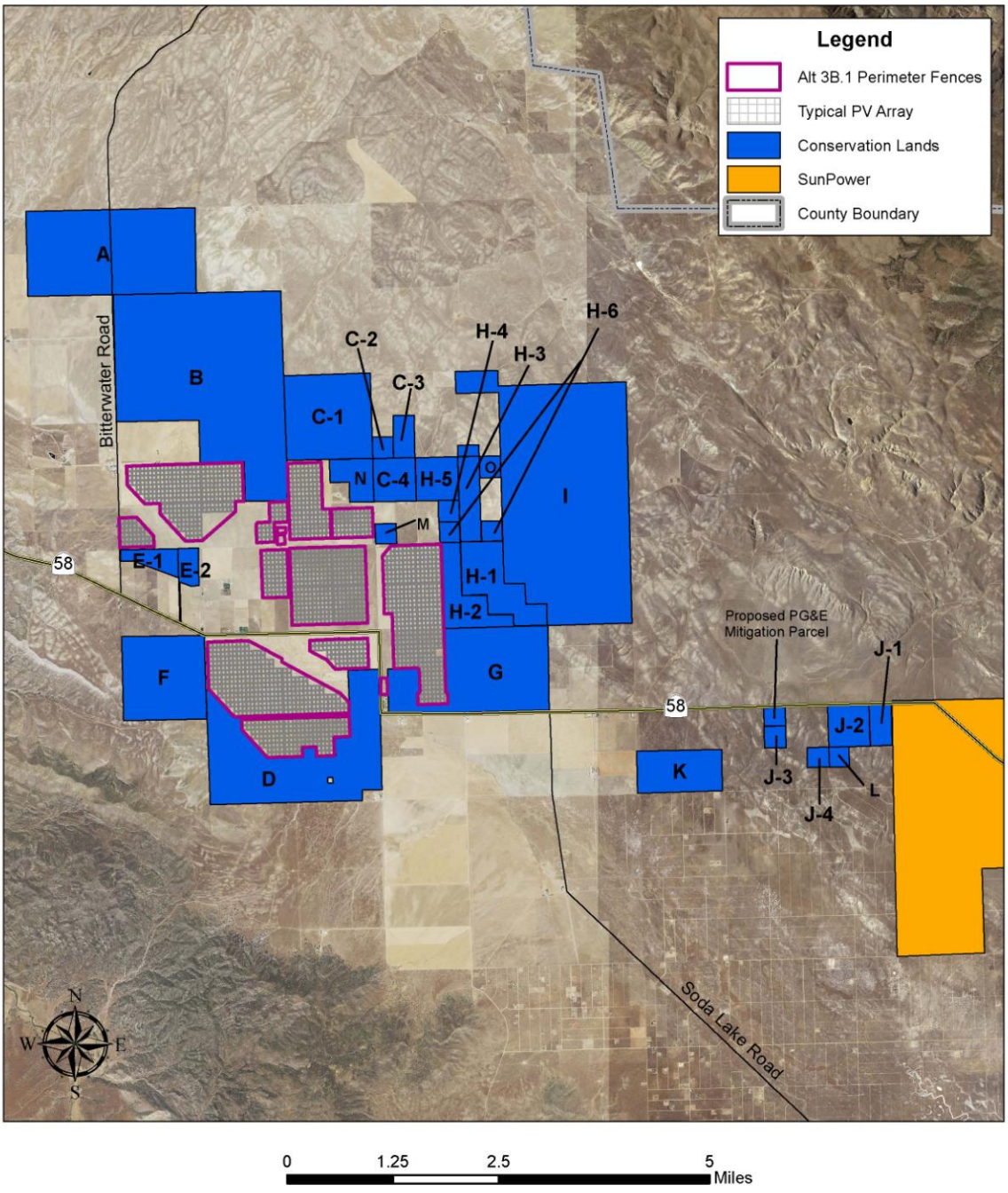



Figure 1. Conservation Land parcels. Designations refer to descriptions in Table 2.

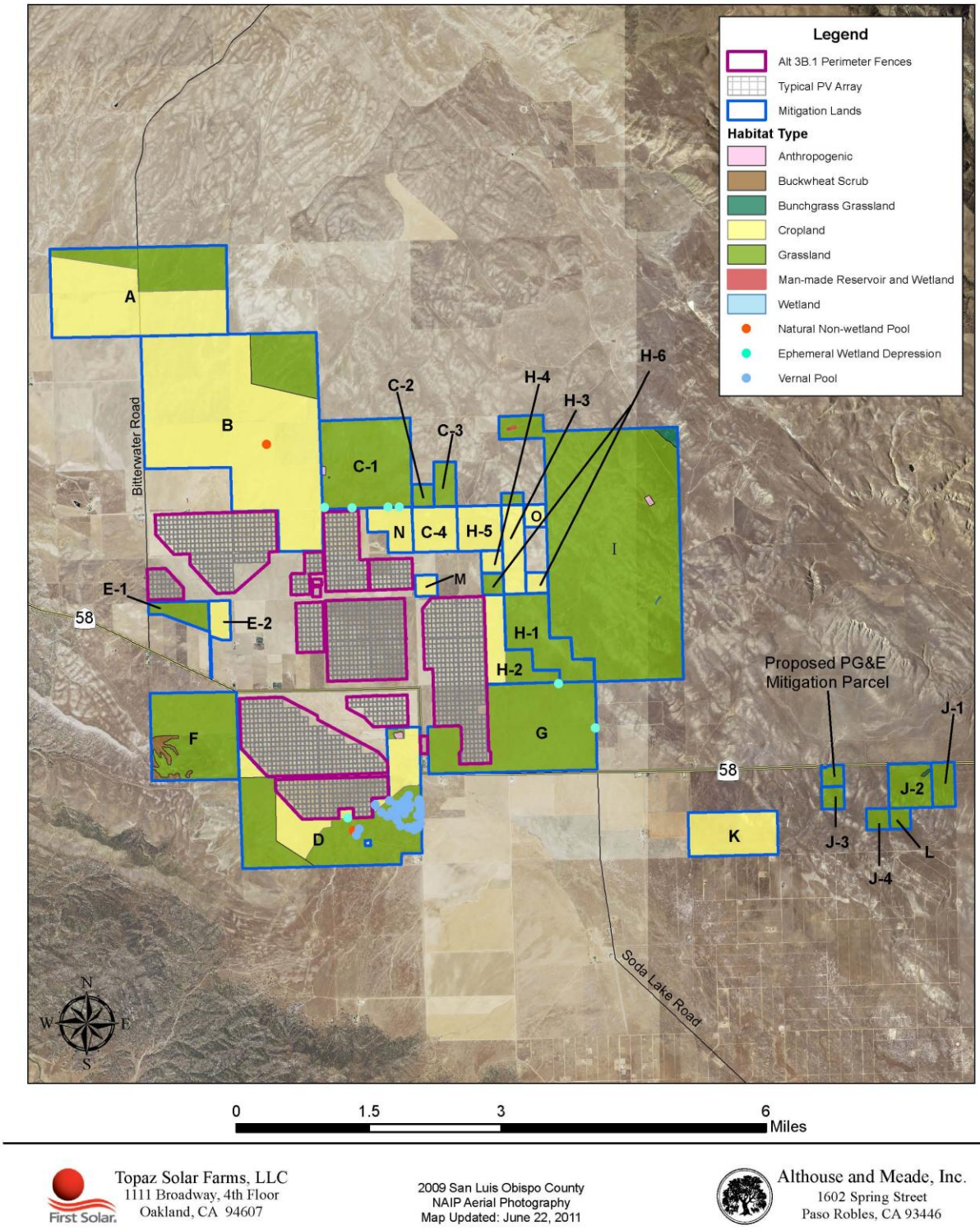



Figure 2. Habitat Map

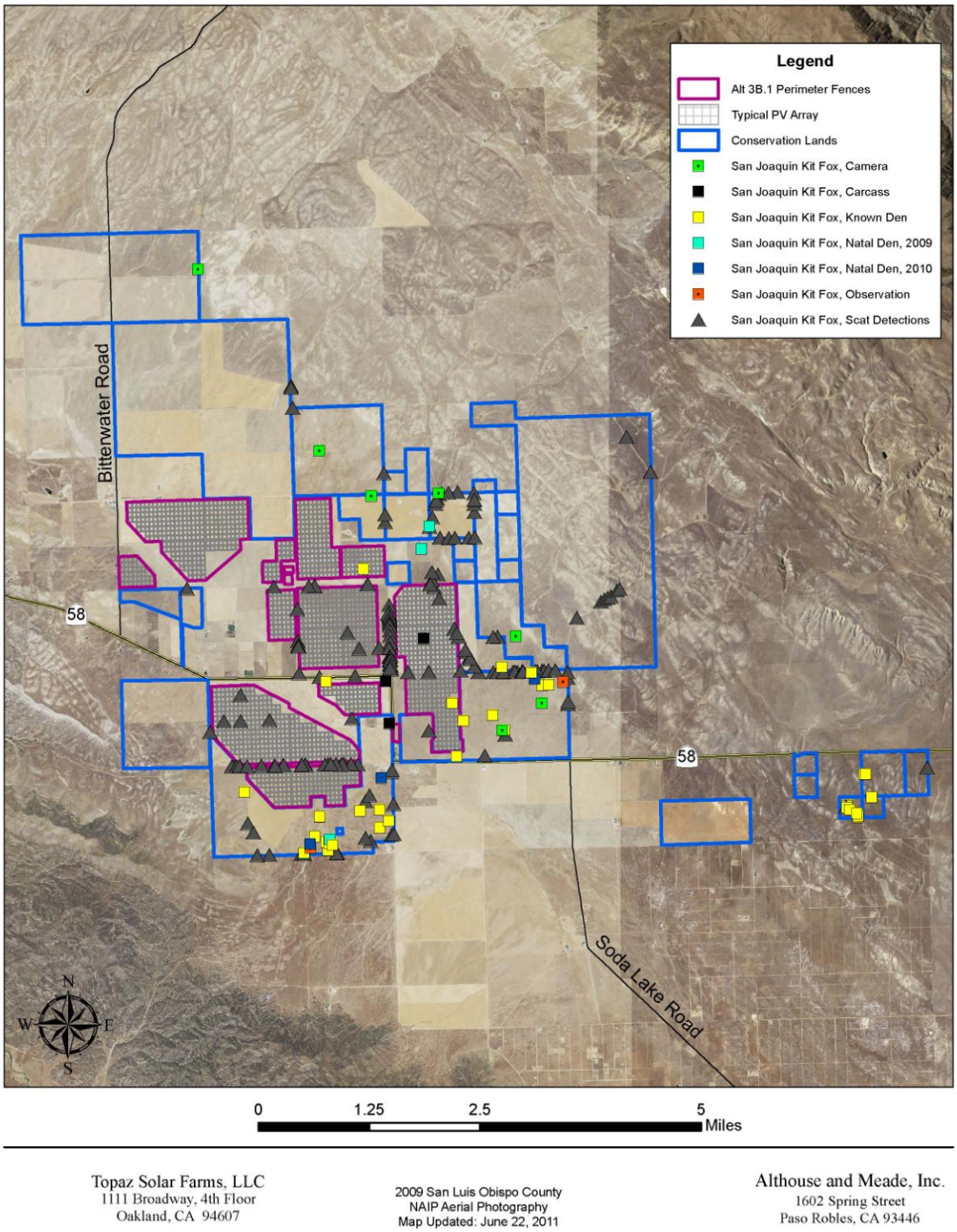



Figure 3. San Joaquin kit fox map

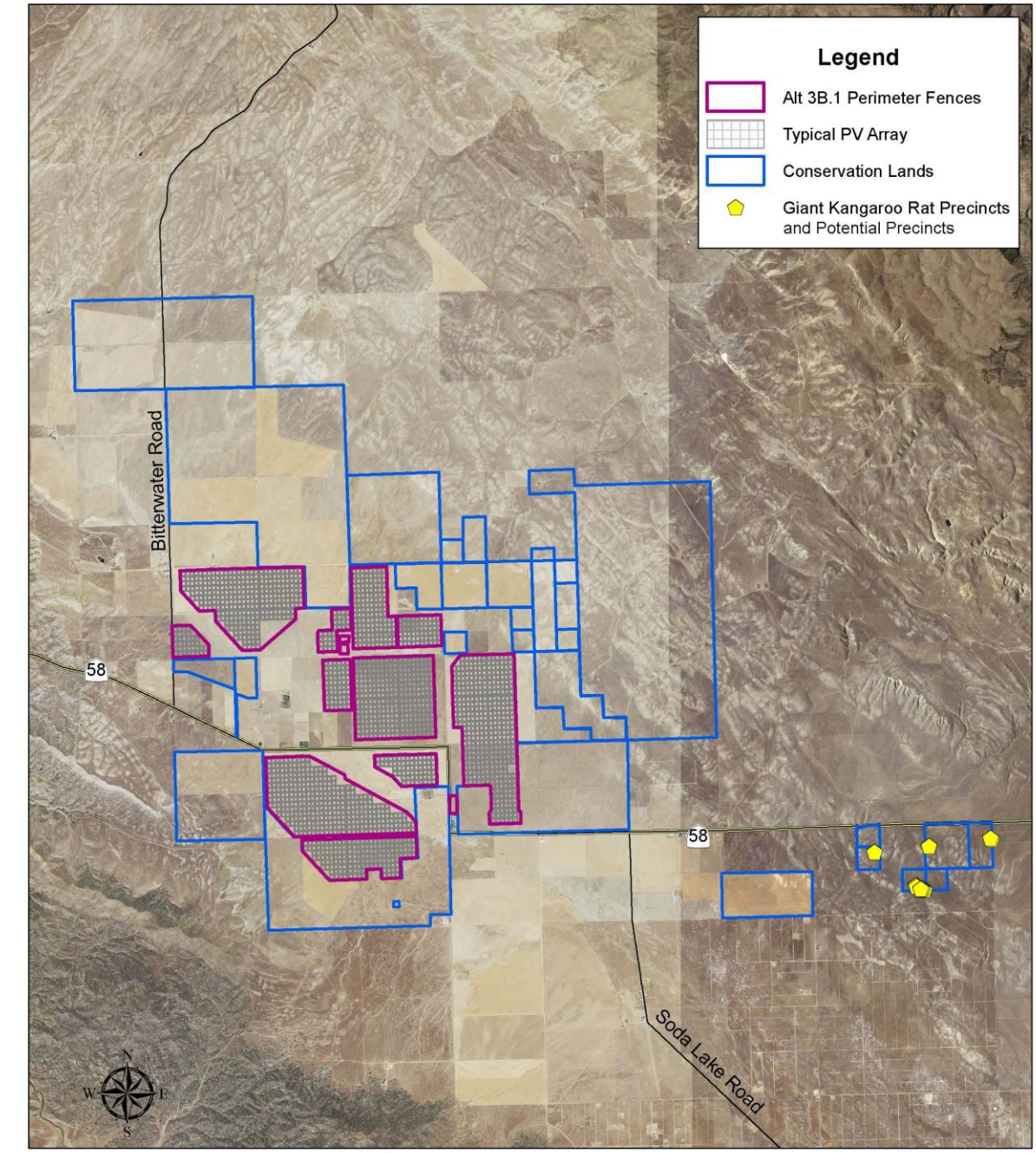



Figure 4. Giant Kangaroo Rat Map

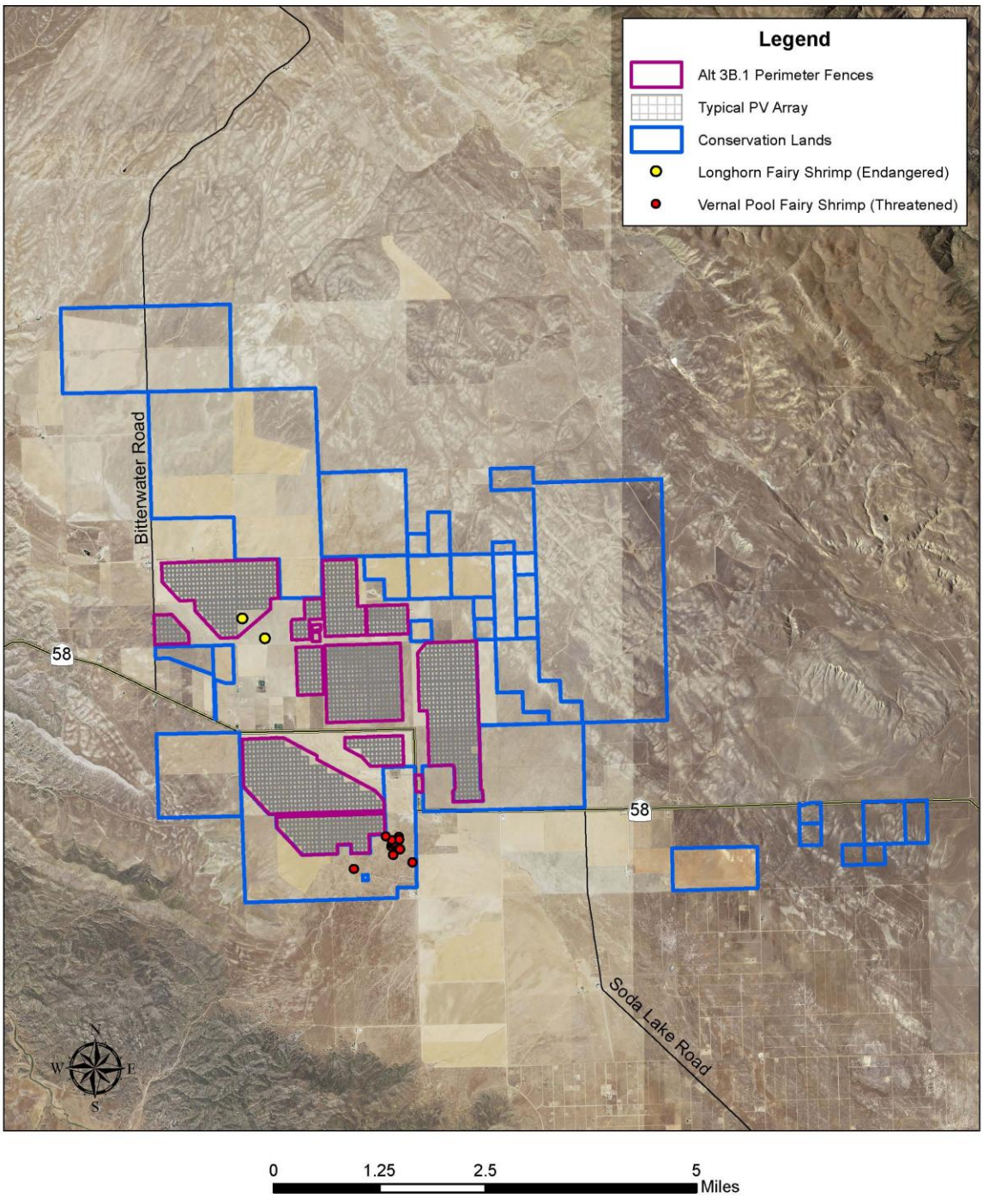



Figure 5. Listed Branchiopod Map

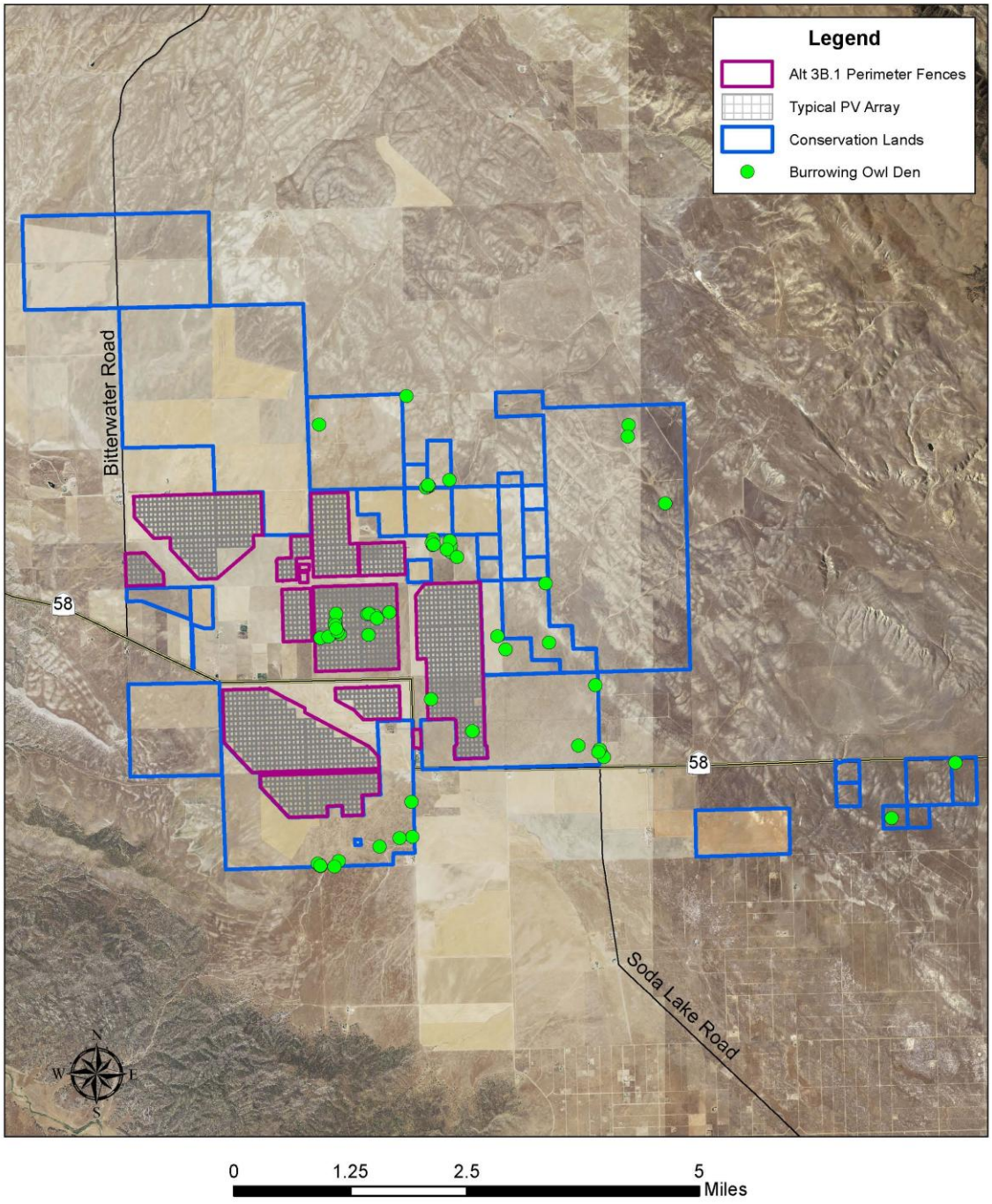



Figure 6. Burrowing Owl Map

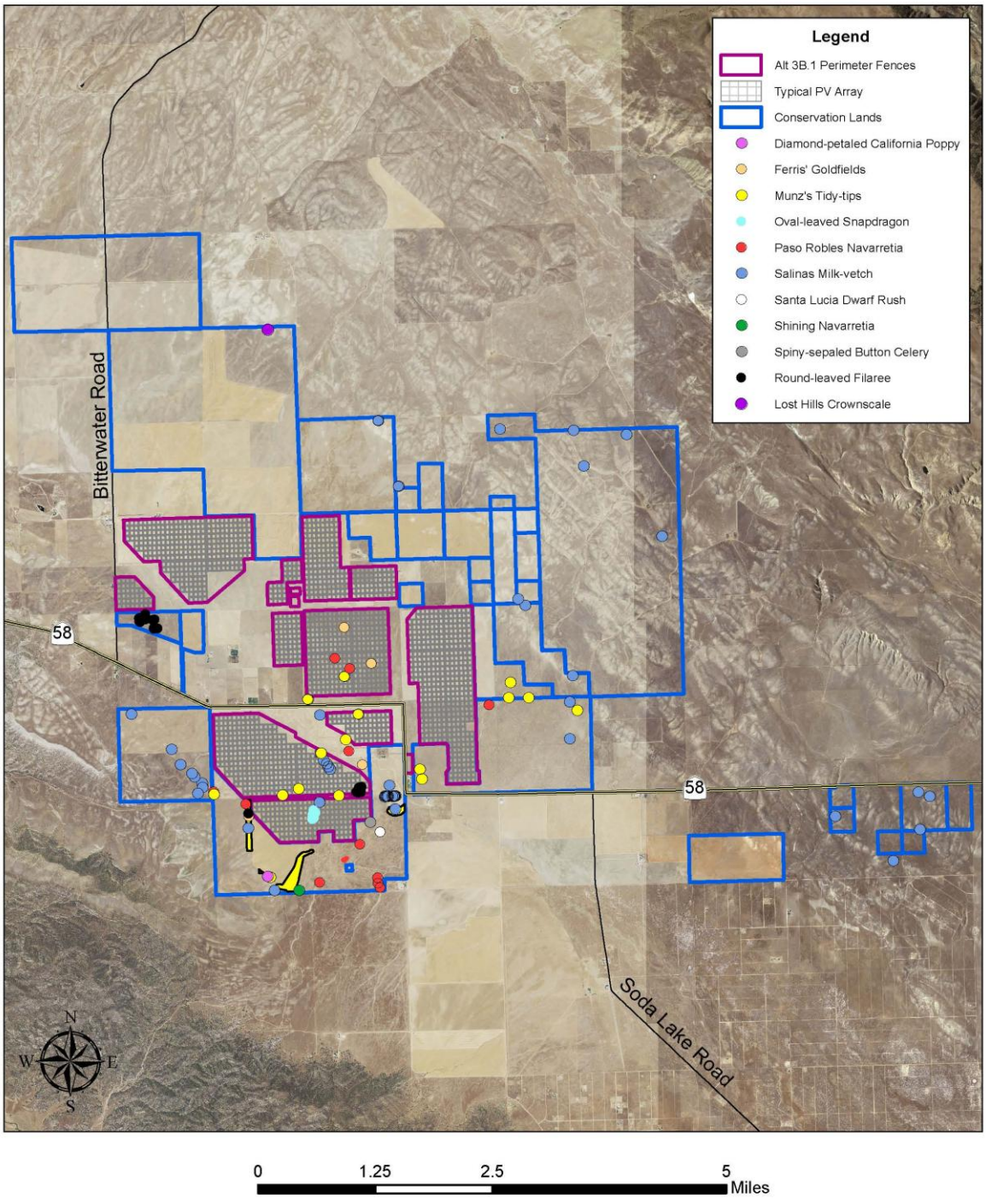



Figure 7. Special Status Plant Map

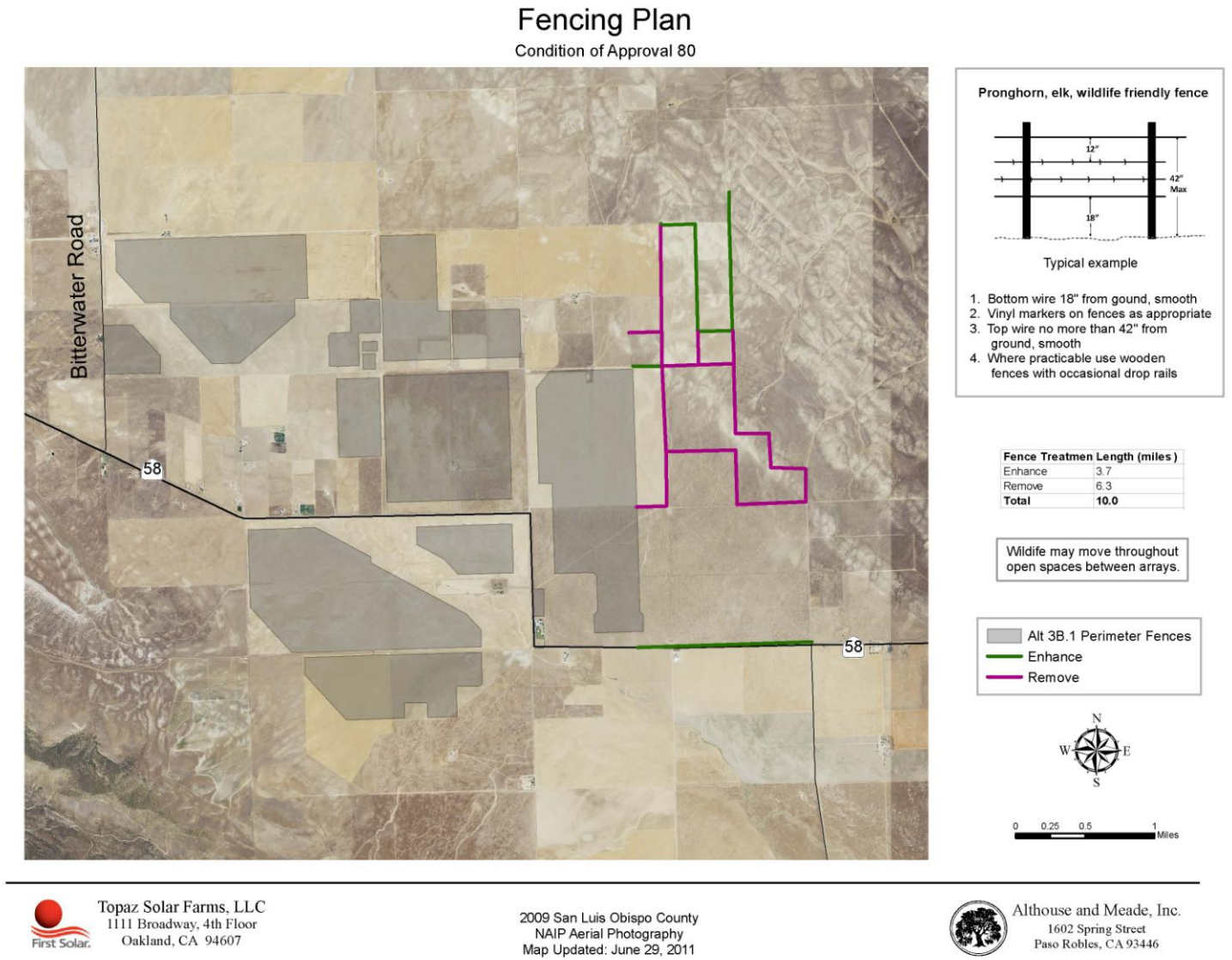



Figure 8. Fencing Plan

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# DRAFT HABITAT RESTORATION AND REVEGETATION PLAN

# Habitat Restoration and Revegetation Plan

# Topaz Solar Farm

San Luis Obispo County
California



Prepared for

**Topaz Solar Farms, LLC**
1111 Broadway, 4th Floor
Oakland, California 94607

by

**ALTHOUSE AND MEADE, INC.**
**BIOLOGICAL AND ENVIRONMENTAL SERVICES**
1602 Spring Street
Paso Robles, California 93446
(805) 237-9626

**June 17, 2011**

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# Executive Summary

The purpose of this Habitat Restoration and Revegetation Plan (HRRP) is to fulfill the conditions of approval listed in the County of San Luis Obispo Conditional Use Permit DRC2008-00009 for the Topaz Solar Farm Project. Conditions of Approval met by this plan are summarized below in Section 1.2. These measures require that Topaz Solar Farms, LLC restore temporarily disturbed annual grassland areas to pre-construction conditions or better. This HRRP guides revegetation of graded grassland habitat as well as restoration of agricultural croplands to California annual grassland habitat within proposed fenced areas and adjacent Stewardship Lands.

Each construction phase of the Project will generally occur in the following order of work:

- Perform seed collection and/or propagation, as appropriate.
- Categorize treatment areas and subcategories—grassland/cropland; grading/no grading; disking/no disking.
- Identify topsoil salvage locations; salvage and stockpile at least three inches of topsoil within the upper six inches of soil from these locations.
- Perform grading; replace topsoil, and perform soil preparations as determined for the relevant habitat type (grassland or cropland).
- Sow seed, harrow, and roll or crimp to provide a roughened surface still stable enough for workers to access on foot.
- Install PV arrays.
- Excavate trenches; lay feeder and connector lines, and backfill trenches.
- Sow seed over disturbed trench areas in grassland where trenches exceed 5 feet in width, and compact to achieve good seed-soil contact.

As each construction phase of the Project is completed, perform the following maintenance and monitoring steps for a minimum of five years, or until success criteria are met. Timelines refer to years after restoration/revegetation has been implemented in each Project phase.

- For the first year following installation, perform monthly qualitative monitoring. Perform monthly qualitative inspections on a rotation such that all restored areas are covered over the course of the year.
- Perform qualitative monitoring quarterly for years one to five or until success criteria are met.
- Perform quantitative monitoring twice annually for years one to five or until success criteria are met.

- Prepare an annual report for the County of San Luis Obispo Planning and Development Department (County) and other regulatory agencies (as relevant to restoration) documenting the progress of revegetation and restoration efforts at Topaz and on Stewardship Lands. Provide an estimate of years remaining until successful completion of HRRP requirements for each phase of construction.
- Maintain Project Site and Stewardship Lands based on observations made during monitoring inspections.

This document provides a Final Closure Plan to restore and revegetate sites occupied by structures and roads. Details regarding structure removal and panel recycling are provided in a separate Final Closure Plan document.

- Disturbed soil will be recontoured to eliminate mounds or unnatural terrain, and revegetated with native and naturalized grassland species common in the surrounding region.

# 1.0 Introduction

Construction of the Topaz Solar Farm (TSF) project (Project, Project Site, or TSF Project) will temporarily disturb California annual grassland habitat and will convert existing cropland habitat to California annual grassland. Temporary disturbance to annual grassland habitat will occur primarily in areas where grading is required to reduce slope or surface irregularities prior to photovoltaic (PV) array installation. Temporary vegetation disturbance is also anticipated in most areas where construction occurs, particularly in construction staging areas, trenches, existing structure demolition areas, and along new roads. Farming activities will cease on existing croplands within the TSF Project, which will improve the baseline condition for San Joaquin kit fox (*Vulpes macrotis mutica*) and other sensitive species by facilitating restoration of these lands to annual grassland habitat.

In this document, habitat restoration refers to the process of restoring function to a significantly disturbed ecosystem, and ensuring that vegetative cover will be as good as or better than pre-construction conditions. Within Topaz Solar Farm, habitat restoration is required to convert existing croplands to functioning annual grasslands. The Conditions of Approval require habitat revegetation, the process of vegetating temporarily disturbed California annual grassland habitat with the same species that previously occurred in that habitat. Restoration requires more initial preparation and management than revegetation; conversion of cropland to annual grassland requires more effort than revegetation of graded grassland habitat.

Where PV array installation does not involve soil disturbance in grassland habitats, restoration or revegetation is not planned. PV module installation is a low-impact activity that is not expected to significantly disturb the soil. During extreme wet conditions, soil disturbance will be minimized with selected work areas avoided. When module installation disturbs the soil in grassland habitats, revegetation is planned.

This Habitat Restoration and Revegetation Plan addresses management of the TSF Project fenced areas and Stewardship Lands between and adjacent to the fenced areas. Approximately 1400 acres of land owned by Topaz Solar Farms, LLC that is composed of interstitial areas between fenced array areas of the Project is called Stewardship Land. For operational and regulatory reasons, these land areas will not be the subject of a conservation easement and are not part of the 12,139 acre land mitigation package that has been proposed to the County and wildlife agencies. Stewardship Lands will not be managed according to the Habitat Mitigation and Monitoring Plan (prepared for the Mitigation Lands), but will be restored by Topaz according to the approved Habitat Restoration and Revegetation Plan and maintained according to the approved Vegetation Management Plan (see Althouse and Meade, Inc. 2011b). Figure 1 illustrates the Project footprint and Stewardship Land. A separate Habitat Mitigation and Monitoring Plan prescribes management strategies for mitigation lands (Althouse and Meade, Inc. 2011a).

## 1.1 Purpose of the Habitat Restoration and Revegetation Plan

The purpose of this Habitat Restoration and Revegetation Plan (HRRP) is to fulfill the

conditions of approval listed in the County of San Luis Obispo Conditional Use Permit DRC2008-00009 for the Topaz Solar Farm Project. Conditions of Approval met by this plan are summarized below in Section 1.2. These measures require that Topaz Solar Farms, LLC restore temporarily disturbed annual grassland areas to pre-construction conditions or better. This HRRP guides revegetation of graded grassland habitat as well as restoration of agricultural croplands to California annual grassland habitat within proposed fenced areas and adjacent Stewardship Lands.

### 1.2 Summary of Conditions of Approval Met by this Plan

***Condition 38. MM AQ-1.3: Reduce Fugitive Dust*:**

- Permanent dust control measures (revegetation) shall be implemented as soon as possible following completion of any soil disturbing activities

***Condition 44. MM BR-1.3. Develop a Habitat Restoration and Revegetation Plan*:**

- Restore temporarily disturbed areas to pre-construction conditions or better.
- Identify restoration process to return disturbed annual grassland habitat to pre-construction conditions.
- This plan includes:
    - Topsoil stockpile and restoration
    - Species proposed for restoration and revegetation
    - Seed source and collection guidelines
    - Planting methodology
    - Invasive non-native vegetation control (see also Vegetation Management Plan)
    - Monitoring Program
    - Success Criteria
    - Reporting Requirements
- Prepare a Final Closure Plan for restoration and revegetation following decommission of the Project.

## 2.0 Baseline Information for the Restoration Sites

### 2.1 Environmental Setting

The TSF Project and Stewardship Lands are generally characterized by treeless level terrain and low rolling hills and plains with ephemeral swales. Some moderately steeper slopes occur in the north and northeast. The Project footprint and Stewardship Lands are currently used for agricultural production of grain and as rangeland for cattle. Farming practices consist of a rotational program where fields are farmed for one year then plowed bare for a year to conserve soil moisture. At any one time some of the land is plowed bare, some is planted to grain, and some is left fallow. Areas that are left un-tilled for several years or more support naturally recruited annual grasslands. The

primary crops are barley and oats. These grains are dry-farmed crops sown in the fall or winter and harvested for grain or used as cattle feed. Broad-leaf herbicides are sprayed on the crops by aerial crop duster or ground spray rigs to control non-crop plants.

Fields that are plowed in the summer or fall and left unplanted through the following spring and summer tend to grow agrestal weeds. Some of these plants are native to the area, but most are naturalized (non-native, naturally recruiting) annual herbs and grasses. Early in the spring, vegetation is short, which allows establishment of ground squirrel den complexes and easy foraging by predators and grazing ungulates. If rainfall totals are average or above, as was the case in the winters of 2007-2008 and 2009-2010, and 2010-2011, fields left fallow more than one season become densely vegetated with annual grasses and forbs that can reach three feet in height. Tall, dense vegetation limits use of these areas by some wildlife. With less than average rainfall, as in the winter of 2008-2009, vegetation in fallow fields and annual grasslands is typically less than two feet in height. In normal and above-average rainfall years, percent vegetative cover is typically 60 to 80 percent, while in drier years it can be as low as 30 percent.

Croplands are plowed at least once each year. Following the first fall rains after harvest, cropland is plowed to reduce weed growth and allow the soil to absorb rainfall. In the spring, cropland is plowed again to reduce weeds. During the second fall season, croplands are plowed and prepared for seeding, depending on timing of rain. If there is insufficient or excessive fall rain , cropland may require plowing again before seeding.

From mid spring into summer, plowed ground typically hosts an abundant growth of bindweed (*Convolvulus arvensis*), an introduced perennial herb with a deep persistent taproot that sprouts green leafy growth year after year. Bindweed provides summer forage for pronghorn (*Antelocapra americana*) and tule elk (*Cervus elephus nannodes*). Common reptiles, mammals, and birds may forage in plowed fields, but the lack of vegetated cover increases the likelihood of predation and reduces food supply.

Portions of the Project and Stewardship Lands were removed from farming rotation in the 1980s when landowners voluntarily entered land into the Conservation Reserve Program (CRP) and the Grassland Reserve Program (GRP). The CRP and GRP are federal programs administered by the U.S. Department of Agriculture Farm Service Agency, which provides landowners with annual rental payments, cost-sharing assistance, and technical assistance to remove land from annual tilling practices in order to minimize water run-off and sedimentation, and increase wildlife habitat value. CRP and GRP contracts are signed for periods of 10 to 15 years. The Natural Resources Conservation Service (NRCS) provides landowners with technical assistance regarding conservation planning and practice implementation.

Lands within the Project and Stewardship Lands that are in the CRP and GRP are managed as rangelands for cattle. Rangelands are described in this report as annual grasslands since species composition is similar to typical annual grassland habitats in the region. Annual grassland species associations within the Project and Stewardship Lands are variable with respect to dominant species due to different topography, soils, grazing regimes, and farming history.

Anthropogenic habitat within the Project and Stewardship Lands is associated with residential compounds and associated ranching and farming facilities. All existing roads

are dirt ranch roads, with the exception of gravel-based access roads from Highway 58 to Sections 4 and 27.

## 2.2 Existing Habitat Types that would be Affected by the Project

Figure 1 shows the current status of the lands within the Project and Stewardship Lands as cropland and California annual grassland. Habitat types on adjacent Mitigation Lands are also depicted, although these areas are not discussed in the HRRP. The Topaz Solar Farm is designed to have a fenced Project area of approximately 3,500 acres. The surrounding Stewardship Lands total an additional approximately 1,400 acres. California annual grassland and croplands would be affected by the Project. Ephemeral wetlands and natural non-wetland pools also occur on Stewardship Lands but are not proposed to be affected by the Project.

### *2.2.1 Cropland*

Land in varying stages of dry-farm production constitutes cropland habitat within the Project. The cropland habitat designation includes fields planted to grain and fields left bare during rotation. Farming on the parcels utilizes a summer fallow program. Summer fallow is the practice of idling farmland and removing weeds for up to 14 months to allow soil moisture to increase. Barley and oats are non-irrigated grain crops planted in alternate years. After being harvested for grain, the stubble is grazed by cattle. Herbicides are regularly used to control weeds in planted fields. Cropland habitat supports few native plant species, and is generally low quality wildlife habitat. In addition, the farming methods employed on active grain fields likely result in routine wildlife mortality. Within the Project footprint and adjacent Stewardship lands, existing cropland would be removed from production and converted to annual grassland beneath and between solar arrays.

### *2.2.2 California annual grassland*

Annual grassland habitat within the Project and Stewardship Lands consists of low-lying annual grasses and forbs in a dry environment where the dominant species die back in the summer. The grassland habitat is dominated by non-native and native annual grass species, with varying percentages of native and introduced forbs. This habitat type is ubiquitous throughout the state of California. Throughout its range, the California annual grassland habitat type takes on many forms, and the Project and Stewardship Lands likewise contain several forms depending upon the land use history. The CRP lands within the Project and Stewardship Lands have been untilled for at least 20 years and generally show significant recovery in terms of native forb diversity and abundance. Some areas of the Project and Stewardship Lands were removed from farming more recently, five years or less. These grasslands are predominantly composed of introduced annual grasses and support a lower diversity of native forbs and grasses.

Early season vegetation in all grasslands within the Project and Stewardship Lands is dominated by redstem filaree (*Erodium cicutarium*), an introduced species. CRP lands develop large areas of native annual fescue (*Vulpia microstachys*) with significant patches of introduced soft chess brome (*Bromus hordeaceus*) and introduced annual fescue (*Vulpia myuros*). In addition, native wildflowers such as tidy tips (*Layia*

*platyglossa*), annual lupine (*Lupinus bicolor*), Indian paintbrush (*Castilleja* spp.), and needle goldfields (*Lasthenia gracilis*) are common to abundant. Other native forbs common in the CRP grasslands are Douglas' silverpuffs (*Microseris douglasii*), Lindley's silverpuffs (*Uropappus lindleyi*), grassland silverpuffs (*Stebbinsoseris heterocarpa*), foothill deervetch (*Lotus humistratus*), and red maids (*Calandrinia ciliata*).

Untilled agricultural fields that have recently reverted to annual grasslands tend to be dominated by introduced annual grasses such as wild oats (*Avena fatua*), soft chess brome, introduced annual fescue, and foxtail barley (*Hordeum murinum*). Common and sometimes abundant native wildflowers include the native Great Valley phacelia (*Phacelia ciliata*) and several species of fiddleneck (*Amsinckia menziesii*, *A. lycopsoides*, and *A. tessellata*).

Within the Project footprint, approximately 835 acres of annual grassland would be temporarily disturbed and then restored within fenced areas. Within Stewardship Lands, approximately 20 acres of Project components (roads and utility lines) would affect grassland habitat.

### 2.3 Special Status Wildlife

One primary goal of the restoration and revegetation efforts at the TSF Project is to enhance the quality of existing habitats so the federally listed endangered San Joaquin kit fox can utilize the Project Site during its operation. We expect that, with habitat creation and enhancement and other wildlife-friendly facility designs, conditions suitable for a variety of small mammals will be present that will attract San Joaquin kit fox either as temporary foraging habitat or as permanent breeding habitat.

### 2.4 Special Status Plants

No federal or state listed plant species were detected in the Project and Stewardship Lands during the comprehensive botanical surveys conducted from 2008 through 2010. A few special status plants are known to occur as scattered individuals within the Project fenced area. The most significant occurrences of special status plants were avoided during the Project planning process. However, Project components, primarily PV arrays, will affect some areas that contain special status plants. We expect that habitat creation and enhancement onsite will facilitate natural establishment and expansion of special status plants within the TSF Project.

## 3.0 Goals of Restoration and Revegetation

The TSF Project primary long-term goal for restoration and revegetation is to create and enhance annual grasslands within the fenced Project areas. Stable grassland vegetation will support prey and habitat for keystone species such as San Joaquin kit fox.

The primary short-term goal for restoration and revegetation of existing croplands and other areas disturbed during construction is to maintain a vegetated ground surface that will provide critical minimization of fugitive dust and erosion, both of which would adversely affect sensitive biological resources. This short-term work will promote the

long-term objective of restoring these croplands to potential sensitive species habitat.

### 3.1 Restoration

The Applicant intends to restore existing cropland habitat within the TSF Project fenced areas to California annual grassland habitat similar in composition to surrounding annual grassland habitat. The primary goal of the restoration effort is to enhance the quality of onsite habitat for San Joaquin kit fox and other common and sensitive wildlife and plants. Stewardship Lands not directly disturbed during Project development will be allowed to naturally recover to annual grassland habitat over time without any mechanical actions or seed application.

### 3.2 Revegetation

The Applicant intends to revegetate California annual grassland habitat temporarily disturbed during construction of the TSF Project. The primary goal of the revegetation effort is to maintain California annual grassland habitat within the TSF Project so it would be suitable for use by San Joaquin kit fox and other common and sensitive wildlife and plants.

## 4.0 Restoration and Revegetation Methods

The plant palette for restoration can be selected from the list of species in Table 1. Exact proportions and species used will vary with seed availability in the year(s) in which seed is harvested and propagated for the Project. Irrigation will not be used in restoration or revegetation areas since the plant palette will be identical to natural vegetation on the site, which is adapted to low rainfall. Soil conservation measures will include topsoil salvage and replacement and appropriate erosion control measures, including measures to minimize wind erosion from graded areas. Temporary erosion control measures will be implemented according to the General Construction Stormwater Permit. Restored and revegetated grassland habitat will provide permanent erosion control and is predicted to have a lower runoff coefficient than existing cropland conditions (Craig Campbell, P.E., personal communication). Methods are detailed in the following sections.

### 4.1 Soil Conservation

Soil conservation will focus on preserving topsoil in grassland areas that require grading. The only Project phases that currently contain grassland for which soil conservation may be required are Phases 3 (less than 40 acres) and 4. A phasing map is included in Section 10. Some areas will be temporarily disturbed via "pocket grading", in which soil is moved around but not removed, for instance when filling a ground squirrel burrow or an erosion feature to provide a safe working surface. These areas do not require topsoil salvage. Other areas will be graded more extensively to provide a more uniform surface and appropriate slopes for array installation. Condition of Approval 44(a)(4) states: "… between 3 and 12 inches of topsoil shall be salvaged from where it must be temporarily removed."

### *4.1.1 Soil suitability*

Some areas of the Project must be disturbed temporarily as part of the Project installation process. Locations of temporary soil disturbance will be shown on grading plans prepared for each Project phase.

Topsoil baseline conditions in areas that will be temporarily graded and then restored will be evaluated by the Project Biologist. Existing vegetative cover, including presence of invasive weed species, would be evaluated to rank each area's suitability for soil salvage. If noxious weeds are present, the infested area would be excluded from salvage operations. If existing vegetation contains preferred species (listed in Table 1) that show adequate growth and reproduction relative to that rainfall year, it can be inferred that the soil contains few limitations to plant growth and requires no further testing. The site has been extensively surveyed and no evidence of soil conditions restrictive to plant growth was observed within the Topaz Project Site. Geotechnical work provided baseline information on soil texture, structure, and infiltration. Additional soil testing for areas to be graded is not indicated because fertilizers will not be used and physical properties have already been evaluated.

### *4.1.2 Topsoil salvage and stockpile for graded areas in grassland habitat*

Topsoil salvage is indicated when grading affects more than one acre (continuous disturbance) with a net elevation change of more than twelve inches within areas supporting native vegetation (grassland habitat). Locations shall be identified based on results of soil tests and weed checks from within disturbance sites identified on grading plans. At least three inches of topsoil will be salvaged from identified locations prior to grading activities by removing the prescribed depth of soil and moving it to a topsoil stockpile location.

Salvaged topsoil shall be stored separately from spoils for no longer than two years in approved onsite locations away from jurisdictional drainages and other sensitive biological resources. Topsoil stockpiles shall be identified clearly on grading plans for each construction phase, and flagged or posted with signs to avoid confusion with other spoils. Appropriate erosion control measures, including dust control measures, shall be implemented as prescribed in the dust control plan and Stormwater Pollution Prevention Plan (SWPPP). Chemical means of stabilizing soils shall NOT be applied to topsoil stockpiles.

### *4.1.3 Topsoil replacement for graded areas in grassland habitat*

After final contours are made, salvaged topsoil shall be spread over all cut and fill areas to provide a natural seed bank for post-construction revegetation. Within a few weeks following grading and prior to installation of panels, stockpiled soil shall be replaced over the graded area. Topsoil shall be replaced in an even layer over areas from which soil was salvaged.

Following topsoil replacement, sites shall be seeded and harrowed as described below in sections 3.3, 3.4, and 3.5. Surfaces of graded areas shall be left roughened to minimize risk of wind erosion without making the surface unsafe for workers accessing the site on foot. The method used to roughen the surface shall be selected dependent on safety needs

of workers on foot, time of year grading is performed, and antecedent moisture content of the soil, since moist soils are less susceptible to wind erosion than dry soils.

## 4.2 Seed Sources

### *4.2.1 Onsite Seed Harvest*

Native and naturalized seeds may be collected from existing onsite annual grasslands with high percent cover of native species and low percent cover weeds. The preferred method of seed collection will be to utilize a harvest regime similar to that for hay or seed. Prior to disturbance from construction activities, existing grassland will be mowed during late spring when native wildflowers and grasses have set seed, and left in windrows to dry. Mowed material may be threshed and transported to be bagged and stored in a dry place.

### *4.2.2 Propagated Seed*

Some native and naturalized seed may be collected on site and propagated by a qualified native plant propagator (such as S&S Seeds, Environmental Seed Producers, Central Valley Plant and Seed, or Hedgerow Farms). Table 1 lists some preferred species to be harvested and/or propagated from Carrizo Plain sources.

Additional grassland seed may be collected from stock within the TSF Study Area, or from within a 25 mile radius to maintain local genetic integrity.

Species composition for grassland revegetation and conversion of cropland to grassland (natural community with a high forb component) will depend on availability of species to be selected from the list in Table 1. Not all species are required to be used. Recommended application rates are provided by species in Table 2, allowing flexibility in design of seed mixes to allow for variation in species and quantity availability from year to year.

All native seed will originate from the Project region, within approximately 1,000 feet elevation of the Project and Stewardship Lands. The seed supplier chosen will provide a list of three references with the bid proposal. References will include year, contact names, and telephone numbers. Seeds will be tested for percent purity, percent germination, number of pure live seeds per pound, and weed seed content. Seed testing will be the responsibility of the seed supplier and will be certified free of invasive, exotic weeds.

TABLE 1. SPECIES FOR REVEGETATION AND RESTORATION SEED MIX. Seed selection should include abundant forbs.

| Type | Native or Naturalized | Scientific Name | Common Name |
|---|---|---|---|
| Forbs | Native | *Eschscholzia californica* | California poppy |
| | Native | *Lasthenia gracilis* | Goldfields |
| | Native | *Layia platyglossa* | Tidy tips |
| | Native | *Lupinus bicolor* | Miniature lupine |
| | Native | *Lupinus microcarpus* | Chick lupine |
| | Native | *Lupinus nanus* | Sky lupine |
| | Native | *Phacelia ciliata* | Great Valley phacelia |
| | Native | *Trifolium gracilentum var. gracilentum* | Pinpoint clover |
| | | | |
| Grasses | Naturalized | *Bromus hordeaceus* | Soft chess brome |
| | Native | *Nassella cernua* | Nodding needlegrass |
| | Native | *Poa secunda* | One-sided bluegrass |
| | Native | *Vulpia microstachys* | Annual fescue |
| | Naturalized | *Vulpia myuros* | Rattail fescue |

TABLE 2. GRASSLAND REVEGETATION AND RESTORATION SEEDING RATES. Seeding rate and number of seeds per pound of species to be used for grassland seed mixes.

| Scientific Name | Common Name | Estimated Pounds per acre | Number of Seeds per pound |
|---|---|---|---|
| *Eschscholzia californica* | California poppy | 0.5 | 300,000 |
| *Lasthenia gracilis* | Goldfields | 0.1 | 200,000 |
| *Layia platyglossa* | Tidy tips | 0.1 | 150,000 |
| *Lupinus bicolor* | Miniature lupine | 0.5 | 95,000 |
| *Lupinus microcarpus* | Chick lupine | 0.2 | 9,000 |
| *Lupinus nanus* | Sky lupine | 0.5 | 40,000 |
| *Phacelia ciliata* | Great Valley phacelia | 0.1 | 275,000 |
| *Trifolium gracilentum var. gracilentum* | Pinpoint clover | 0.5 | 350.000 |
| | | | |
| *Bromus hordeaceus* | Soft chess brome | 15 | 190,000 |
| *Nassella cernua* | Nodding needlegrass | 2 | 130,000 |
| *Poa secunda* | One-sided bluegrass | 1 | 600,000 |
| *Vulpia microstachys* | Annual fescue | 3 | 250,000 |
| *Vulpia myuros* | Rattail fescue | 2 | 750,000 |

## 4.3 Grassland Seed Planting Methods

### *4.3.1 Material Harvested Onsite*

If onsite seed stock is mechanically harvested and bagged, seed material with retained natural straw (e.g. grass and flower stems) may be spread using a straw blower or by hand broadcasting the seed/straw mixture. Application rate will be approximately one acre harvested to four acres restored or revegetated.

### *4.3.2 Seed from Propagated Sources*

Propagated seed may be broadcastseeded or drilled, as appropriate. Seeding can be conducted immediately following ground preparation and prior to installation of arrays. Specific methods for providing appropriate soil conditions and good seed-soil contact are described in Sections 4.5 and 4.6 below. Seeding rates will be estimated for each construction phase based on existing habitat conditions (grassland or cropland), area, and depth of disturbance. Rate will be calculated based purity and germination to produce at least one seedling per square inch of bare soil during winter.

## 4.4 Disturbed Annual Grassland Revegetation Methods

Habitat revegetation is required for all areas of the Project where construction activities temporarily disturb soil in California annual grassland habitat. Grassland vegetation is expected to recover during the following season from the existing seed bank, augmented with seeds collected on site. Revegetation of temporarily disturbed grasslands, such as in graded areas, staging areas, along roads, and structure demolition areas will consist of broadcasting seed material collected from the site. Seeding rate may be low in disturbed grassland areas compared to cropland areas, and may be one-fourth of the rate applied to croplands.

### *4.4.1 Temporarily disturbed grassland soil*

Where grassland soils are mechanically disturbed, such as where ground squirrel holes are removed, revegetation will occur within a few weeks of completion of soil disturbing construction activities in each particular grassland area. Revegetation steps include: harrow disturbed soil, broadcast native and naturalized seeds (refer to Sections 4.2 and 4.3 for seed procurement; Section 4.3 for planting), and roll to provide soil-seed contact. Revegetation may occur during or after site preparation within an area of development but before array installation. At a minimum, revegetation of disturbed areas must be performed prior to the next rainy season following disturbance.

### *4.4.2 Graded grassland areas*

Some annual grassland areas require cut and fill to be consistent with PV array installation requirements. All areas that require grading within existing annual grassland habitat will require topsoil salvage (see Section 3.1 above). Following topsoil replacement, graded areas shall be seeded, harrowed, and rolled with a sheep's foot or similar implement that leaves a walkable but roughened surface to reduce risk of wind erosion. Disturbed grassland may be seeded at the time of site preparation. Sparse areas can be overseeded again in the fall if plant density is less than one seedling per square

inch. Methods of overseeding that can accommodate presence of arrays include hand-broadcast, ATV-pulled seeder, and hydroseed with 500 lbs/acre mulch.

## 4.5 Cropland Conversion to Natural Community; Grassland Habitat Restoration Methods

Cropland habitat disturbed during Project installation will be restored to annual grassland habitat. Cropland will be graded where necessary, disked, harrowed, seeded, and rolled. Seed mixes will be created from the species list in Table 1 and seeding rates in Table 2, dependent on availability in the year in which restoration is performed. The optimal time to implement habitat restoration is when sufficient soil moisture is present to allow for seed bed preparation (cultivation). Alternatively, water used for dust control can also be used to moisten soil for seed bed preparation during the dry season. Several cropland conditions may be present when construction of the TSF Project commences include bare plowed ground (recently fallowed fields), active grain field (barley fields), and fallow field (last-year's plowed ground that has not been prepared for planting barley). Each cropland condition requires slightly different site preparation measures.

### *4.5.1 Bare plowed ground*

Bare plowed ground has generally been plowed to a depth of up to 24-inches and contains large clods of soil. After site-specific grading is completed, bare ground should be disked to reduce clod size, harrowed to prepare the seed bed, planted, and rolled to provide suitable seed-soil contact. Rolling may include use of a steel roller that leaves a roughened surface to inhibit wind erosion.

### *4.5.2 Active grain field*

Croplands that are planted to grain will be harvested as needed and the stubble may be grazed by sheep or cattle to reduce biomass. After site-specific grading is completed, active grain fields will be treated as described above for bare plowed ground.

### *4.5.3 Fallow agricultural field*

Fallow agricultural fields are likely to be heavily vegetated with weeds. These areas will have been grazed by sheep or cattle, specific areas will be graded as needed, and the fallow fields treated as described above for bare plowed ground. Pre-construction surveys for weeds such as Russian thistle and yellow starthistle are described in the Vegetation Management Plan for Topaz Solar Farm (Althouse and Meade, Inc. 2011).

## 4.6 Revegetation of trenches larger than 5 feet wide in grassland areas

Trenches larger than 5 feet wide will be backfilled with stockpiled topsoil where trenches occur in grasslands. Seeds will be sown via broadcast over the trenched area. Backfill can be rolled with a sheep's foot or similar steel roller to achieve good soil-seed contact and provide a roughened surface to reduce wind erosion.

# 5.0 Habitat Restoration and Revegetation Work Plan

Habitat restoration and revegetation work shall commence shortly after approval of all permits for the TSF Project. This work plan recognizes that onsite baseline vegetative conditions requiring restoration at the onset of Project construction will vary, with pre-project conditions consisting of bare plowed ground, active grain fields, fallow agricultural fields, and newly graded areas.

Restoration and revegetation shall be completed in three steps: (1) site preparation and seed distribution; (2) maintenance and monitoring; and (3) final clean-up and Project completion. Site preparation and seed distribution shall begin shortly after approval of all permits for the TSF Project. Maintenance and monitoring shall be conducted annually throughout the monitoring period until success criteria performance standards are met. Final clean-up and Project completion shall be implemented when the restoration areas satisfy the final performance standards. The work plan is shown below in sequence of steps, some of which can be performed concurrently such as seed collection and soil salvage.

## 5.1 Site Preparation and Seed Distribution

Each construction phase of the Project will generally occur in the following order of work as applicable, depending on if the Project phase is cropland or grassland.

- Perform seed collection.
- Perform soil testing and identify salvage locations.
- Salvage and stockpile at least three inches of topsoil.
- Perform grading.
- Replace topsoil and perform soil preparations as determined for the relevant habitat type (described above in Section 3).
- Sow seed, harrow, and roll or crimp to provide a roughened surface still stable enough for workers to access on foot.
- Install PV arrays.
- Excavate trenches, following stockpile method outlined in Section 3.1.4.
- Lay feeder and connector lines and backfill trenches.
- Sow seed over disturbed trench areas and compact to achieve good seed-soil contact.

## 5.2 Strategy for Monitoring Factors Related to Long-term Potential Changes in Vegetation.

Condition of Approval 65 addresses monitoring "indirect impacts to vegetation and wildlife from alteration to the solar and hydric regimes as a result of solar modules." The

strategy for monitoring indirect impacts to vegetation is included in the Vegetation Management Plan (a separate document).

### 5.3 Maintenance and Monitoring

As each construction phase of the Project is completed, perform the following maintenance and monitoring steps described in the Vegetation Management Plan for a minimum of five years, or until success criteria are met.

### 5.4 Final Closure Plan: Revegetation and Restoration

All structures and facilities shall be removed to a depth of three feet and replaced with topsoil as described in the Decommissioning and Recycling Plan (a separate document). PV array areas will require less restoration effort that parking lots, building sites, and roads. Piles, cables, and support structures in grassland habitat will be pulled or unearthed and removed from the site. Disturbed soil will be recontoured to eliminate mounds or unnatural terrain, and revegetated with native and naturalized grassland species common in the surrounding region. Select seed from Table 1, with a dominance of forb seeds.

Restoration in areas previously occupied by hardscape (e.g. roads, buildings, and parking lots) will require a series of restoration efforts, subject to updating based on current science. Soil will be ripped to a depth of at least two feet and disked. The top six inches will be mixed with two tons per acre of compost and seeded with an appropriate mix as described above for disturbed PV array areas. The seed mix should be applied at a rate sufficient to produce one seedling per square inch. Seeded areas will be harrowed or raked and lightly rolled (as with a ring-roller). Seeding should occur in the fall, prior to the rainy season (late October to mid November).

This plan should be refined within two years of proposed decommissioning, and should integrate up-to-date research and onsite experience.

TABLE 3. FINAL CLOSURE PLAN: REVEGETATION AND RESTORATION COSTS.

| Task | Cost per Acre |
|---|---|
| Rip, disk, and harrow parking lots, roads, and building sites to be abandoned, preferably right after first fall rains. | $1000 |
| Seed with species common in adjacent natural communities (in the fall). | $1000 |
| Immediately harrow seeded areas to cover seed with soil. | $100 |

# 6.0 Success Criteria and Performance Standards

The success criteria for TSF restoration and revegetation areas are to achieve percent total cover and species composition similar to or better than adjacent California annual grassland reference sites. Percent total cover is the percentage of the ground surface covered by vegetation. Stable annual grasslands at TSF currently range between 40 and 90 percent total cover. Common species include naturalized grasses such as bromes and wild oats or naturalized forbs such as filaree and field bindweed.

Quantitative success criteria for habitat restoration and revegetation are described fully in the Vegetation Management Plan because Success Criteria and Performance Standards are similar for short-term restoration and long term vegetation management. The difference is that monitoring for restoration and revegetation will cease after year five if success criteria have been met. Monitoring for vegetation management will continue for the life of the Project as described in Section 5 of the Vegetation Management Plan.

# 7.0 Monitoring Program

Monitoring of the restoration and revegetation areas will be conducted by the Project Biologist knowledgeable in the area of annual grassland habitat restoration and revegetation. Monitoring will be conducted for five years, following the completion of each phase, or until the performance standards for the primary success criteria have been met (refer to Section 6.0). Both qualitative and quantitative monitoring will be conducted.

Qualitative monitoring will be conducted on a monthly basis for the first year following restoration or revegetation implementation, and will be reduced to a quarterly schedule thereafter until final completion is approved by the County. Qualitative monitoring surveys will assess native plant species performance, including growth and survival, germination success, reproduction, plant fitness and health, as well as pest or invasive plant problems. The monitor shall record mammal and other wildlife use observed in the Project footprint and in Stewardship Lands, and note any needs for remedial work, invasive species control, and other concerns that need immediate redress. There are no success criteria or performance standards that need to be met for the qualitative monitoring reports. Qualitative monitoring will provide the County with a general assessment on the status of restoration and revegetation efforts.

Quantitative monitoring will be conducted annually during the first five years or until the performance standards are met. Quantitative monitoring surveys will utilize a one meter square quadrat sampling method to determine percent cover and species composition. During each quantitative monitoring effort, an onsite undisturbed California annual grassland habitat area will be used as a reference site against which the restoration and revegetation data are compared. Monitoring can occur at the same time that grazing monitoring is being conducted (see Vegetation Management Plan).

# 8.0 Reporting

Throughout the five year monitoring period for each phase, or until the success criteria have been met, the Project restoration biologist shall submit quarterly progress reports and an annual monitoring report to the County of San Luis Obispo. The Quarterly progress report will summarize monthly qualitative monitoring surveys in each fenced area and in Stewardship Land. Representative photographs at designated photo points as well as other informative perspectives will be included in the report to document site conditions. Information will include estimated native and non-native plant coverage and species diversity, noting overall health and vigor of the vegetation. Unusual drought or frost stress will also be noted. Problems such as weed species or erosion will be identified with remedial measures, as appropriate, to ensure compliance with specified performance criteria.

An annual monitoring report will be prepared each winter to summarize information regarding Project fenced areas and Stewardship Lands. The monitoring report will summarize results of spring and summer quadrat sampling, and will compare the results to the baseline condition and reference sites based on success criteria or performance standards. Use of the site by wildlife species will be listed by species, especially sensitive species such as San Joaquin kit fox, badgers, and nesting birds. Presence of and areas occupied by invasive weeds targeted for eradication or control will be documented with maps and tables. An overall assessment of each restoration site will be provided with remedial measures, as appropriate. The monitoring summary will include the name, title, and company of all persons monitoring the site, and their methods used to monitor the site. Photographs of restoration areas, reference sites, and other informative perspectives will be provided to document site conditions. The report will include an assessment of restoration success and a list of remedial actions or a plan for recommended adaptive management actions.

# 9.0 References

Althouse and Meade, Inc. 2010b. Final Biological Report for the Topaz Solar Farm, California Valley, San Luis Obispo County, California. July.

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California Department of Fish and Game. 2000. Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities. Revised May 8, 2000.

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San Luis Obispo County, Planning and Development Department. 2006b. Draft County of San Luis Obispo Guidelines For Revegetation/Restoration Plans. Revised June 20, 2006.

Hickman, James C. 1993. The Jepson Manual. University of California Press, Berkeley and Los Angeles, California.

United States Department of Agriculture, National Cooperative Soil Survey. 2003. Soil Survey of San Luis Obispo County, California, Carrizo Plain Area.

United States Fish and Wildlife Service. 1998. Recovery Plan for Upland Species of the San Joaquin Valley, California. Region 1, Portland, OR. Fed. Register Notice, U.S. Fish and Wildlife Service.

# 10.0 Figures, Sample Checklists, and Forms

## 10.1 Figures

- **Alternative 3b.1 Project Area**
- **Habitat Map and Phasing Boundaries**

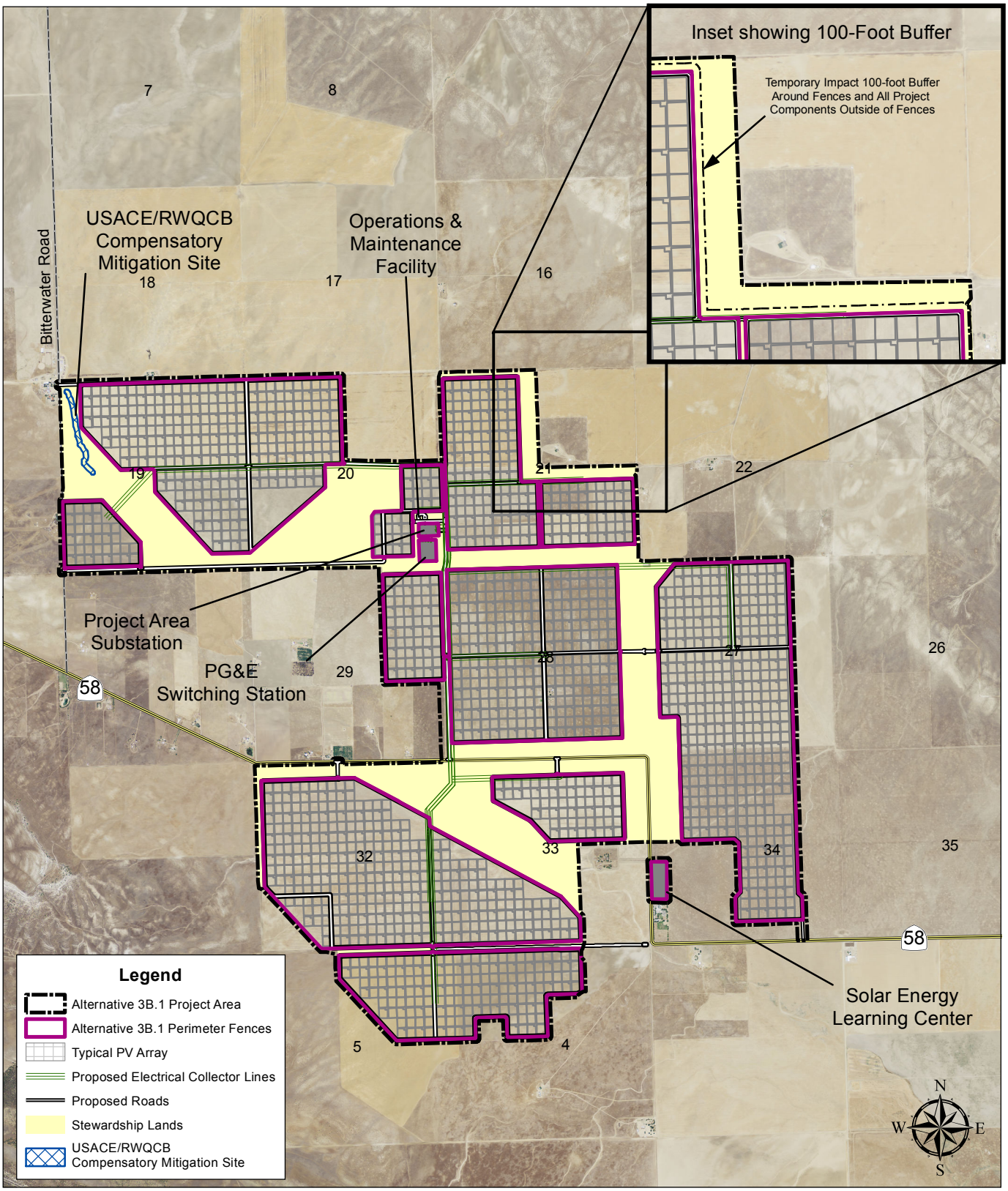
## 10.2 Quarterly Monitoring and Annual Report Checklists

## 10.3 Performance Standard Monitoring Checklist from Vegetation Management Plan

## 10.4 Sample Data Sheet from Avian Protection Plan

## 10.5 Sample Wildlife Log

# Alternative 3B.1 Project Area



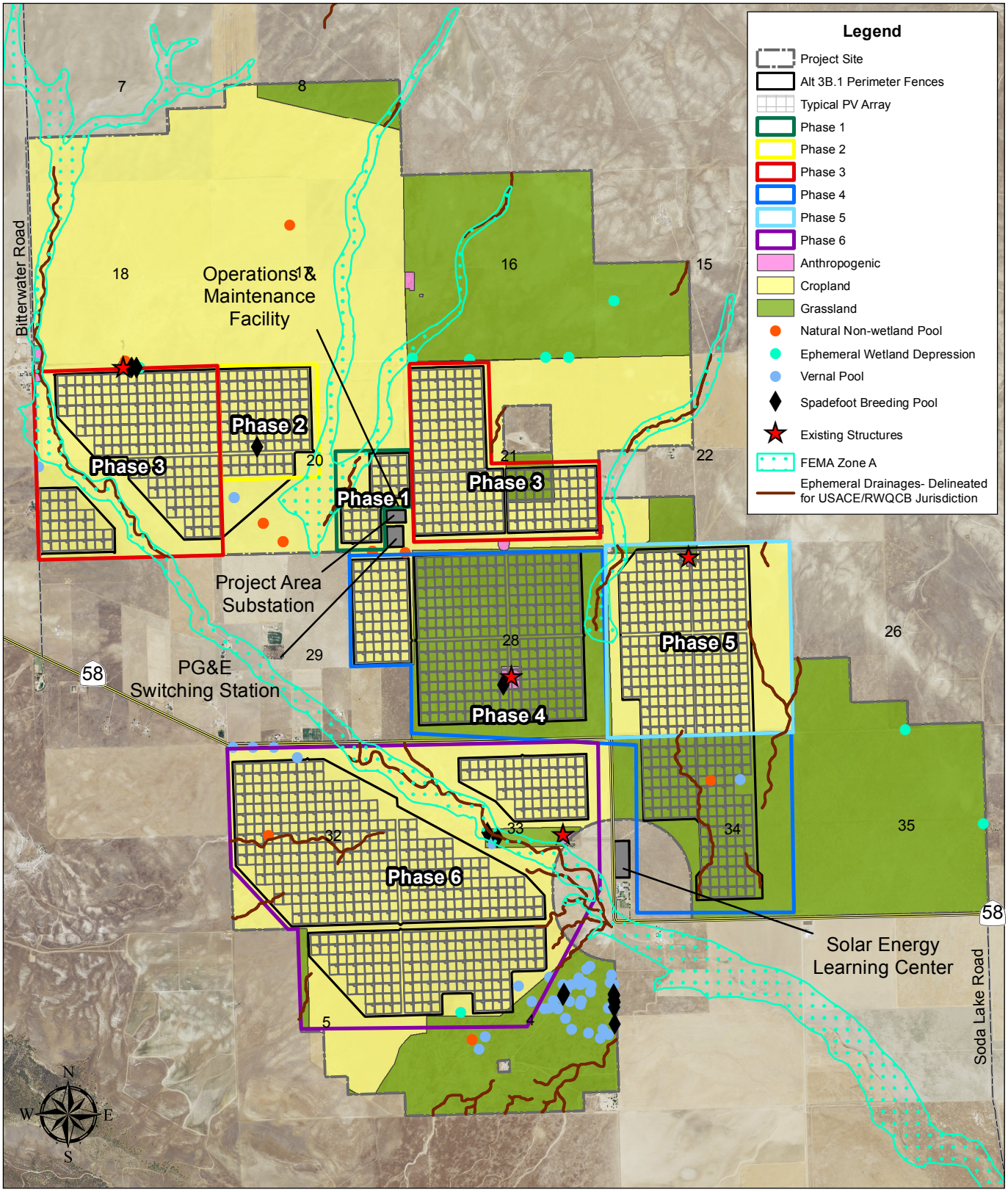


Topaz Solar Farms, LLC
1111 Broadway, 4th Floor
Oakland, CA 94607


2009 San Luis Obispo County
NAIP Aerial Photography
Map Updated: July 06, 2011


Althouse and Meade, Inc.
1602 Spring Street
Paso Robles, CA 93446

# Topaz Solar Farm
# Habitat Map with Phasing Boundaries





Topaz Solar Farms, LLC
1111 Broadway, 4th Floor
Oakland, CA 94607


2009 San Luis Obispo County
NAIP Aerial Photography
Map Updated: June 03, 2011


Althouse and Meade, Inc.
1602 Spring Street
Paso Robles, CA 93446

## 10.2 Quarterly Monitoring and Annual Report Checklists

## (Due 30th of March, June, September, December)

1. Quarterly progress reports
    a. results of monthly qualitative monitoring surveys in each fenced area and in Stewardship Land
        i. estimated species coverage and diversity
        ii. species health and overall vigor
        iii. establishment of native species
        iv. topographical/soils conditions
        v. problem weed species
        vi. significant drought stress
        vii. use of the site by wildlife observed during quarterly visits, and may be supplemented by documentation (e.g. photos and recorded observations) provided by onsite managers. Sample observation logs are provided in Section 10.5.
    b. remedial measures, as appropriate, to ensure compliance with specified performance criteria (punch list for site manager)

2. Annual monitoring to summarize information in each fenced area and in Stewardship Land due 30 December
    a. results of quadrat sampling in spring and summer
    b. compare results to the baseline condition and success criteria
    c. compliance/noncompliance with required performance standards
    d. use of the site by wildlife species
    e. presence of invasive weeds
    f. remedial measures, as appropriate (punch list for site manager)
    g. assessment of the success of each restoration site
    h. Reference information:
        i. Relevant maps of restoration areas, sample sites, and photo locations
        ii. Name, title, and company of all persons involved in restoration monitoring and report preparation
        iii. Site photographs
        iv. Methods used to perform the work
        v. Number of acres treated for removal of non-native plants
        vi. Assessment of treatment success

## 10.3 Performance Standard Monitoring Checklist (From Vegetation Management Plan)

**(During Spring and Summer Quarterly Sampling)**

| Performance Standard | Measurement | Observed Quantity | Details |
|---|---|---|---|
| Percent Bare Ground (exposed soil not covered by dead or live plant material) | Percent of quadrat | % | Soil conditions |
| Percent Organic Matter (e.g. dead plant material or feces) | Percent of quadrat | % | Type |
| Non-native, Naturalized Grass Cover | Percent absolute non-native plant cover | % | Species |
| Native Grass Cover | Percent absolute native grass cover | % | Species |
| Native Forb Cover (wildflowers) | Percent absolute wildflower and other native forb cover | % | Species |
| Non-native Forb Cover | Percent absolute non-native forb cover | % | Species |
| Total Live Vegetative Cover (permanent erosion control) | Percent absolute plant cover[1] | % | Ht, Vigor |
| | | | |
| Forage Production (Spring) | Pounds per acre | lbs/acre | high average, poor |
| Residual Dry Matter (Fall) | Pounds per acre | lbs/acre | high, average, poor |

## Sampling Data Form for Each Quadrat

Site Type (PV Array Under or Alley, Stewardship, Reference) _____ Site number _____

Date _____Section, Township, Range_____ Investigator(s)_____

| Scientific Name | Common Name | Absolute % Cover | Dominant Species? | Forb or Grass | Native or Non-native |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | Total Percent Live Cover | | | | |

_____ % Bare Ground _____ %Dead Organic Matter

| Remarks |
|---|
| |

[1] Absolute plant cover may total over 100% if tall plants overlap shorter plants.

## 10.4 Sample Data Sheet from Avian Protection Plan

Datasheet 4. Sample Avian Reporting System Datasheet

Dead Bird/Nest Form

Operations Area:_____

_____

| Dead Bird (circle one) | or | Nest (circle one) |
|---|---|---|
| Crow / magpie / raven | | Active |
| Hawk / falcon / osprey | | Inactive |
| Small bird (protected) | | |
| Eagle | | |
| Owl | | |
| Waterfowl | | |
| Unknown species | | |

Bird Count:_____

Date Found:_____ Time Found:_____

Sign of Death (circle one)

Collision Electrocution Unknown Other:_____

County:_____

Finder's Name:_____

Finder's Phone:_____

Line Name/Circuit #/Array ID #:_____

Pole ID #:_____

Recommended Action (circle one or more)

| *Dead Bird Actions* | *Nest Actions* |
|---|---|
| Cover transformer equipment | Initiate buffer area |
| Install Insulator covers | Install nest platform |
| Install perch deterrent (triangle) | Relocate nest |
| Reframe structure | Install nest discourager |
| Replace structure | Remove nest |
| Remove pole | Seek expert advice |
| Install bird flight diverters | No action |
| De-energize | |
| No action (Justification required) | |

Comments:_____

## 10.5 Sample Wildlife Log

(To be kept in O&M Building for Workers and Managers to Document Observations)

| Date | Time | Observer | Location | Species | Wildlife Observation Notes<br>Number of animals, behavior, unique characteristic (you may write on more than one line) |
|---|---|---|---|---|---|
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Deliver log and digital photos (if available) to Project Biologist who makes monthly or quarterly site visits.

# Appendix A. County of San Luis Obispo Conditions of Approval for Conditional Use Permit DRC2008-00009

- **Condition 38: MM AQ-1.3. Reduce Fugitive Dust**
- **Condition 44: MM BR-1.3. Develop a Habitat Restoration and Revegetation Plan**
- **Condition 65. MM BR-16.3 - Prepare a Habitat Mitigation and Monitoring Plan.**

## CUP Condition 38. Reduce Fugitive Dust.

**MM AQ-1.3 - Reduce Fugitive Dust. Prior to issuance of construction permits and during construction/ground disturbing activities and decommissioning**, the Proposed Project shall implement the following measures to minimize nuisance impacts and to significantly reduce fugitive dust emissions:

a. The amount of disturbed area shall be reduced where possible;

b. Water trucks or sprinkler systems shall be used in quantities sufficient to prevent airborne dust from leaving the site. Watering frequency shall be increased whenever wind speeds exceed 15 mph. Reclaimed (non-potable) water shall be used whenever possible;

c. All dirt stockpile areas shall be sprayed daily for dust suppression as needed;

d. Permanent dust control measures identified in the approved project revegetation and landscape plans shall be implemented as soon as possible following completion of any soil disturbing activities;

e. Exposed ground areas that are planned to be reworked at dates more than one month after initial grading shall be sown with a fast germinating, non-invasive grass seed and watered until vegetation is established;

f. All disturbed soil areas not subject to revegetation shall be stabilized using approved chemical soil binders (identified in Section 4.3 of the APCD's CEQA Air Quality Handbook), jute netting, or other methods approved in advance by the APCD;

g. Paving for those roadways, driveways, sidewalks, etc., planned to be paved shall be completed as soon as possible. In addition, building pads shall be laid as soon as possible after grading unless seeding or soil binders are used;

h. Vehicle speed for all construction vehicles shall not exceed 15 mph on any unpaved (i.e., without asphalt) surface at the construction site;

i. All trucks hauling dirt, sand, soil, or other loose materials shall be covered or shall maintain at least 2 feet of freeboard (minimum vertical distance between top of load and top of trailer) in accordance with CVC Section 23114;

j. Wheel washers shall be installed where vehicles enter or exit unpaved roads from or onto streets, or trucks and equipment leaving the site shall be washed;

k. Streets shall be swept at the end of each day if visible soil material is carried onto adjacent public paved roads. Water sweepers with reclaimed water shall be used where feasible;

l. All of these fugitive dust mitigation measures shall be shown on grading and building plans; and

m. The contractor or builder shall designate a person or persons to monitor the fugitive dust emissions and enhance the implementation of the measures as necessary to minimize dust complaints, reduce visible emissions below 20 percent opacity, and prevent transport of dust offsite. Their duty hours shall include holidays and weekend periods when work may not be in progress. The names and telephone numbers of such persons shall be provided to the APCD Compliance Division **prior to the start of any grading, earthwork or demolition**.

In addition, the Applicant shall consult with the County Health Department to develop a Dust Management Plan that addresses management of dust to reduce the potential for

exposure to Valley Fever. **Prior to issuance of permits**, the Applicant shall submit the Plan to the County Health Department for review and approval. The Plan shall include a program to evaluate the potential for exposure to Valley Fever from construction activities, and to identify appropriate dust management and safety procedures that shall be implemented, as needed, to minimize personnel and public exposure to potential Valley Fever–containing dust. Measures in the Plan, which shall be implemented as applicable, may include the following:

n. Provide HEP-filtered air-conditioned enclosed cabs on heavy equipment. Train workers on proper use of cabs, such as turning on air conditioning prior to using the equipment.

o. Provide communication methods, such as two-way radios, for use in enclosed cabs.

p. Provide National Institute for Occupational Safety and Health (NIOSH)-approved respirators for workers.

q. Require half-face respirators equipped with N-100 or P-100 filters to be used during digging. Require employees to wear respirators when working near earth-moving machinery.

r. Cause employees to be medically evaluated, fit-tested, and properly trained on the use of the respirators, and implement a full respiratory protection program in accordance with the applicable Cal/OSHA Respiratory Protection Standard (8 CCR 5144).

s. Provide separate, clean eating areas with hand-washing facilities.

t. Thoroughly clean equipment, vehicles, and other items before they are moved offsite to other work locations.

u. Train workers to recognize the symptoms of Valley Fever, and to promptly report suspected symptoms of work-related Valley Fever to a supervisor.

v. Work with a medical professional to develop a protocol to medically evaluate employees who develop symptoms of Valley Fever.

w. Work with a medical professional, in consultation with the County Health Department, to develop an educational handout for onsite workers and surrounding residents within three miles of the Project Site, and include the following information on Valley Fever: what are the potential sources/ causes, what are the common symptoms, what are the options or remedies available should someone be experiencing these symptoms, and where testing for exposure is available. **Prior to construction permit issuance**, this handout shall have been created by the Applicant and reviewed by the County. **No less than 30 days prior to any work commencing**, this handout shall be mailed to all existing residences within three miles of the project boundaries.

**Prior to the Notice to Proceed** for decommissioning, the applicant will follow the above process for all decommissioning work.

## CUP Condition 44. Develop a Habitat Restoration and Revegetation Plan

**MM BR-1.3 - Develop a Habitat Restoration and Revegetation Plan.** The Applicant shall restore disturbed areas to pre-construction conditions or better. **Prior to the issuance of a construction permit** and removal of any vegetation and/or wetland habitat, the Applicant shall retain a County-approved biologist(s), knowledgeable in the area(s) of annual grassland and wetland habitat restoration, to prepare a Habitat Restoration and Revegetation Plan (HRRP).

Additionally, the Applicant shall retain an experienced pronghorn range manager, approved by the County, to assist the County qualified biologist in the preparation of this plan. The Applicant shall submit the HRRP to the County Planning and Building Department for approval (in consultation with CDFG and USFWS). This biologist will also be responsible for monitoring the implementation of the plan as well as the progress on achieving the established success criteria.

The purpose of the HRRP will be to explicitly identify the process by which all disturbed areas occupied by annual grassland habitat shall be restored to pre-construction conditions. The plan will address restoration and revegetation related to disturbance from construction. It will also address restoration and revegetation required after decommissioning of the project should this be required. The plan shall include, at a minimum, the following items:

a. **Soil restoration plan.** A soil baseline study shall be conducted before ground-disturbing activities at the Project Site. The County may determine that the geotechnical survey conducted for the EIR would satisfy this requirement.

   Where top soil removal will occur, the Plan shall include locations and details for top soil salvage and storage and shall identify areas within the construction footprint where topsoil:

   i. is present;

   ii. supports native vegetation;

   iii. and can be salvaged and stockpiled for replacement onto the site during revegetation activities.

   Top soil on the Project Site shall be characterized based on (1) depth to impervious layer; (2) soil nutrient levels and chemistry; (3) soil texture and organic matter; and (4) water-holding capacity and permeability.

   Areas of the project dominated by soils with a high sand component generally have little or no soil development (i.e., seed banks, microorganisms, or nutrient storage) and would contribute little to the revegetation effort. These sandy soils will not be salvaged for revegetation. Topsoil that is wholly dominated by invasive non-native species, such as Russian thistle or other noxious plant species, shall not be used in revegetation because the non-native seed bank would outweigh any benefit for revegetation the soil may have. Areas characterized as California annual grassland or wetland habitat will require topsoil salvage.

   Where top soil removal occurs on the Project Site, the soil restoration plan shall require, at a minimum:

   iv. Between 3 and 12 inches of topsoil shall be salvaged from where it must be temporarily removed.

   v. Topsoil shall not be mixed or stored with spoil material. The length of time topsoil is stored shall not exceed two years.

   vi. For disturbed areas where topsoil was removed, redistribution shall begin immediately after re-grading, weather permitting, and depths shall vary between 3 and 12 inches depending on the depth of topsoil stripped.

   vii. Redistribution of stockpiled topsoil shall be completed **prior to final inspection**.

   viii. Replaced topsoil shall be left in a roughened condition where slopes and soil conditions dictate to discourage erosion. Additional erosion control and soil

stabilization may be required on steeper slopes, on topsoil susceptible to wind erosion, etc.

ix. If compaction, rutting, or crushing occurs prior to seeding, the replaced topsoil shall be worked with a harrow, disc, spring, tooth, chisel plow, or similar implement. Fertilization shall not be utilized unless recommended by a County-approved restoration ecologist and approved by the California Department of Fish and Game (CDFG).

x. Where electrical cables are buried, trenching shall occur in the proposed aisles between module rows, and trenched areas shall be refilled as cables are buried and topsoil shall be replaced.

xi. After closure and decommissioning: (1) All structures and facilities shall be removed to a depth of 3 feet; (2) The areas where structures and facilities are removed shall be restored and contoured to match site conditions, as appropriate; and (3) As appropriate, highly-disturbed soils shall be supplemented with certified weed-free mulch.

b. **Figures depicting areas proposed for temporary disturbance** – The HRRP shall include detailed figures indicating the locations and vegetation types of areas proposed for temporary disturbance. These figures shall be updated, as necessary, to reflect current site conditions should they change.

c. **Proposed species for restoration/revegetation** – The species palate proposed for restoration/revegetation shall include a combination of native and non-native, non-invasive, (based on current species composition in the restoration/revegetation areas) annual and perennial grasses and annual herbaceous species known to occur in the area. Due to the large non-native annual grass component currently present within most of project area (including wetland habitats) the intent of the Plan is to introduce as many native species as possible recognizing that the colonization of the site by non-native annual grasses is likely. In addition, on mitigation lands, enhanced lands and/or areas of disturbance slated for restoration for pronghorn antelope, a shrub component (not to exceed 30 percent cover) shall be included in the proposed restoration seed mix (i.e. Atriplex sp.), that will provide a food source for pronghorn for late season foraging.

d. **Seed source and collection guidelines** – Seeds shall first be collected from the stock of rare plants occurring on the Proposed Project Site, during the appropriate collection period (late spring through the summer, depending on the species) and prior to disturbance from construction activities. Additional seed may be collected from stock within the Carrizo Plain (for those rare plants occurring within the boundaries of the Proposed Project Site), or from within a 25 mile radius will be collected to maintain local genetic integrity. If seed collection from these areas is not possible then a seed source must be obtained from a local seed supplier familiar with native species. Seeds must be obtained from a local seed supplier familiar with native species. Seed will be limited to the species and quantity specified in the seed mix palette prepared for the project. As possible, all seed will originate from the project region, within +/- 1000 feet elevation of the Project Site. The seed supplier chosen will provide a list of three references with the bid proposal. The references will include year, contact names, and telephone numbers. Seeds will be tested for percent purity, percent germination, number of pure live seeds per pound, and weed seed content. Seed testing will be the responsibility of the seed supplier.

e. **Planting methodology** – A description of the preferred methods proposed for seeding shall be provided (e.g., hydroseeding, drill seeding, broadcast seeding, etc.). Additionally, a discussion on timing of seeding, type of irrigation system proposed, potential need of irrigation, type and duration of irrigation, and erosion controls proposed for revegetation activities shall be included.

f. **Invasive, non-native vegetation control** – A comprehensive Weed Control Plan will be developed for the project. The Weed Control Plan will serve to prevent the type conversion of natural habitats to those dominated by invasive species known to occur in the area such as Russian thistle.

g. **Monitoring program** – Areas subject to restoration/revegetation shall be monitored to assess conditions and to make recommendations for successful habitat establishment. Monitoring will be performed by a County-approved biologist(s), knowledgeable in the area of annual grassland habitat restoration. Monitoring should include, at a minimum, the following:

   i. **Qualitative monitoring** – Qualitative monitoring surveys will be performed monthly in all restored/revegetated areas for the first year following planting in any phase of the project. Qualitative monitoring will be on a quarterly schedule thereafter, until final completion approval of each restoration/area. Qualitative surveys will assess native plant species performance, including growth and survival, germination success, reproduction, plant fitness and health as well as pest or invasive plant problems. A County-approved wildlife biologist will assist in monitoring surveys and will actively search for mammal and other wildlife use.

      Monitoring at this stage will indicate need for remediation or maintenance work well in advance of final success/failure determination. The monitoring reports will describe site progress and conditions and list all observations pertinent to eventual success, and make recommendations as appropriate regarding remedial work, maintenance, etc.

   ii. **Quantitative monitoring** – Quantitative monitoring will occur annually for years one to five or until the success criteria are met.

      Within each revegetation area the biologist will collect data in a representative series of one square meter quadrats, as specified in the monitoring plan, to estimate cover and density of each plant species within the revegetated areas. Data will be used to measure native species growth performance, to estimate native and non-native species coverage, seed mix germination, native species recruitment and reproduction, and species diversity. Additionally, within wetland habitat restoration areas, the biologist shall conduct sampling events to document the presence of hydric soil characteristics/indicators (if present). Based on these results, the biologist will make recommendations for maintenance or remedial work on the site and for adjustments to the approved seed mix.

h. **Success criteria** – Criteria for successful restoration/revegetation of temporarily disturbed areas shall be as follows:

   i. **California annual grassland habitat –** Restored annual grassland habitat shall exhibit 75% vegetative cover to account for natural processes such as burrowing animals including San Joaquin kit fox and other species that preclude or limit the establishment of vegetation. This percentage shall include no more than a 10% non-native component, with the exception of red-stemmed filaree and

intentionally/or naturally seeded non-native grasses that occurred in the area **prior to site disturbance**.

ii. **Wetland habitat –** Restored wetland habitat shall demonstrate 75% vegetative cover over a 5- to 10-year period. This percentage shall include no more than a 10% non-native component, with the exception of red-stemmed filaree and intentionally/or naturally seeded non-native grasses that occurred in the area **prior to site disturbance**. The restored habitat shall exhibit the same functional values (retains the same ecological function) and display the same hydric soil characteristics/indicators (i.e. redoximorphic features, buried organic matter, organic streaking, reduced soil conditions, gleyed or low-chroma soils, or sulfidic odor) or show a trend toward meeting these conditions, as found **prior to disturbance**.

i. **Reporting** – Reporting will include progress reports summarizing site status and recommended remedial measures that will be submitted by the biologist to the County quarterly until successfully reestablished, with the exception of the site visits immediately preceding the development of each annual status report (see below). Each progress report will list estimated species coverage and diversity, species health and overall vigor, the establishment of volunteer native species, topographical/soils conditions, problem weed species, the use of the site by wildlife species, significant drought stress, and any recommended remedial measures deemed necessary to ensure compliance with specified performance criteria.

One annual site status report that summarizes site conditions will be forwarded by the biologist to the County, the U.S. Fish and Wildlife Service (USFWS) and the CDFG at the end of each year following implementation of this plan until the established success criteria have been met. Each annual report will list species coverage and diversity measured during yearly quantitative surveys, compliance/non-compliance with required performance standards, species health and overall vigor, the establishment of volunteer native species, hydrological and topographical conditions, the use of the site by wildlife species, and the presence of invasive weed species. In the event of substantial non-compliance with the required performance criteria, the reports will include remedial measures deemed necessary to optimize the potential for future compliance with specified performance criteria, or adaptive management recommendations to address each of the performance criteria. Each annual report will include, at the minimum:

i. The name, title, and company of all persons involved in restoration monitoring and report preparation

ii. Maps or aerials showing restoration areas, transect locations, and photo documentation locations

iii. An explanation of the methods used to perform the work, including the number of acres treated for removal of non-native plants

iv. An assessment of the treatment success

j. **Final Closure Plan** (Decommissioning) – The HRRP shall also include a Final Closure Plan, which shall address the final infrastructure removal, restoration, and revegetation activities upon closure and decommissioning of the project. The primary intent of the Closure Plan will be to restore the Project Site back to its previous natural/grazing land condition, which shall include the removal of project elements as further described in the above subsection (a)(xi) of this Condition. The Final Closure Plan shall include a cost estimate, adjusted for inflation, reflecting the costs of restoration, revegetation, and

monitoring for the duration of time expected to fully restore impacted soil and vegetation communities impacted by the project. At least one year **prior to planned closure and decommissioning** the Applicant shall submit to the County an updated Final Closure Plan for review to determine if revisions are needed. The Applicant shall incorporate all required revisions and re-submit the Final Closure Plan to the County 90 days **prior to the start of ground-disturbing activities** associated with closure and decommissioning activities.

### CUP Condition 65. MM BR-16.3 - Prepare a Habitat Mitigation and Monitoring Plan.

To ensure the success of onsite preserved land and acquired mitigation lands, required for compensation of permanent impacts to vegetative communities and listed or special-status plants and wildlife, the Applicant shall retain a County-approved biologist to prepare a Habitat Mitigation and Monitoring Plan (HMMP). The HMMP will be submitted to the County of San Luis Obispo for review and approval **prior to the issuance of a construction permit**. **Prior to the final County inspection** final impact acreages must be presented to the County and acquisition of off-site lands must be verified. The HMMP will include, at a minimum, the following information:

…

g. Development of a strategy for the monitoring of indirect impacts to vegetation and wildlife from alteration to the solar and hydric regimes as a result of solar modules.

…

# Appendix B. HRRP Action Items

| Permit | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section |
|---|---|---|---|---|---|---|
| **Prior to Issuance of Construction Permits** | | | | | | |
| CUP | 44.MM BR-1.3.1 | Habitat Restoration & Revegetation Plan (HRRP) | Develop Habitat Restoration & Revegetation Plan (HRRP) including Final Closure Plan | Prior to Issuance of Permits | Project Biologist | 1.1, 5.4 |
| **Prior to Start of Work** | | | | | | |
| CUP | 44.MM BR1.3.2 | Habitat Restoration & Revegetation Plan (HRRP) | Identify sites for Topsoil Salvage (requires weed survey) | Prior to Site Disturbance | Project Biologist; Wallace Group | 4.1 |
| CUP | 44.MM BR1.3.3 | Habitat Restoration & Revegetation Plan (HRRP) | Collect seed and/or order seed from supplier(s) | Prior to new site disturbance or mobilization | Project Biologist; First Solar | 4.2 |
| **During Construction** | | | | | | |
| CUP | 38.MM AQ-1.3.1 | Fugitive Dust Reduction Measures | Implement & incorporate fugitive dust reduction measures – stabilize topsoil salvage stockpiles | During Construction, | First Solar EPC | 1.1 |
| CUP | 38.MM AQ-1.3.2 | Fugitive Dust Reduction Measures | Implement & incorporate fugitive dust reduction measures –install seed on finished grade surfaces as soon as possible | During Construction, prior to panel installation | First Solar EPC | 1.1 |
| CUP | 43.MM BR-1.2.4 | Implement Biological Resource BMP's as Standard Procedure | Implement BMP Program on site | During Construction; Prior to New site disturbance or mobilizations. | First Solar EPC | 1.1 |
| CUP | 44. MM BR-1.3.4 | Habitat Restoration & Revegetation Plan (HRRP) | Salvage topsoil from locations identified by engineer and Project biologist | Prior to ground preparation activities in grassland habitats | First Solar EPC | 4.1 |
| CUP | 44. MM BR-1.3.5 | Habitat Restoration & Revegetation Plan (HRRP) | Spread salvaged topsoil on graded areas where they occur in grassland habitats | Immediately following grading, as applicable | First Solar EPC | 4.1 |

| Permit | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section |
|---|---|---|---|---|---|---|
| CUP | 44. MM BR-1.3.6 | Habitat Restoration & Revegetation Plan (HRRP) | Perform site preparation techniques as appropriate for the original habitat type (cropland, grassland, or bare tilled) | Immediately following grading and/or topsoil replacement as applicable, and prior to array installation | First Solar EPC | 4.5, 4.6 |
| CUP | 44. MM BR-1.3.7 | Habitat Restoration & Revegetation Plan (HRRP) | Apply seed mix as applicable, harrow, and roll | Immediately following site preparation, prior to array installation | First Solar EPC | 4.5, 4.6 |
| CUP | 44. MM BR-1.3.8 | Habitat Restoration & Revegetation Plan (HRRP) | Apply seed over trench disturbance areas where applicable | Immediately following backfilling of trenches | First Solar EPC | 4.7 |
| CUP | 44. MM BR-1.3.9 | Habitat Restoration & Revegetation Plan (HRRP) | Re-seed unsuccessful areas as needed in the restoration (grassland) habitats | As needed, the first year following revegetation efforts | First Solar EPC/ First Solar O&M | 4.5, 4.6 |
| **During Operation** | | | | | | |
| CUP | 44. MM BR-1.3.10 | Habitat Restoration & Revegetation Plan (HRRP) | Perform quarterly qualitative monitoring | Quarterly for the first year following revegetation implementation (may include first year of operations) | Project Biologist; First Solar O&M | 7.0 |
| CUP | 44. MM BR-1.3.11 | Habitat Restoration & Revegetation Plan (HRRP) | Perform annual quantitative monitoring of restored and revegetated areas | Annually for the first five years following Project construction | Project Biologist; First Solar O&M | 7.0 |
| CUP | 44. MM BR-1.3.12 | Habitat Restoration & Revegetation Plan (HRRP) | Prepare annual report documenting results of annual quantitative monitoring | Annually for the first five years following Project construction or until success criteria are met. | Project Biologist; First Solar O&M | 8.0 |
| **Decommissioning** | | | | | | |
| CUP | 44. MM BR-1.3.13 | Habitat Restoration & Revegetation Plan (HRRP) | Perform revegetation and restoration following removal of structures and arrays. | Decommissioning, after structures have been removed. | Project Biologist; First Solar O&M | 5.4 |

# DRAFT
# AVIAN AND BAT PROTECTION PLAN
# AND
# BIRD MONITORING AND AVOIDANCE PLAN

# Avian and Bat Protection Plan

**and**

# Bird Monitoring and Avoidance Plan

**for the**

## Topaz Solar Farm

San Luis Obispo County
California



Prepared for

**Topaz Solar Farms LLC**
1111 Broadway, 4th Floor
Oakland, California 94607

By

**ALTHOUSE AND MEADE, INC.**
**BIOLOGICAL AND ENVIRONMENTAL SERVICES**
1602 Spring Street
Paso Robles, California 93446
(805) 237-9626

**June 2011**

654.33

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# Executive Summary

The Topaz Solar Farm (TSF) Project will be constructed under County of San Luis Obispo Conditional Use Permit (CUP) DRC2008-00009. The CUP conditions of approval contain numerous requirements for avian protection and monitoring. This document addresses all of the applicable CUP requirements pertaining to birds and bats, as listed herein, and provides the U.S. Fish and Wildlife Service (USFWS) with a detailed plan that identifies and guides implementation of all reasonable, prudent and effective measures to avoid take of migratory birds and eagles, as regulated under the federal Endangered Species Act, the Migratory Bird Treaty Act, and the federal Bald and Golden Eagle Act. USFWS and Avian Power Line Interaction Committee (APLIC) guidance documents serve as the basis for the Avian and Bat Protection Plan (ABPP) and Bird Monitoring and Avoidance Plan (BMAP) included in this document.

## Avian and Bat Protection Plan Components

The Avian and Bat Protection Plan is an avian resource management tool intended to guide Project design, construction and operation such that avian and bat mortality at the TSF Project are minimized.

- **Project Design**: The ABPP identifies proven design standards from APLIC (2006) guidance, as well as from Topaz Solar Farms LLC's own design team. Some of the design standards will be implemented as part of original construction while others are provided as potential adaptive management techniques, if deemed necessary.
- **Minimization, Protection, and Enhancement Measures**: A suite of measures, including CUP conditions of approval and Applicant Proposed Measures are provided that when implemented would minimize Project conflicts with birds and bats, protect birds and bats from harm due to construction and operation of the Project, and enhance habitat in the TSF Project vicinity for birds and bats.
- **Avian Reporting System**: Details are provided for Topaz Solar Farm personnel to report avian mortality or injury identified at the facility.

## Bird Monitoring and Avoidance Plan Components

The Bird Monitoring and Avoidance Plan provides guidance for Topaz Solar Farms LLC regarding methods for avian use surveys and avian mortality surveys. The results of these surveys and subsequent analysis will be used by TSF facility managers to determine the need for Adaptive Management.

- **Avian Use Surveys**: Surveys will be conducted to collect data on bird use within the solar arrays, near or on overhead power lines, and at the substation/switching station.
- **Avian Fatality Surveys**: Surveys will be conducted to collect data on bird mortality associated with the Project components listed above under avian use surveys.

# 1.0 Introduction

The Topaz Solar Farm (TSF) project (Project, or TSF Project) would install arrays of photovoltaic (PV) modules, manufactured by First Solar, with the cumulative capacity to generate 550 megawatts of power at the point of delivery to PG&E, under peak solar conditions. The Project would have a fenced area of approximately 3,500 acres of land that would contain the solar facility components. PV modules would be mounted on steel support structures called tables. Tables would be attached at an angle to a bracket on vertical steel posts spaced approximately eight to ten feet center-to-center and driven into the ground to a depth of four to seven feet below grade. Once mounted, the front of each table would be approximately 1.5 feet (18 inches) above grade, while the rear would be approximately 5.5 feet (66 inches) above grade. The distance from the ground to the top of the PV module table may vary depending on the topography. The solar arrays have no moving parts for sunlight tracking and utilize no water during operation. Vehicular access to the facility would be from Bitterwater Road and Highway 58.

The TSF Project is currently undergoing California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) review. The County of San Luis Obispo (County) has prepared a Final Environmental Impact Report (FEIR) under CEQA (Aspen 2011) and the U.S. Department of Energy (DOE) has prepared a Draft Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) (EMPSI 2011). Each document specifies mitigation or protection measures designed to minimize the potential effects of the Project on avian resources (refer to Sections 1.3 and 1.4).

## 1.1 Project Components Overview

The Topaz Solar Farm Project is a photovoltaic solar facility that will utilize passive (non-moving) PV modules to collect sunlight. The resulting energy is transmitted through a power line collection system comprised of overhead and underground sections to an onsite substation and switching station. The PV modules will be constructed in blocks called arrays. The Project will have a total of 460 arrays, each of which is approximately 7.5 acres in size. Three Project components are specifically addressed in this document with respect to potential conflicts with birds and bats: Array Areas, Overhead Power Lines, and the Substation/Switching Station (refer to Project Components diagram in Section 7.0).

## 1.2 Guidance

This Avian and Bat Protection Plan and Bird Monitoring and Avoidance Plan is modeled on guidance published by the U.S. Fish and Wildlife Service (USFWS) in its *Region 8 Interim Guidelines for the Development of a Project Specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities* (USFWS 2010), and it follows the *Avian Protection Plan Guidelines* developed jointly by Edison Electric Institute's Avian Power Line Interaction Committee (APLIC) and the USFWS (APLIC 2005). In addition, this document utilizes methods, recommendations, and data provided in the APLIC (2006) document *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*, the APLIC (1994) document *Mitigating Bird*

*Collisions with Power Lines: The State of the Art in 1994*[1], and the USFWS (2011) document *USFWS Pacific Southwest Region Monitoring Migratory Bird Take at Solar Power Facilities: An Experimental Approach*.

## 1.3 Purpose of the Avian and Bat Protection Plan

The Avian and Bat Protection Plan (ABPP), included as Section 4.0 of this document, is an avian resource management tool prepared by Topaz Solar Farms LLC that has the singular goal of guiding Project design, construction and operation such that avian and bat mortality at the TSF Project are minimized through implementation of various avoidance and protection measures, including but not limited to implementing an environmental worker training program, permit compliance, construction design standards, nest management, and implementing an avian reporting system. Action items to be implemented prior to and during construction and operation of the Project are outlined for TSF personnel in Appendix C.

## 1.4 Purpose of the Bird Monitoring and Avoidance Plan

The Bird Monitoring and Avoidance Plan (BMAP) included as Sections 5.0 and 6.0 of this document, provides guidance for the Project regarding data collection methods for avian use surveys and avian mortality surveys, as well as a framework for analyses of Bird Utilization Rate and Bird Fatality Rate calculations, which will be used to derive a Bird Risk Index for various Project components (e.g. Overhead Power Lines, Array Areas, and Substation/Switching Station). The Bird Risk Index will inform TSF facility managers regarding the need for Adaptive Management.

Additionally, this BMAP will provide data to the U.S. Fish and Wildlife Service regarding avian mortality associated with large-scale PV solar projects that could inform USFWS review of future similar projects.

## 1.5 Applicable Regulations

The Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (Eagle Act), California Fish and Game Code, federal and California Endangered Species Acts (FESA, CESA), and CEQA provide the primary legal framework for this document.

The MBTA (16 U.S.C. §§ 703, *et seq*.) prohibits the taking, killing, possession, transportation and importation of migratory birds (as defined therein), their eggs, parts, and nests, except when authorized by the USFWS. FESA (16 U.S.C. §§ 1531-1599) protects endangered and threatened species and provides a means to conserve their ecosystems. The Eagle Act (16 U.S.C. §§ 668-668d) protects bald and golden eagles. Through a new regulation (50 CFR § 22.26), the USFWS can authorize take of bald and golden eagles when the take is associated with, but not the purpose of, an otherwise lawful activity, and cannot practicably be avoided. CESA (Fish and Game Code §§ 2050-2115.5) provides protections similar to FESA for California-listed endangered and threatened species. Fish and Game code sections 3503 and 3503.5 state that it is unlawful to take, possess, or destroy the nest or eggs of any bird or take, possess, or

[1] A revision of this 1994 document is due to be released in late 2011.

destroy birds of prey, and sections 3511, 4700, 5050, and 5515 classify and prohibit the take of "fully protected" birds, mammal, amphibian/reptile, and fish species in California. Fish and Game Code section 3513 prohibits any take or possession of birds that are designated by the MBTA as migratory non-game birds.

## 1.6 Corporate Policy

Topaz Solar Farms LLC has maintained and will continue to maintain a strong commitment to natural resource protection and preservation. Close coordination with local, state and federal agency personnel with regards to wildlife and other sensitive biological resources is a priority so that all parties understand the importance of renewable energy development balanced with environmental protection and preservation.

## 1.7 Effects Statement

The TSF Project has been designed, and will be constructed and operated, in a manner that avoids and reduces the potential for disturbance or take of eagles and other covered species to a level of insignificance. Additionally, the Project will have a very low risk to common bird and bat species through increased mortality from electrocution and/or collision with Project components. Avian fatality surveys will document bird deaths during the approximately three year construction period and for three years post-construction. The following list provides the supporting evidence for this conclusion, and references the location in the document where additional information is presented:

1. The Project Site and surrounding lands have been the subject of intensive field studies that have resulted in a large body of data regarding bird and bat occurrence in the area and use of the Project area that has enabled Project planners to make informed decisions regarding siting and design considerations in order to minimize impacts to wildlife, including birds and bats (Section 3.0);
2. Overhead collection lines are designed to be highly visible to avoid bird and bat collisions, and will be coated to prevent electrocutions (Section 4.3);
3. The First Solar PV modules that will be used for the Project have been deployed all over the world and are not expected to attract birds. The PV modules are designed to never be washed, and will only be cleaned by natural precipitation events. Soiling that is expected to accumulate on the PV panels' surfaces would minimize reflectivity and glare, and therefore the panels are not expected to confuse birds or cause collision with the modules (Section 4.7);
4. The Project is situated primarily on active farmlands (76% of fenced area) that provide the lowest quality bird and bat habitat in the area (Graphs 1 and 2 in Section 3.2.2, and Figure 1, Section 7.0);
5. Extensive minimization and protection measures for birds and bats will be implemented during construction and operation (Sections 4.2, 4.4, 4.5 and 4.6);
6. Potential golden eagle foraging habitat (grassland) accounts for only 24% of the Project lands. There are no golden eagle nests at or near the Project Site; the nearest nest is located approximately 8 miles northwest of the Project in the San Juan Creek watershed (Figure 3, Section 7.0).

- The Project is not likely to result in injury to eagles; will not substantially interfere with normal breeding, feeding or sheltering behavior that results in a decrease in eagle productivity; and will not substantially interfere with normal breeding, feeding or sheltering behavior that results in nest abandonment.

7. There are no bat roosts at the Project Site (Section 3.4);
8. Approximately 2,675 acres of onsite active croplands will restored to annual grassland habitat suitable for a variety of ground-nesting species once the Project is installed (Section 4.5);
9. Over 12,000 acres of offsite conservation lands will be protected and managed in perpetuity as San Joaquin kit fox habitat. Approximately 5,000 acres of this area are active croplands that will be restored to annual grasslands. This will significantly increase the quantity and quality of available habitat in the region for golden eagles and other sensitive bird species (Section 4.5 and Figure 4, Section 7.0).
10. Approximately 1,320 acres of onsite Stewardship Lands consisting of interstitial areas and movement corridors between fenced array areas of the Project will be enhanced and managed as grassland habitat for kit fox and other sensitive species (Section 4.5 and Figure 4, Section 7.0).

# 2.0 Permit Compliance

The U.S. Department of Energy (DOE), as the lead federal agency preparing the NEPA document for the TSF Project, formally initiated section 7 Endangered Species Act (ESA) consultation with the U.S. Fish and Wildlife Service (USFWS), and USFWS is preparing a Biological Opinion with associated incidental take statement for the Topaz Solar Farm Project. The U.S. Army Corps of Engineers is a cooperating agency for the NEPA process and is also relying upon and incorporating the results of the section 7 process into the conditions of its Section 404 permit. We do not expect take of federally-listed birds or bats will occur due to the Project, and therefore none will be covered by the FESA incidental take statement.

Topaz Solar Farms LLC is seeking authorization under Section 2081(b) of CESA via issuance of an incidental take permit for incidental take of state-listed species that are known or are expected to occur within the Project. We do not expect take of California-listed birds or bats will occur due to the Project, and therefore none will be covered by the CESA incidental take statement.

Topaz Solar Farms LLC will also implement all Project conditions of approval provided by the County of San Luis Obispo Conditional Use Permit DRC2008-00009.

The ABPP is a guidance document for the Project that provides information regarding compliance with APLIC (2006) guidelines, which is a requirement of Condition 61 (MM BR-13.1 - Implement Avian Power Line Interaction Committee [APLIC] guidelines) of

the County of San Luis Obispo conditions of approval for Conditional Use Permit (CUP) DRC2008-00009.

The BMAP is prepared in accordance with Condition 62 (MM BR-14.1 - Prepare and implement a Bird Monitoring and Avoidance Plan) of CUP DRC2008-00009.

In addition, this ABPP/BMAP document addresses Project compliance with the following CUP DRC2008-00009 conditions (refer to Appendix A for the full text of the CUP conditions):

- **Condition 50: MM BR-6.1** - Conduct pre-construction surveys for nesting and breeding birds and implementation of avoidance measures;
- **Condition 60: MM BR-11.1** - Monitor construction in condor habitat and remove trash and microtrash from the work area daily;
- **Condition 73: MM BR-22.1** - Complete focused pre-construction burrowing owl surveys and implement avoidance measures; and
- **Condition 76: MM BR-27.1** - Conduct pre-construction maternity colony or hibernaculum surveys for sensitive bats.

# 3.0 Project Site Bird and Bat Surveys

Topaz Solar Farms LLC conducted biological research and feasibility studies on various potential Project lands from March 2008 through July 2010. The study area (referred to herein as "Project Study Area") encompassed approximately 9,700 acres of land, within which the TSF Project layout was designed based on constraint data collected during the studies. Project bird and bat surveys were used in CEQA and NEPA review of the TSF Project. The data collection methodology for these surveys is different from the Avian Use Survey methodology that will be conducted as part of the Bird Monitoring and Avoidance Plan (refer to Section 5.0). However, the data provides useful information on bird use of grassland and cropland habitats in the vicinity of the approximately 3,500 acre TSF Project ("Project Site), and is presented here as background information.

## 3.1 Bird Survey Methods

Nesting, wintering, protocol and general bird surveys were conducted between March 2008 and July 2010 throughout an approximately 9,700 acre Project Study Area (Figure 1, Section 7.0). Winter bird surveys conducted November 2009 through January 2010 utilized a focused survey method in which surveyors walked representative habitat types, and also inspected homesteads, power lines, and fence lines.

Winter bird surveys conducted in February 2010 utilized a non-random transect survey method in which biologists covered parallel belts of land in north-south orientation across annual grasslands and croplands within the Project Study Area. Each transect belt was 800 feet wide and up to 5,280 feet long (one mile). Transect spacing was set at 660 feet (one-eighth mile) so that transects overlapped each other for greater than 100 percent visual cover. Each one mile long transect belt was covered in approximately 50 minutes, including three five-minute stationary observation points. Each transect was surveyed

twice between February 11 and February 25. Surveyors walked the center line of the transect belt, but could meander throughout the transect belt to make positive identifications of bird species. Surveyors tallied the number of each species observed during each transect, and the resulting data provided a count of species (species richness) per transect and a total bird abundance per transect.

Prior to initiating the surveys, tests were done in the field to determine a suitable transect width. Vegetation in most areas was less than four inches in height during the winter period. Therefore, by using binoculars horned larks and savannah sparrows (small ground-dwelling species) were identified at a distance of 400 feet.

To aid in the surveys, transect lines were overlaid on a high resolution aerial photograph for use in the field, and flagging was set out along fence lines to indicate the boundaries. Surveyors used 10 power binoculars, and carried a Garmin GPS to record coordinates for special status species observations. For burrowing owls, coordinates were taken for burrow sites showing signs of recent use (pellets, feathers, prey remains and urea).

Nesting bird surveys conducted in 2010 utilized a focused survey method in which surveyors targeted special status birds expected to nest within the Project Study Area. Burrowing owls are a sensitive nesting species at the site, and consequently a focused burrowing owl nesting survey was conducted on June 2 and 3, 2010. Surveyors searched for burrowing owls and visited all burrow sites previously observed in use by burrowing owls or that were documented as exhibiting burrowing owl sign during previous wildlife surveys. The condition of each burrow was noted, and locations of burrowing owls and new burrows were mapped. When burrowing owls were located, they were observed from a distance to determine their breeding status.

An aerial survey for golden eagle nests was conducted in 2010 by Senior Raptor Biologist, Brian Latta (Latta 2010). Methods of the survey conform to the newly published Interim Golden Eagle inventory and monitoring protocol (Pagel et al. 2010). In one location, the Beartrap Condor critical habitat area, aerial survey is not permitted and nest searches were conducted on foot. The golden eagle nest survey included coverage for both the proposed Topaz Solar Farm and the proposed California Valley Solar Ranch. The survey area included a ten mile radius area around both the project sites, totaling approximately 448,647 acres (Figure 3, Section 7.0).

## 3.2 Bird Survey Results

### *3.2.1 Bird list*

Table 1 provides a list of 82 bird species that could potentially occur on or near the Project Site. We provide this list as a guide to the bird species observed in the Project Study Area and to the species that could potentially be present at least seasonally. Other species could occur as transients or migrants. A total of 58 bird species were observed in the 9,700 acre Project Study Area, between March 2008 and July 2010 (Table 1). The list includes resident breeders like horned lark and raven, winter residents such as mountain plover, ferruginous hawk, and merlin, as well as migrants and uncommon transients such as Anna's hummingbird, black-throated grey warbler, bald eagle, and Western tanager.

TABLE 1. TOPAZ SOLAR FARM BIRD LIST.

| Common Name | Scientific Name | Special Status | Observed Within study area? | General Habitat Preference |
|---|---|---|---|---|
| **Birds – 83 species** | | | | |
| Cooper's Hawk | *Accipiter cooperii* | Special Animal[2] (Nesting) | ✓ (Migrant) | Oak, riparian woodland |
| Sharp-shinned Hawk | *Accipiter striatus* | Special Animal (Nesting) | ✓ (Migrant) | Oak, riparian woodland |
| White-throated Swift | *Aeronautes saxatilis* | None | | Nests in cliffs |
| Red-winged Blackbird | *Agelaius phoeniceus* | None | ✓ (Nesting) | Marshes, fields |
| Tricolored Blackbird | *Agelaius tricolor* | SSC[3] (Nesting Colony) | ✓ (Not nesting) | Marshes, fields |
| Grasshopper Sparrow | *Ammodramus savannarum* | SSC (Nesting) | ✓ (Nesting) | Grassland hillsides |
| American Pipit | *Anthus rubescens* | None | ✓ | Fields, beaches, etc. |
| Golden Eagle | *Aquila chrysaetos* | Fully Protected[4], (Nesting & Wintering) BGEPA | ✓ (Not nesting) | Open or mountainous areas |
| Great Egret | *Ardea alba* | SSC (Rookery Site) | | Water habitats, grasslands |
| Great Blue Heron | *Ardea herodias* | SSC (Rookery Site) | | Water habitats, grasslands |
| Short-eared Owl | *Asio flammeus* | SSC (Nesting) | | Swamp, lowland meadows |
| Long-eared Owl | *Asio otus* | SSC (Nesting) | | Riparian bottomlands with adjacent open lands |
| Burrowing Owl | *Athene cunicularia* | SSC (Burrow sites & some winter sites) | ✓ (Nesting and Wintering) | Grasslands with ground squirrel burrows |
| Great Horned Owl | *Bubo virginianus* | None | | Woodland, grassland |
| Red-tailed Hawk | *Buteo jamaicensis* | None | ✓ | Open, semi-open country |

[2] Special Animal refers to all of the animal taxa inventoried by the California Natural Diversity Database (CNDDB), regardless of their legal or protection status.

[3] SSC = California Department of Fish and Game designation for Species of Special Concern

[4] Fully Protected species may not be taken or possessed at any time and no provision of the CDFG code authorizes the issuance of permits or licenses to take any Fully Protected species.

| Common Name | Scientific Name | Special Status | Observed Within study area? | General Habitat Preference |
|---|---|---|---|---|
| Rough-legged Hawk | *Buteo lagopus* | None | | Variety of open habitats |
| Ferruginous Hawk | *Buteo regalis* | Special Animal (Wintering) | ✓ | Grasslands, open fields |
| Swainson's Hawk | *Buteo swainsoni* | ST[5] (Nesting) | ✓ (Migrant) | Grasslands or agricultural with trees, riparian |
| Anna's Hummingbird | *Calypte anna* | None | ✓ | Many habitats |
| Costa's Hummingbird | *Calypte costae* | SSC (Nesting) | ✓ (Migrant) | Desert riparian, scrub |
| Lesser Goldfinch | *Carduelis psaltria* | None | | Riparian, oak woodlands |
| American Goldfinch | *Carduelis tristis* | None | | Weedy fields, woodlands |
| Lawrence's Goldfinch | *Carduelis lawrencei* | Special Animal (Nesting) | ✓ | Oak woodlands, savanna |
| House Finch | *Carpodacus mexicanus* | None | ✓ | Riparian, grasslands, chaparral, and woodlands |
| Turkey Vulture | *Cathartes aura* | None | ✓ | Open country |
| Mountain Plover | *Charadrius montanus* | SSC (Wintering) | ✓ (Winter transient) | Winters in grasslands, agricultural fields |
| Killdeer | *Charadrius vociferous* | None | ✓ | Mud flats, stream banks |
| Lark Sparrow | *Chondestes grammacus* | Special Animal (Nesting) | ✓ | Woodland edges, grasslands |
| Northern Harrier | *Circus cyaneus* | SSC (Nesting) | ✓ (Wintering) | Nest on ground in tall reeds or grasses |
| Northern Flicker | *Colaptes auratus* | None | | Woodlands |
| Band-tailed Pigeon | *Columba fasciata* | None | | Woodlands, urban trees |
| Rock Dove | *Columba livia* | None | ✓ | Urban areas |
| American Crow | *Corvus brachyrhynchos* | None | ✓ | Many habitats, esp. urban |
| Common Raven | *Corvus corax* | None | ✓ | Riparian, chaparral and woodlands |
| Yellow-rumped Warbler | *Dendroica coronata* | None | ✓ | Woodlands, brush, open country |
| Black-throated Grey Warbler | *Dendroica nigrescens* | None | ✓ | Woodlands |
| White-tailed Kite | *Elanus leucurus* | Fully Protected | | Nests in dense live oaks |
| Horned Lark | *Eremophila alpestris* | None | ✓ | Grassland, oak savanna |
| Brewer's Blackbird | *Euphagus cyanocephalus* | None | ✓ | Open habitats |

[5] ST = State listed Threatened

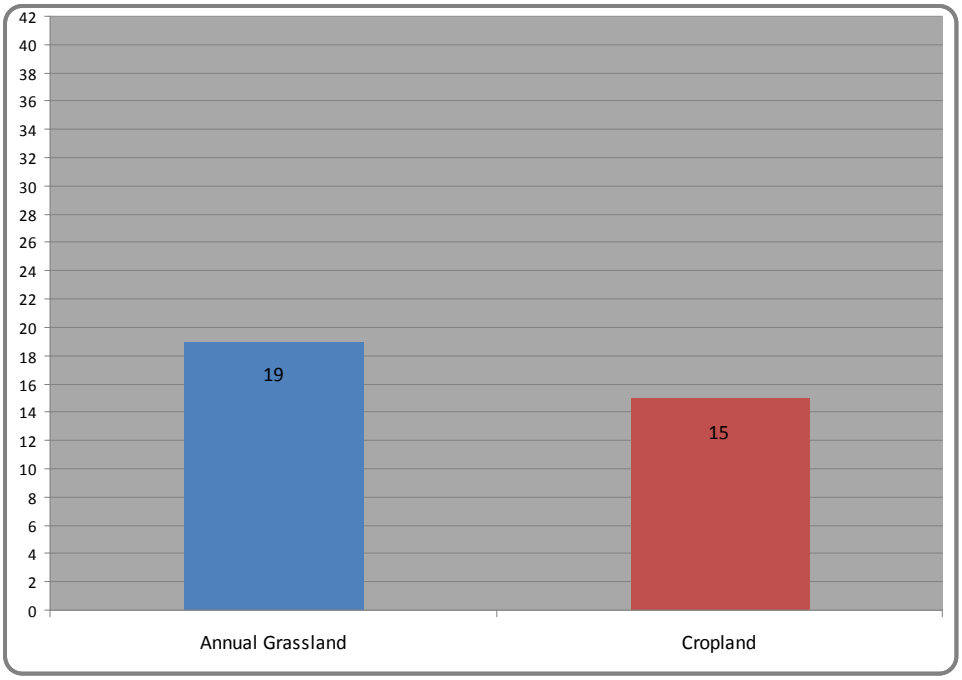
| Common Name | Scientific Name | Special Status | Observed Within study area? | General Habitat Preference |
|---|---|---|---|---|
| Merlin | *Falco columbarius* | Special Animal (Wintering) | ✓ (Winter transient) | Open country with adjacent woodlands |
| Prairie Falcon | *Falco mexicanus* | Special Animal (Nesting) | ✓ | Open country, nests on cliffs |
| American Kestrel | *Falco sparverius* | None | ✓ | Open, semi-open country |
| Greater Roadrunner | *Geococcyx californianus* | None | | Open habitats |
| California Condor | *Gymnogyps californianus* | FE | | Large expanses of mountainous terrain |
| Bald Eagle | *Haliaeetus leucocephalus* | Delisted/ SE BGEPA | ✓ (Winter transient) | Forested areas near water for breeding. Wintering in variety of habitats with suitable prey |
| Barn Swallow | *Hirundo rustica* | None | ✓ | Riparian, grasslands, lakes |
| Bullock's Oriole | *Icterus bullockii* | None | ✓ | Oak, riparian woodlands |
| Loggerhead Shrike | *Lanius ludovicianus* | SSC (Nesting) | ✓ (Nesting) | Nests in shrubs, trees near open areas |
| Northern Mockingbird | *Mimus polyglottos* | None | | Riparian, chaparral and woodlands. Also urban |
| Brown-headed Cowbird | *Molothrus ater* | None | | Rural areas, ranches |
| Ash-throated Flycatcher | *Myiarchus cinerascens* | None | ✓ | Open, arid habitats |
| Long-billed Curlew | *Numenius americanus* | Special Animal (Nesting) | ✓ (Wintering) | Winters in meadows, fields |
| Whimbrel | *Numenius phaeopus* | None | | Winters in meadows, fields |
| MacGillivrays Warbler | *Oporornis tolmiei* | None | ✓ | Forests, woodlands |
| Western Screech Owl | *Otus kennicottii* | None | | Oak woodland |
| Osprey | *Pandion haliaetus* | Special Animal (Nesting) | ✓ | Aquatic areas |
| House Sparrow | *Passer domesticus* | None | ✓ | Urban |
| Savannah Sparrow | *Passerculus sandwichensis* | None | ✓ | Open habitats, marshes, grasslands |
| Cliff Swallow | *Petrochelidon pyrrhonota* | None | ✓ | Urban; open areas near water |
| Phainopepla | *Phainopepla nitens* | None | | Oak, riparian, scrub |
| Western Tanager | *Piranga ludoviciana* | None | ✓ | Woodlands |
| Oregon Vesper Sparrow | *Pooecetes gramineus affinis* | SSC (Wintering) | ✓ (Wintering) | Open habitats, often with scattered shrubs |
| Black Phoebe | *Sayornis nigricans* | None | | Near water |

| Common Name | Scientific Name | Special Status | Observed Within study area? | General Habitat Preference |
|---|---|---|---|---|
| Say's Phoebe | *Sayornis saya* | None | ✓ | Open country, grassland |
| Mountain Bluebird | *Sialia currucoides* | None | ✓ | Open areas with scattered trees |
| Western Bluebird | *Sialia mexicana* | None | | Woodland near open areas |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | None | | Riparian, lakes, open areas |
| Eurasian Collared Dove | *Streptopelia decaocto* | None | ✓ | Urban areas |
| Western Meadowlark | *Sturnella neglecta* | None | ✓ | Open habitats, grasslands |
| European Starling | *Sturnus vulgaris* | None | ✓ | Agricultural, livestock areas |
| Tree Swallow | *Tachycineta bicolor* | None | ✓ | Oak, riparian woodlands, open areas near water |
| Violet-green Swallow | *Tachycineta thalassina* | None | ✓ | Oak, riparian woodlands, open areas near water |
| Bewick's Wren | *Thryomanes bewickii* | None | | Riparian woodland, scrub |
| House Wren | *Troglodytes aedon* | None | ✓ | Shrubby areas |
| American Robin | *Turdus migratorius* | None | ✓ | Streamsides, woodlands |
| Western Kingbird | *Tyrannus verticalis* | None | ✓ | Grasslands, savanna |
| Cassin's Kingbird | *Tyrannus vociferans* | None | ✓ | Grasslands, savanna |
| Barn Owl | *Tyto alba* | None | ✓ | Agricultural, woodlands |
| Warbling Vireo | *Vireo gilvus* | None | | Riparian, oak woodlands |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* | SSC (Nesting) | ✓ (Spring transient) | Freshwater emergent wetlands, winters in open habitats |
| Mourning Dove | *Zenaida macroura* | None | ✓ | Open and semi-open habitats |
| White-crowned Sparrow | *Zonotrichia leucophrys* | None | ✓ | Oak, riparian woodlands |

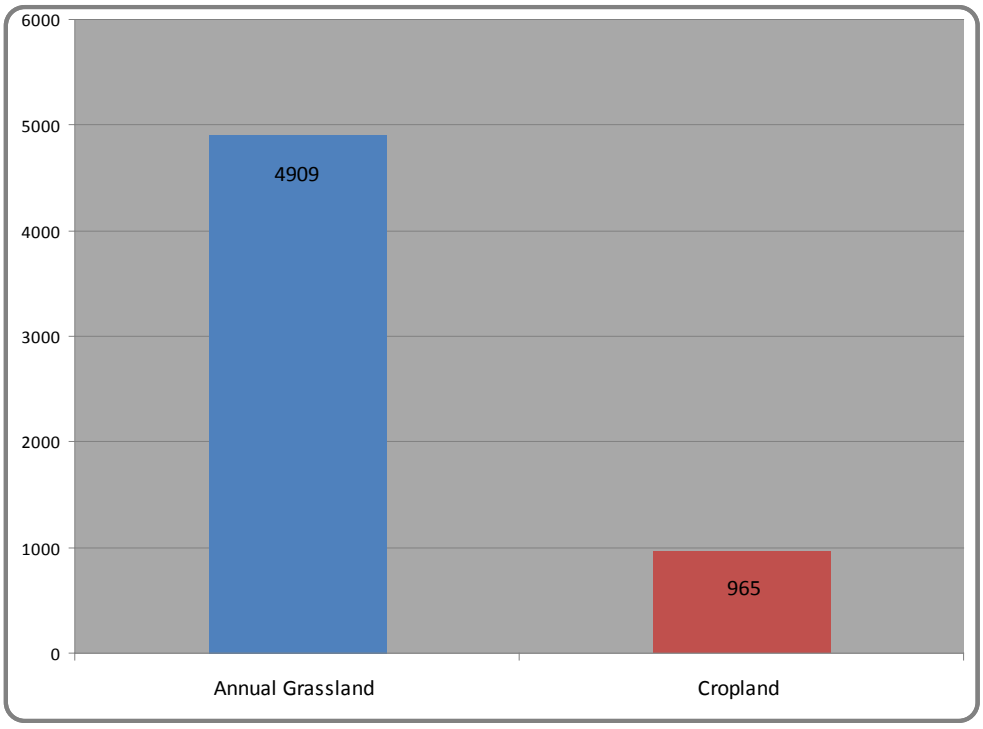
### *3.2.2 Wintering birds*

Winter bird surveys conducted in 2009 and 2010 detected a total of 35 species of birds, nine of which are special status species in California including burrowing owl, ferruginous hawk, golden eagle, long-billed curlew, merlin, prairie falcon, tri-colored blackbird, loggerhead shrike, and mountain plover (Table 1).

Species richness in grassland and cropland habitats was compared using data collected during transect surveys in 2010. Nineteen bird species were detected in grassland habitats and fifteen bird species were detected in croplands of equivalent area (Graph 1). In addition, total bird abundance was compared for grassland and cropland habitats using the winter bird survey transect data. During a one day winter transect survey 4,909 birds were detected in grassland habitats and 965 birds in croplands of equivalent area. Approximately 80% more birds were detected in grassland habitat than in cropland habitat (Graph 2).




GRAPH 1. BIRD SPECIES RICHNESS. Data from winter bird transect surveys for species richness within grassland and cropland habitats. The number of bird species is labeled on the vertical axis and habitat type on the horizontal axis.




GRAPH 2. TOTAL BIRD ABUNDANCE. Data from winter bird transect surveys for bird abundance within grassland and cropland habitats. The number of birds detected is on the vertical axis and habitat type on the horizontal axis.

### *3.2.3 Nesting birds*

Habitats within the Project Study Area were found to support breeding activities for twenty-one species of birds (Table 1). Four species (European starling, Eurasian collared dove, rock dove and house sparrow) are not native to the United States. Four species (grasshopper sparrow, lark sparrow, loggerhead shrike and burrowing owl) are special status species in California. In 2010 one singing male grasshopper sparrow was detected, in addition to, fledgling lark sparrows, two active loggerhead shrike nests, and seven active burrowing owl nests.

Grasshopper sparrows nest on the ground or in low shrubs in grassland habitat. They were observed occasionally within the study area during spring migration, however only one singing male was detected in spring 2010, in an area of taller grass in the northeast portion of the Project Study Area, outside the Project Site.

Lark sparrows nest on the ground or in low shrubs in grassland or shrubland habitat. They were observed to be uncommon throughout the study area. Breeding behaviors were observed in 2009, and fledglings were observed in 2010.

Loggerhead shrikes nest in dense shrubs. Two active nests were documented in spring 2010 in ornamental plantings associated with residential compounds in the Project Study Area. It is expected that shrikes will nest at these locations annually.

Burrowing owls nest in abandoned mammal burrows in grassland habitat. They show a high level of site fidelity, often returning to nest in the same burrow complex or nearest suitable burrow year after year. Winter burrows, nesting burrows, and satellite burrows were mapped from 2009 and 2010 data (Figure 2, Section 7.0).

Final results from two complete aerial survey passes determined 12 golden eagle territories are located within the 448,647 acre survey area (Latta 2010). Twenty-two golden eagle stick nests were located, nine of which were active and contained chicks (Figure 3, Section 7.0). The aerial survey did not determine how many eagles were present at the time of the survey, however observations of at least one adult on two of the three non-active territories suggest 11 to 12 pairs were present. Two nests showed signs of recent activity but were not active. The remaining 11 nests are likely alternate nests not used in 2010. Seven of the 12 golden eagle territories contained nests within ten miles of the Project. Four of these territories contained active golden eagle nests that are located within 10 miles of the Project. The closest active golden eagle nest to the Project is approximately eight miles northwest, in the San Juan River drainage. No golden eagle nests were located within the Project.

Golden eagles forage periodically within the Project Site year-round. In winter, adult and sub-adult golden eagles were regularly observed utilizing habitats within and around the Project Site for hunting, loafing, and occasional night roosting. From late winter and through spring, adult golden eagles were seldom observed. Presumably, they move into mountainous areas where there is better nesting habitat. Un-mated sub-adult golden eagles are present in and near the Project Site through the spring, where they hunt ground squirrels, feed on carrion, and occasionally utilize trees in abandoned ranch compounds as night roosts. The Project Site represents a very small fraction (less than 1%) of the over 500,000 acres of potential foraging habitat in the Carrizo Plain region.

Birds are common in all areas of the Project Site, however overall species diversity is generally low compared to other areas in the County. The limited amount of vegetative cover reduces the suitability for most bird species that require shrubs and trees for cover and nesting sites. Only a few species, such as common raven and horned lark, are true residents at the site. These species breed on site and live on and near the site throughout the year. Most birds observed in the Project Site are migratory or utilize habitat at the site only seasonally. Winter bird surveys identified migrants such as ferruginous hawk and long-billed curlew that come to forage on site during winter months. Spring bird surveys identified spring residents such as lark sparrow and Western kingbird that come to nest at the Project site but leave before the onset of winter. In addition, spring migrants such as Western tanager, MacGillivray's warbler, black-throated gray warbler, and Anna's hummingbird utilize vegetated areas of the Project site during migration.

TABLE 2. NESTING BIRDS. Twenty-one species of birds were documented nesting, or are presumed to be nesting based on observed behaviors, within the 9,700 acre study area.

| | **Common Name** *Scientific Name* | **Special Status** | **Origin** | **Nesting Location** | **Within proposed Project Site Fenced Areas?** | **Abundance Notes** |
|---|---|---|---|---|---|---|
| 1. | **Grasshopper Sparrow** *Ammodramus savannarum* | SSC | Native | NW corner of Section 16 | No | One singing male in 2010 |
| 2. | **Burrowing Owl** *Athene cunicularia* | SSC | Native | In Sections 4, 16, 22, 26, 28 and 35 | Yes | 7 nesting pairs in 2010. Probably fluctuates year to year. |
| 3. | **Red-tailed Hawk** *Buteo jamaicensis* | None | Native | Power line towers between Sections 22 and 27 | No | One pair annually |
| 4. | **Anna's Hummingbird** *Calypte anna* | None | Native | Residential compounds in Sections 4 and 18. Nesting not confirmed. | No | Limited to landscaped residential areas |
| 5. | **House Finch** *Carpodacus mexicanus* | None | Native | Residential compounds throughout Project Site | No | Common only in residential areas |
| 6. | **Lark Sparrow** *Chondestes grammacus* | Special Animal | Native | Grassland in Section 8, possibly north of Project Site. Olive grove west of Project | No | Uncommon; no nests found. |
| 7. | **Rock Dove** *Columba livia* | None | Introduced | Structures in Sections 21, 22, 27, 28 and 33 | Yes | Common |
| 8. | **Common Raven** *Corvus corax* | None | Native | Residential compounds and other structures in Sections 4, 15, 18, 21, 28 and 33 | Yes | Very common |
| 9. | **Horned Lark** *Eremophila alpestris* | None | Native | In grassland habitats throughout the Project Site | Yes | Very common |
| 10. | **Brewer's Blackbird** *Euphagus cyanocephalus* | None | Native | Presumed in residential compounds throughout Project Site | No | Common but not abundant |
| 11. | **Red-winged Blackbird** *Agelaius phoeniceus* | None | Native | Section 28 west half. | Yes | Uncommon |

| | **Common Name**<br>*Scientific Name* | **Special Status** | **Origin** | **Nesting Location** | **Within proposed Project Site Fenced Areas?** | **Abundance Notes** |
|---|---|---|---|---|---|---|
| 12. | **Loggerhead Shrike**<br>*Lanius ludovicianus* | SSC | Native | Residential compounds in Sections 18 and 33 | No | 2 active nests in 2010. |
| 13. | **House Sparrow**<br>*Passer domesticus* | None | Introduced | Residential compounds throughout Project Site | Yes | Common but not abundant |
| 14. | **Say's Phoebe**<br>*Sayornis saya* | None | Native | Residential compounds throughout Project Site | Yes | Uncommon |
| 15. | **Eurasian Collared Dove**<br>*Streptopelia decaocto* | None | Introduced | Residential compounds throughout Project Site | Yes | Common but not abundant |
| 16. | **Western Meadowlark**<br>*Sturnella neglecta* | None | Native | In grassland habitats throughout Project Site | Yes | Common |
| 17. | **European Starling**<br>*Sturnus vulgaris* | None | Introduced | Residential compounds throughout Project Site | Yes | Common |
| 18. | **Western Kingbird**<br>*Tyrannus verticalis* | None | Native | Residential compounds throughout Project Site | Yes | Very common |
| 19. | **Cassin's Kingbird**<br>*Tyrannus vociferans* | None | Native | Confirmed in Section 4 residential landscape. | No | Uncommon |
| 20. | **Barn Owl**<br>*Tyto alba* | None | Native | Abandoned building in Section 27. | Yes | Uncommon |
| 21. | **Mourning Dove**<br>*Zenaida macroura* | None | Native | Residential compounds in Sections 4, 16, 18, 22, 27, 28 and 33. | Yes | Common |

### *3.2.4 Special status birds*

Twenty bird species observed in the TSF study area are considered special status species (Table 1). Special status species are those that are listed as endangered, threatened or rare under CESA, are listed by the California Department of Fish and Game (CDFG) as California species of special concern or Fully Protected species, or are included on the CDFG Special Animals List. Only 9 of these 20 species were observed in a manner consistent with their listing status (e.g. nesting or wintering).

No birds listed under FESA were documented in the study area. Bald eagle and golden eagle, listed under the Eagle Act, were documented in the study area. Bald eagle is an uncommon winter transient, observed near the study area on two occasions. Golden eagles winter in the vicinity of the study area, and nest in the Carrizo Plain region (refer to Sections 3.2.3 and 4.0).

One species listed under CESA, the Swainson's hawk (*Buteo swainsoni*), was observed as a spring migrant flying over the Project Study Area, but does not occur as a breeder. Three species listed as California Species of Special Concern (SSC) (burrowing owl, loggerhead shrike and grasshopper sparrow) and one species listed as a Special Animal (lark sparrow) were documented breeding in the Project Study Area (Table 2).

## 3.3 Bat Survey Methods

Abandoned buildings within the Project Study Area (PSA), an approximately 9,700 acre area that encompasses the 3,500 acre Project Site, were surveyed for roosting bats in 2010 during the winter and spring (Althouse and Meade, Inc. 2010a). The exterior of each building was examined for potential openings which could be used by bats to access roosting sites. Any potential opening was further examined for signs of bat entry, such as wear marks, feces, and urine staining. Surveyors used flashlights and binoculars where needed. Interior visual surveys were conducted at most of the barns and abandoned homes. Interior surveys examined attics and other potential roost locations for bats or their sign. Two occupied residences were not surveyed.

## 3.4 Bat Survey Results

Potential roosting habitat is present for bats in occupied and abandoned structures at the Project Site. We found no evidence of temporary or permanent use of abandoned structures within the PSA by roosting bats. Bats are likely to forage over the Project Study area seasonally and opportunistically.

# 4.0 Avian and Bat Protection Plan

## 4.1 Responsible Parties

**Environmental Monitor**: Retained by the County of San Luis Obispo at the expense of Topaz Solar Farms, LLC to monitor permit compliance throughout the construction phase of the Project.

**Project Biologist**: Retained by Topaz Solar Farms LLC to implement biological resource conditions of approval, including but not limited to the mitigation measures listed in Section 4.4, below, and other environmental minimization and protection measures.

## 4.2 Environmental Worker Training Program

An environmental Worker Training Program (WTP) will be developed by Topaz Solar Farms LLC, per the County of San Luis Obispo CUP Condition 42, prior to issuance of construction permits. All personnel working on the Project Site during construction and operation of the Project will be required to complete the WTP. Training materials will include at a minimum, discussions on FESA, CESA, Eagle Act, and MBTA compliance, consequences of non-compliance, species identification, avoidance measures, and reporting protocols for dead or injured wildlife encountered at the Project (refer to Appendix A).

## 4.3 Project Design Standards

### *4.3.1 Siting considerations*

Topaz Solar Farms LLC's goal for site location considerations, in relation to birds and bats, was to avoid take of birds and bats, and to minimize the loss, destruction, or degradation of bird and bat habitat by placing Project components in disturbed and degraded areas (croplands) to the maximum extent feasible. Approximately 76 percent of the Project is situated on active croplands, with only 24 percent being situated on grasslands of variable quality.

Topaz Solar Farms LLC evaluated a larger Project Study Area (PSA) when determining the siting of the TSF Project. Approximately 9,700 acres of land was intensively studied for habitat quality and sensitive biological resources. Areas of environmental sensitivity (wetland and drainage features, wildlife corridors, federally listed species, rare bird habitat, etc.) were avoided to the extent possible, in part to avoid potential bird roosting, nesting, and foraging areas within the PSA. Siting considerations included the following:

- Project components avoid locations with FESA and/or CESA listed, or other special status birds to the extent possible, and were sited in the areas of lowest known concentration for other sensitive species.
- The main ephemeral drainage to Soda Lake and all vernal pools were avoided.

- Bald and golden eagle wintering use areas (grasslands) were avoided to the extent feasible. No eagle nesting habitat is present.
- Burrowing owl nesting and wintering den areas were avoided to the extent feasible.
- Mountain plover wintering habitat was avoided to the extent feasible.

### *4.3.2 Facility design considerations*

The following design considerations, based on APLIC (2006) guidelines, will be incorporated into the TSF facility design to reduce potential adverse effects of the Project on birds and bats:

- All new construction of power poles and the substation will incorporate at least one of the following avian and bat protection measures:
    - Avian-safe separations between energized conductors or energized hardware and neutral or grounded hardware and equipment as per the APLIC (2006) guidelines. The APLIC (2006) recommended separation for eagles is 60 inches. They do not have a recommended separation for Condor protection. The California condor is the largest raptor that could potentially be present at the Project Site, therefore a larger separation will be considered.
    - Where design constraints prohibit these separation distances between energized conductors or energized hardware and neutral or grounded hardware and equipment (including the pole itself), insulating covers will be installed to prevent electrocutions from wires or other components.
- All new power poles will be outfitted with raptor perch discouragers. Keeping raptors from perching on power poles will minimize the potential for electrocution, as well as preventing raptors from using power poles to hunt kit fox and other sensitive small mammal species.
- All new construction of Project overhead collection system lines will utilize the Hendrix Spacer Cable System (refer to Example Photograph in Section 7.0). The Hendrix Spacer Cable System is designed to minimize avian electrocutions and open air collisions by birds and bats. All cables have a covering that limits the electrical charge on the surface such that phase to phase or phase to ground contact by wildlife will not result in lethal electrical charges. The "spacers" that are installed to maintain line separation allow for a compact line system that is easily detected by birds and bats in flight, thus significantly reducing collisions. Also, the compact line configuration allows for power pole designs that have a reduced cross-arm width of one foot which minimizes the dangerous practice of cross-arm perching and nesting by raptors.
- Perch discouragers and/or insulation covers may be installed as an Adaptive Management practice on any Project component determined to attract perching birds to potential electrocution hazards (refer to Section 6.0).

- Flight diverters may be installed as an Adaptive Management practice on any Project component determined to be a collision hazard to birds in flight (refer to Section 6.2).
- Lighting at night will be minimized and only located at the Operations and Maintenance (O&M) Facility, the substation, and the PG&E Switching Station. Lighting fixtures will be focused downward to reduce skyward illumination.
- The number and length of roads will be minimized so that roads outside Project fences will not lead to further loss and fragmentation of migratory bird habitat.
- Permanent buildings and structures constructed for the O&M Facility and the substation will not have suitable roosting crevices for bats, and will be designed to minimize potential nesting sites for birds (e.g. roof materials without gaps, screens over vents, minimal roof overhangs).
- No permanent ponds are required for operation of the facility. Temporary dust control ponds may be used during construction only. A dust control pond management plan will be prepared under separate cover, as required by CUP DRC2008-00009 Condition 48 (MM BR-4.1 - Implement protective dust control pond design, monitoring and management plan) and implemented to minimize bird use of ponds during construction.

## 4.4 Construction Phase Minimization and Protection Measures

Construction of the Project is scheduled to be phased over an approximately three year period. Construction activities could potentially result in adverse effects to nesting birds, raptors, or bats if appropriate pre-construction surveys and avoidance measures are not implemented. The following County of San Luis Obispo conditions of approval are requirements of the Project, to be implemented prior to construction activities to minimize potential impacts to nesting birds, raptors, and bats (refer to Appendix A for the full text of these conditions). A brief description of the proposed implementation of each condition is listed below the condition title.

- **CUP Condition 50: MM BR-6.1** - Conduct pre-construction surveys for nesting and breeding birds and implementation of avoidance measures;
    - A County-approved biologist will conduct pre-construction surveys for nesting birds prior to any site disturbance within the recognized breeding season.

- **CUP Condition 60: MM BR-11.1** - Monitor construction in condor habitat and remove trash and microtrash from the work area daily;
    - All personnel will be trained on the issue of microtrash and its potential affect on California condors. Daily surveys of the work area will be conducted to remove microtrash from potential condor occurrence areas. Should a condor land within the project area, all work will stop within 500 feet of the condor until it has left the area on its own. All condor sightings

within the project area will be reported to USFWS, CDFG and the County within 24 hours.

- **CUP Condition 61: MM BR-13.1** - Implement Avian Power Line Interaction Committee guidelines (APLIC);
    - All transmission facilities, towers, poles and lines will be designed in accordance with and comply with all policies set forth by APLIC (2006) to minimize avian electrocutions as a result of the construction of the Project.

- **CUP Condition 62: MM BR-14.1** - Prepare and implement a Bird Monitoring and Avoidance Plan;
    - The Bird Monitoring and Avoidance Plan (contained herein) will require monitoring the death and injury of birds and bats from collisions with facility features such collector/distribution lines, solar modules, and dust control ponds.

- **CUP Condition 73: MM BR-22.1** - Complete focused pre-construction burrowing owl surveys and implement avoidance measures;
    - No more than 15 days prior to the commencement of initial ground disturbing activities for each phase of the Project, the Applicant shall implement focused pre-construction reconnaissance level surveys for burrowing owls. Surveys shall be conducted prior to the initiation of ground disturbance and be conducted by a County-approved biologist(s), knowledgeable about the species.
    - Occupied burrows will not be disturbed during the nesting season (February 1 through August 31).
    - A 250 foot buffer will be implemented around burrowing owl nesting dens. A 150 foot buffer will be implemented around wintering burrowing owl dens.
    - Passive relocation of burrowing owls may be implemented during the wintering season (September 1 through January 31) if the Project Biologist deems construction activity could potentially injure or kill burrowing owls. Passive relocation will be conducted using one-way doors. To prevent multiple relocations of the same owl, all potential burrows in the construction area will be outfitted with one-way doors simultaneous with the first passive relocation.

- **CUP Condition 76: MM BR-27.**1 - Conduct pre-construction maternity colony or hibernaculum surveys for sensitive bats.
    - No more than 15 days prior to grading near or the removal of towers, trees or other structures, the Applicant shall retain a County-approved biologist to conduct pre-construction surveys for sensitive bats. Surveys shall also be conducted during the maternity season (1 March to 31 July) within 300 feet of project activities.

## 4.5 Operation Phase Minimization and Enhancement Measures

The following minimization and enhancement measures will be implemented during the operation phase of the TSF Project to reduce potential adverse effects of the Project on birds and bats.

- An environmental WTP will be provided to all employees and contractors employed to work at the TSF facility (refer to Section 4.2, above).
- All personnel will be trained on the issue of microtrash and its potential affect on California condors.
- Vegetation management during operation of the TSF facility will consist of grazing and mowing. Grazing will be done within the fenced array areas. Mowing will be done along roadsides, fence lines, and other limited areas where grazing is impractical. A Vegetation Management Plan (VMP) will be implemented at the TSF facility that will guide grazing and mowing practices. Grazing and mowing will be minimized within the nesting bird season (February 1 through August 31). If mowing is conducted during the nesting season, pre-activity nesting bird surveys will be conducted in all affected areas. Active bird nests will be be flagged and avoided, unless otherwise authorized by USFWS and CDFG to be removed.
- Approximately 2,675 acres of onsite active croplands within the proposed Project Site will be restored to annual grassland habitat through implementation of the Topaz Habitat Restoration and Revegetation Plan.
- More than 12,000 acres of Conservation Lands will be preserved in perpetuity for the San Joaquin kit fox (SJKF) in the northern Carrizo Plain region (Figure 4, Section 7.0). Conservation Lands will be managed as habitat for SJKF, including the discontinuation of cropping. Conversion of cropland to grassland protected in perpetuity and enhanced with a managed grazing program would increase prey abundance and foraging potential for eagles, hawks, owls, and a variety of other birds. It would also provide suitable wintering habitat for mountain plover, ferruginous hawk, prairie falcon, Oregon vesper sparrow, and northern harrier, and increase the quality and quantity of nesting habitat for burrowing owl, short-eared owl, grasshopper sparrow, lark sparrow, loggerhead shrike and other species.
- Approximately 1,320 acres of onsite Stewardship Lands consisting of interstitial areas and movement corridors between fenced array areas of the Project will be enhanced and managed as grassland habitat for kit fox and other sensitive species (refer to Figure 4, Section 7.0).

## 4.6 Nest Management

Bird surveys conducted at the Project Site from 2008 through 2010 documented 21 species that nested in the 9,700-study area, and that could nest at or near the Project Site during construction and operation of the facility (refer to Section 3.2.3).

### *4.6.1 Nest discouragement and avoidance*

Nest discouragement and avoidance measures will be implemented during Project construction and operation phases.

- During the approximate three-year construction phase, the Project Biologist will recommend vegetation management strategies in areas proposed for construction that will minimize the habitat attractiveness to nesting birds. Vegetation management strategies could include mowing or grazing tall grasses and forbs and removing shrubs or trees prior to start of nesting season;
- Mechanical vegetation removal during Project operation will be conducted outside the nesting season where feasible;
- Pre-activity surveys will be conducted prior to work that would affect potential nesting habitat, if work must be done during the nesting season;
- Nests of common species (not listed under FESA, CESA or Eagle Act) that are under construction but do not have eggs may be removed by the Project Biologist. Adaptive management actions may be required, at the discretion of the Project Biologist, including but not limited to installation of nest discouraging devices (refer to Section 6.3.3);

### *4.6.2 Management of active nests*

If a nest is found on Project components or in proposed work areas, the Project Biologist will inspect the nest and determine its status as active, under construction, or abandoned.

- Nests that contain eggs or chicks are considered active and may not be removed without written documentation from the USFWS and/or CDFG authorizing the nest relocation;
- Nests that are under construction or are abandoned can be removed by the Project Biologist;
- If a bald or golden eagle or a California condor nest is found onsite, the nest will not be disturbed and the USFWS and CDFG will be contacted within 48 hours for guidance;
- Construction buffers for active nests are outlined in the CUP conditions of approval as follows (full text of conditions is provided in Appendix A):
    - **CUP Condition 50: MM BR-6.1**

      Active Nest of Ground-nesting Species: 300 foot buffer

      Active Nest of Raptor: 500 foot buffer

      Active Nest of Bald or Golden Eagle: 0.5 mile buffer
    - **CUP Condition 73: MM BR-22.1**

      Active Nest of Burrowing Owl: 250 foot buffer

### *4.6.3 Nesting season*

For the purposes of implementing this ABPP, the active bird nesting season extends from February 1 to August 31. Bird nests may not be removed during this period, unless a qualified biologist determines the nest does not contain eggs, and there are no chicks dependent on the nest, regardless of whether or not they are actually within the nest.

The nesting season dates outlined here are intended to be used as a guide to the typical nesting season in the Carrizo Plain region, when some bird nests can be expected to be active. If a nest is occupied and/or it contains eggs or chicks outside the February 1 to August 31 period, disturbance of the nest is still not permitted.

The non-nesting season extends from September 1 through January 31. Bird nests found during this time that are determined not to be active can be removed. It is illegal to possess or sell bird nests or eggs.

## 4.7 Avian Mortality Risk Assessment

The risk of avian mortality at the TSF Project is anticipated to be very low during the approximately three-year construction period and during subsequent operation of the facility. The Project is not expected to cause any prohibited "take" or to "disturb" species protected by FESA, CESA, Eagle Act or MBTA.

Avian mortality risk in association with various types of energy projects is primarily comprised of electrocution and collision factors, but also includes nest disturbance factors during facility construction, daily operation, and maintenance. These three factors, electrocution, collision, and nest disturbance, comprise the highest risk of avian mortality at the TSF Project.

The BMAP outlined in Section 5.0 of this document provides detailed information on Avian Use Surveys that would be conducted at the Project Site to calculate Bird Utilization Rates for study plots associated with different Project components (Section 5.4.1). Bird Utilization Rates can be used in combination with Bird Fatality Rates (Section 5.4.2) to calculate a Bird Risk Index (Section 5.4.3) for each study plot or survey category (Section 5.2). The Bird Risk Index would be used to identify Project components that may require Adaptive Management (Section 6.0), and to assess those components that are successfully operating without impacts to birds. Additionally, analysis of this Bird Risk Index would be useful in future planning efforts for large-scale solar development projects.

### *4.7.1 TSF Project components*

**A. Overhead Power Lines**: The TSF Project requires an electrical collection system to gather energy from the PV modules and convey it to the existing Morro Bay/Midway 230 kV transmission line that passes through the Project Site. The electrical collection system will comprise both above-ground and below-ground components (refer to electrical collection system figure in Section 7.0). Where the collection system is installed underground, there will be no collision or electrocution risks to birds. Standard overhead electrical collection system designs often present a potential hazard to birds by collision and/or electrocution.

The TSF Project will utilize a power line system that minimizes collision hazards by decreasing cable spacing so that the bundled cables are highly visible to in-flight birds and bats (see Hendrix Spacer Cable System Example Photograph in Section 7.0). Potential electrocution hazards are also significantly reduced because the cables have a covering that limits the electrical charge on the surface such that phase to phase or phase to ground contact by wildlife will not result in lethal electrical charges (refer to discussion of Hendrix Spacer Cable System in Section 4.3.2, above). The risk of avian collision and/or electrocution at onsite overhead power lines is expected to be very low.

**B. Substation/Switching Station**: The TSF Project will require construction and operation of a substation and a switching station in order to transfer energy from the proposed onsite overhead collection system to the existing Morro Bay/Midway 230 kV transmission line. Each of these facilities will have energized components. Design of these facilities will adhere to APLIC (2006) guidelines, such that energized components will be sufficiently spaced or covered to prevent avian electrocution. The risk of avian electrocution at the substation and switching station is expected to be extremely low.

**C. Array Areas**: The TSF Project will install an estimated 460 photovoltaic (PV) arrays that are each about 7 acres in size. These will consist of PV modules installed on steel support structures in rows. The entire fenced area of the Project is approximately 3,500 acres in size. The surface area of the modules is approximately 1,350 acres, with the remainder of the 3,500 acres consisting of grassy rows and aisles between and around the PV modules, and small areas of other appurtenant infrastructure. Concern has been raised that the reflectance and/or glare of the PV modules could confuse birds, increasing the risk of collision with the modules. Another concern that has been raised is that polarized light reflecting from the PV modules could disorient birds, potentially resulting in collisions.

Research conducted to date on the effects of solar installations on birds has been limited in scope. There is no scientific evidence that PV modules cause bird collisions, or have an increased risk of bird collisions. PV modules have less reflectivity than automobile windshields and many other man-made objects (Protogeropoulos and Zachariou 2010), because they are black in color and designed to absorb light rather than reflect light. A recent study (Horvath et al. 2009) suggests that anthropogenic polarized light may have an adverse affect on obligate waterbirds, such as ducks, loons, and brown pelicans, because waterbirds cue in on polarized light reflecting off water surfaces to find water sources during migration, especially at night. These species have been known to become stranded in anthropogenic sites that reflect polarized light, such as large asphalt parking lots and desert roads, where the light from bright downward-facing street lights becomes polarized and is reflected up to the sky.

The TSF Project will not have night-lighting shining on solar PV modules. In addition, the location of the Project is not near any significant permanent body of water. All drainages on and near the Project are ephemeral and rarely contain water in this arid environment, and Soda Lake is approximately 9 miles from the

Project Site at the closest point. Further, no obligate waterbirds have been observed at the Project Site. The risk of avian collision with PV modules in the array areas is expected to be low.

### *4.7.2 Nest disturbance and/or abandonment*

TSF Project construction activities that could potentially affect bird nests are those that affect vegetated areas. TSF Project operational activities that could potentially affect bird nests are associated with mechanical vegetation management practices. Pre-construction surveys, protective setbacks around active nests, and nest monitoring are requirements of Conditional Use Permit DRC2008-00009 and will be implemented throughout the construction phases that affect vegetation during the nesting season, thereby eliminating potential nest disturbance and or nest abandonment. Throughout the life of the Project, vegetation management will be guided by the Vegetation Management Plan, which requires pre-activity surveys by the Project Biologist prior to mechanical vegetation maintenance practices during the nesting season. The risk of nest disturbance and/or abandonment during Project construction and operation is expected to be extremely low.

### *4.7.3 Golden eagle risk assessment*

Golden eagles forage within the 9,700 acre Project Study Area opportunistically and periodically throughout the year, primarily in grassland habitat (refer to Figure 1, Section 7.0, for study area and Project Site boundaries overlaid on habitat types). The study area provides moderate quality foraging habitat for golden eagles during the winter season. There are no golden eagle nests, either active or inactive, within the study area. The closest active golden eagle nest is located in the San Juan Creek watershed approximately eight miles northwest of the Project (Figure 3, Section 7.0).

Trees associated with abandoned ranch compounds on and near the Project Site are very poorly suited for golden eagle nest construction. The Morro Bay/Midway 230 kV transmission towers that pass through the study area could be utilized as a nesting site by golden eagles; red-tailed hawks and ravens presently nest on the towers within and near the study area. There are no cliff faces or other suitable nesting areas in the study area.

The Project would result in a loss of approximately 3,520 acres of land that is currently available to be used opportunistically and periodically by foraging golden eagles. The affected land consists of 835 acres of grazed annual grassland habitat, 2,675 acres of croplands in various stages of grain production, and 10 acres of anthropogenic habitat associated with ranch compounds. The cropland and anthropogenic habitat are poorly suited for eagle foraging.

Additionally, the Project would have some medium-voltage collection system lines that would be designed to not present a danger for electrocution or collision by raptors. This would be accomplished by utilizing design features recommended by the Avian Power Line Interaction Committee (APLIC 2006) which provides species-specific minimum horizontal and vertical spacing guidelines that would eliminate the potential for electrocution by bridging the gap between conductors. Section 4.7.1 contains details of the proposed collection system line design. Section 7.4 provides a detailed outline of proposed conservation measures.

*Direct Effects*: The Project would result in loss of 835 acres of moderate quality grassland foraging habitat for golden eagles, 2,675 acres of low quality cropland foraging habitat, and 10 acres of low quality anthropogenic foraging habitat. The loss of foraging habitat would be an insignificant reduction in the overall regional golden eagle foraging habitat, and would not substantially interfere with normal breeding, foraging or sheltering behavior of golden eagles such that productivity is reduced or nests are abandoned. The loss of habitat would be insignificant because it represents an extremely small fraction of the overall amount of suitable golden eagle foraging habitat in the region. The potential for electrocution or collision with Project components is mitigated to a less than significant level through design considerations and other protection and minimization measures, as outlined above, and would therefore be unlikely to cause injury to golden eagles. Thus, construction and operation of the TSF Project would not result in increased mortality of golden eagles, and would not result in injury to, decreased productivity of, or nest abandonment by golden eagles. At most, the TSF Project potentially would have a discountable and insignificant effect on golden eagles.

*Indirect Effects*: Construction of the proposed Project could affect golden eagle foraging activities due to operation of equipment and general human presence in the area. However, the level of use of the Action Area by golden eagles is moderately low and large areas of suitable foraging habitat are present in the vicinity. Therefore, any indirect effects of the Project would be insignificant.

*Effects Determination*: **Discountable and Insignificant, No Take Anticipated**. The Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "Disturb" is defined by the Service in regulations at 50 CFR § 22.3 as: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

The TSF Project potentially may have a very minor effect on the golden eagle, but would not substantially interfere with its normal breeding, feeding or sheltering behavior to the extent that it causes decreased productivity or nest abandonment. Therefore, the potential adverse effect would be discountable (i.e., extremely unlikely to occur and essentially not expected to occur) and insignificant (i.e. will not reach a scale where "take" occurs) due to factors explained above. Accordingly, the TSF Project would not "take" or "disturb" golden eagles, as defined in the Eagle Act.

## 4.8 TSF Facility Avian Reporting System

Topaz Solar Farms LLC will implement an Avian Reporting System that will provide personnel with forms and instructions for documenting bird mortality and bird nesting within the TSF facility. Data collected will be maintained internally.

If the carcass of a federal or California listed threatened, endangered or fully-protected species is found, data is collected on the find and it is then flagged to mark its location. This information is then reported to the TSF operations office as soon as possible. The find will be collected and processed by a designated TSF employee. If a non-native

species such as rock dove (pigeon), European starling, Eurasian collared dove, or house sparrow is found, data on the fatality is collected, and TSF staff will remove and dispose of the carcass off-site. All other species are individually placed in separate bags with identifications labels that include the following information: incident number, site, species, and date found, and placed in a freezer. If the species cannot be identified in the field, the carcass should be examined by a qualified zoologist to attempt identification.

If an injured bird is found at any time on site, TSF operations is contacted immediately and a designated TSF employee will come to take the bird to a local rehabilitation facility such as Pacific Wildlife Care.

## 4.9 Public Outreach and Education

As part of the Project, and if approved by the County, Topaz Solar Farms LLC will construct and operate a Solar Energy Learning Center on the Project Site. Topaz will work with local educators to develop exhibits, tours, and educational programs for the center that will complement existing science and sustainability curricula. The Center may provide opportunities to enhance public awareness and support for regional wildlife issues. The goal of these outreach efforts would be to provide information to the public regarding responsible stewardship of the environment, and the benefits of working cooperatively with wildlife agencies towards reducing avian mortalities while continuing to provide safe, renewable, reliable, affordable electricity to customers.

# 5.0 Bird Monitoring and Avoidance Plan

The Bird Monitoring and Avoidance Plan (BMAP) described herein was prepared in coordination with Brian Latta, an independent ornithologist with extensive experience conducting avian resource studies, numerous of which have been published in peer-reviewed scientific journals. The BMAP is modeled after successful monitoring programs completed on wind energy projects in California, and satisfies requirements of County of San Luis Obispo CUP DRC2008-00009 Condition 62 (MM BR-14.1 - Prepare and implement a Bird Monitoring and Avoidance Plan).

Methods of study design consider or are directly based on guidance documents and research papers by Anderson (1999), National Renewable Energy Laboratory (NREL 2005), Gauthreaux (1994), McCrary (1986), and USFWS (2011) (refer to References, Section 8.0). On May 2, 2011 the USFWS issued a guidance document titled *Monitoring Migratory Bird Take at Solar Power Facilities: An Experimental Approach* (USFWS 2011). This USFWS document provides recommendations regarding mortality monitoring (referred to as Avian Fatality Surveys herein) protocols for solar projects, which were utilized in the BMAP where applicable.

The BMAP study outlined herein will guide data collection and analysis to answer the following ecological question:

> *Does the Topaz Solar Farm pose a risk to avian resources through increased avian mortality from electrocution and/or collision with Project components such as solar arrays, overhead power lines, and energized substation/switching station equipment?*

Based on the extensive avian minimization and protection measures proposed by Topaz Solar Farms LLC, the hypothesis proposed by this BMAP is that the Project would not result in risk to avian resources through increased mortality from electrocution and/or collision with Project components.

This is not to say that individual bird fatalities will not be recorded during the Avian Fatality Surveys (refer to Section 5.3). However, in order to understand the significance of individual bird fatalities and the risk the TSF facility poses to avian resources, this study will provide data and conclusions regarding statistical comparisons of avian mortality at the Project Site versus offsite undisturbed reference sites (controls), where "mortality" is calculated as a rate of fatalities equaling the number of bird deaths per search plot, adjusted for searcher and scavenger bias (refer to Section 5.4.2). Statistical comparisons to reference sites (controls) are critical because cause of death is often difficult to ascertain in bird carcasses. For example, at the San Gorgonio Wind Resource Area (a California wind farm), carcass searches identified 61 bird carcasses. Of these 61 carcasses, the cause of death could not be determined for 48 (78.7%) of the fatalities (National Renewable Energy Laboratory 2005).

## 5.1 BMAP Goals and Objectives

The BMAP presents a study design that will analyze bird use and bird mortality at three specific Project components (Array Areas, Overhead Power Lines, Substation/Switching Station) and compare results with offsite reference plots. The study design is flexible enough to accommodate modifications based on new information so that the first primary goal listed below can be achieved, while continuing with rigorous data collection methods to facilitate completion of the second primary goal.

The two primary goals of the BMAP are:

**Goal 1.** Provide Project owners/managers with scientifically-based risk analyses to facilitate implementation of Adaptive Management actions to minimize conflicts between Project components and birds.

**Goal 2.** Provide a rigorous scientific study of avian use and mortality associated with specific components of an industrial scale photovoltaic solar facility that can be used by wildlife regulators as a planning tool for future solar projects.

The primary objectives of the BMAP are to collect and analyze data on bird use and mortality at and near the Project Site in order to:

**Objective 1.** Assess changes in total bird abundance, species composition, and species richness relative to development and operation of the Project compared to undeveloped reference sites;

**Task 1.1**: Implement Avian Use Surveys.

**Task 1.2**: Submit quarterly and annual monitoring reports.

**Objective 2.** Calculate Bird Utilization Rate, Bird Fatality Rate, and Bird Risk Index for three specific Project components (Array Areas, Overhead Power Lines, Substation/Switching Station);

**Task 2.1**: Implement Avian Fatality Monitoring Surveys, Searcher Efficiency Trials, and Scavenger/Carcass Removal Trials.

**Task 2.2**: Run calculations on survey data according to methods in Section 5.4.

**Task 2.3**: Submit quarterly and annual monitoring reports.

**Objective 3.** Conduct risk assessment analyses for each Project component based on calculated Bird Utilization Rate, Bird Fatality Rate, and Bird Risk Index;

**Task 3.1**: Prepare a written analysis of survey data and calculated Bird Risk Index for each Project component to be included in the annual report.

**Objective 4.** Inform TSF facility managers of Adaptive Management requirements when Bird Risk Index and/or Bird Fatality Rate indicates significance thresholds for avian mortality have been reached;

**Task 4.1**: Submit quarterly and annual monitoring reports.

**Objective 5.** Prepare a scientific paper describing the results of avian use surveys and avian fatality monitoring surveys, and the conclusion regarding the risk level that the Project poses for avian resources.

**Task 5.1**: Within one year of completion of the study data collection, prepare and submit a scientific paper to the County of San Luis Obispo.

## 5.2 Avian Use Surveys

Avian Use Surveys will be conducted to collect repeatable and comparable data on bird use of Project areas and undeveloped reference sites (controls). Avian Use Surveys will provide the data used to complete Objective 1, above. Three Project component categories were identified as posing the highest potential risk of avian electrocution or collision (Array Areas, Overhead Power Lines, Substation/Switching Station). Section 7.0 includes TSF Project maps indicating the approximate layout of these Project components. Avian Use Surveys will target each of these three Project component areas, and a selection of reference sites (control plots) will be included on offsite conservation lands that are undeveloped.

If Avian Fatality Surveys (refer to Section 5.3) detect bird deaths at other Project components, the study design may be modified to add a survey category and Observation Points for these components. Data collected during the Avian Use Surveys will inform Bird Utilization Rate, Bird Fatality Rate, and Bird Risk Index calculations (refer to Section 5.4).

### *5.2.1 Avian use survey methods*

Avian Use Surveys will be conducted by the point count method. Observation Points will be randomly selected within the following four survey categories: Array Areas, Overhead Power Lines, Substation/Switching Station, and Reference Sites. A sufficient number of Observation Points with each of the four survey categories will be selected to collect a representative sample of the entire Project.

The Survey Area for each Observation Point is a circular area with a 50 meter radius extending out from the observer. Avian use surveys are to be conducted at each Observation Point once a month, throughout the year during construction and for three years after construction is complete (refer to Section 5.2.2, below). All surveys will be conducted in the morning, starting as early as first light and ending by 11:00 a.m. Each point count lasts for 10 minutes. A standardized data sheet will be used by all surveyors. For each point count, data on ambient environmental conditions will be recorded at the beginning and end of the session. These data include, but are not limited to: temperature (F°), average and maximum wind speeds (mph), wind direction, percentage cloud cover, visibility, and precipitation. Surveys will not be conducted when the average wind speed reaches more than 35 mph or if there is heavy rain or fog.

During the 10-minute point count survey, the observer scans the entire plot (360 degree coverage) throughout the observation period. When a bird is detected, data are recorded onto a datasheet. An alphanumeric code will be developed in order to track each unique bird detection, which could be a single bird or a flock of birds, and will include visual as well as auditory detections. For each unique bird detection, the following information is recorded: alphanumeric code, species identification, number of individuals, behavior (flying, perching, soaring, hunting/foraging), height above ground, distance from facility components, and any noted interactions with facility components. If the bird being observed is perching, the type of perching structure and height is also recorded. Estimates of distance to structures and type of structures in the observation area are also recorded. Age and sex of bird is noted whenever possible. To ensure that all perched birds within the observation area are identified, a scan of the entire plot is conducted with binoculars immediately before and after the 10-minute survey period.

### *5.2.2 Avian use survey schedule*

Avian Use Surveys will commence upon issuance of construction permits in order to determine the baseline condition of avian use of Project areas. This baseline will be used for comparative analyses with post-construction survey data. A complete set of Avian Use Surveys (all Observation Points) will be conducted each month throughout the year in order to document variations in total bird abundance, species composition, and species richness. The surveys will continue, as prescribed, annually throughout the approximately three-year construction period and for three years after construction of the TSF facility is complete, per County of San Luis Obispo CUP Condition 62 (refer to Appendix A).

## 5.3 Avian Fatality Surveys

Topaz Solar Farms LLC will conduct Avian Fatality Surveys (i.e.: carcass searches) at the TSF Project Site. The Avian Fatality Survey program will search for, document, and report avian fatalities within the TSF Project and at offsite reference plots. Significance thresholds for avian mortality that trigger Adaptive Management are discussed in Section 6.2.

### *5.3.1 Avian fatality survey methods*

Avian Fatality Surveys will be conducted within the same four survey categories used for the Avian Use Surveys: Array Areas, Overhead Power Lines, Substation/Switching Station and Reference Sites.

Search Plots for each category will be comprised of a linear belt of land 500 feet long. This distance is equal to the width of a typical PV array (see Topaz Solar Farm Project Components diagram, Section 7.0).

**Array Area Search Plots** will be surveyed on foot along transects that are oriented east-west within the opening between PV table rows. Searchers will visually inspect the ground from the center line of the transect to the center line under each table row, as well as the table structures themselves, for evidence of bird collisions, electrocutions, and nesting (when applicable). The transect width will be approximately 14 feet (distance between PV table rows, center to center).

**Overhead Power Line Search Plots** will be surveyed on foot along transects that run down the center of the on-site collection system power line (see Topaz Solar Farm Project Components diagram, Section 7.0). Surveyors will visually inspect the ground from the center line of the power line to 10 feet beyond the power line edge on either side, searching for avian remains and visually inspecting each power pole for evidence of collision or flash-over (burn marks), as well as nesting (when applicable).

**Substation/Switching Station Search Plots** will be surveyed on foot along 500 foot long transects that bisect the facility. Each transect will cover a width of 25 feet. If surveyors are not able to bisect the facility on foot due to electrocution hazard, the transects shall be along the Substation/Switching Station perimeter fences.

**Reference Site Search Plots** will be surveyed on foot along transects through undisturbed grassland habitat on Conservation Land parcels. Transects will be 500 feet long and 25 feet wide.

### *5.3.2 Avian fatality data collection methods*

When a bird carcass is discovered while conducting Avian Fatality Surveys, information on the location, condition, and type of bird is recorded on a standardized datasheet (Appendix B). Fatalities found incidentally outside the search areas are documented following the same protocol for fatalities found during searches. However, for those fatalities a note is added at the top of the datasheet indicating the find was outside of the survey transect.

Bird carcasses found within the Project will be documented left in place. If an eagle or listed species is found, USFWS and CDFG will be contacted. The following information is collected for each bird carcass found:

- Incident number - A unique number for all birds collected, regardless of cause of death, that includes the year, month, date, and a number corresponding to the number found each day. For example, the third bird found Oct. 10, 2005 would be #20051010-03;
- Species - Species is identified as accurately as possible (red-tailed hawk, unknown Buteo, unknown hawk, California myotis). If unknown, it is listed as "unknown small bird" (smaller than a mourning dove), "unknown medium bird" (between a mourning dove and raven), "unknown large bird" (red-tail hawk-sized or larger) or "unknown bat";
- Plot Number - The Search Plot number in which the fatality was found;
- Age & Sex - If known;
- Nearest Structure - The nearest structure to the fatality (overhead wire, power pole, transformer, array, fence, etc.) and any identification numbers associated with that structure;
- Distance - The distance from the nearest structure to the remains in meters;
- GPS location;
- Body parts - All body parts found (for example, "whole bird" or "right wing" or "flight feathers only" or "skull, vertebrae, and sternum"). Bone measurements are included here.

- Cause of Death - Probable cause of death as determined by carcass location and condition (solar array collision, electrocution, predation, overhead lines, hit by car, etc.);
- Evidence - Reason for determination of cause of death when cause other than unknown is circled (e.g., fatality has broken right humerus, <10 m from overhead line);
- Estimated Time Since Death - Age of fatality (fresh, <1 week, <1 month, >1 month). Presence and type of insects, condition of flesh and eyes, whether or not leg scales or bones are bleached, coloration of marrow in bones, etc. are used to estimate time since death. Due to difficulty of determining age after ~1 week, categories are quite large;
- Decay - Stage of decay of the carcass (e.g., fresh, flesh and feathers, feathers and bone, feathers only).
- Color - If the color of the leg scales or cere have begun to fade.
- Notes - Additional information such as carcass condition and location, details for identification of rare species, band number if banded, obvious injuries, and potential cause of death if other than those listed above.
- Searchers - First and last initials of all present in case of future questions. The searcher recording the data lists his/her initials first.

### *5.3.3 Avian fatality survey schedule*

Construction of the TSF Project is proposed in phases over approximately three years. The Avian Fatality Survey program will be conducted over an approximate six year period (approximately three years construction monitoring and three years post-construction monitoring). Once construction begins, Avian Fatality Surveys will be conducted monthly, in phases where Project components have been completed, throughout the year. Avian Fatality Surveys will be conducted for seven consecutive days at the beginning of each month, throughout the year, where each day the total required Search Plots for each survey category will be completed (see below).

Once the first PV array installation is complete (i.e., PV modules have been installed), Avian Fatality Surveys will commence for the Array Area category. A portion of the total PV arrays constructed to date will be randomly selected for partial survey coverage each day for seven consecutive days. Within each of these partial coverage arrays, four Search Plots (rows between PV tables) will be selected and surveyed end to end, a distance of 500 feet. These four Search Plots will represent 10 percent of the approximately 40 Search Plots available in a typical array layout (refer to "Typical Array" diagram on the Project Components figure in Section 7.0). The number of Array Area Search Plots selected will be sufficient to provide rigorous statistical power for comparison of Array Area and Reference Sites (at least 30 degrees of freedom per treatment type).

Avian Fatality Surveys will commence at Overhead Power Lines upon installation. Ten percent of the completed Overhead Power Line Search Plots will be randomly selected and surveyed each day for seven consecutive days at the beginning of each month.

The Substation/Switching Station Search Plots will be surveyed when construction is complete. Each day for seven consecutive days at the beginning of each month, 100 percent of the Substation/Switching Station Search Plots will be surveyed.

Reference Sites will be randomly chosen in undisturbed grassland habitat on Topaz Conservation Lands. The number of Reference Site Search Plots surveyed each of the seven consecutive days will equal the number of Array Area Search Plots surveyed each day.

### *5.3.4 Searcher efficiency trials*

Because searcher efficiency and scavenging of carcasses can influence estimates of the total number of dead birds, searcher efficiency trials will be conducted to estimate the percentage of avian fatalities that are actually found by searchers compared to the total number of fatalities that occur (detected and undetected). The results of these trials are then used to adjust annual fatality estimates for detection bias. Searcher efficiency trials are a USFWS requirement of the study design (USFWS September 2010; 2011) and are a requirement of CUP DRC2008-00009 Condition 62).

Searcher efficiency trials will be conducted twice, once in spring and once in winter, beginning after installation of at least 5 percent of the total PV arrays. A trial administrator secretly places trial carcasses in test search areas. On the same day, search personnel conduct normal searches without knowledge of where or how many test carcasses have been placed in the search area. Within each search plot, carcass location is determined by randomly selecting a compass bearing and distance. Carcasses are marked with green tape on the legs and placed (by dropping from waist height) within the areas to be searched prior to the search on the same day.

Immediately after searches are conducted, the trial administrator determines how many of the efficiency trials were detected by the searcher, and returns to the search plots to recover any undetected trial carcasses. The number and location of the detection carcasses found during the carcass search are recorded, and the number of carcasses available for detection during each trial is determined immediately after the trial by the person responsible for distributing the carcasses. Carcass locations and trial results are recorded on a standardized searcher efficiency datasheet.

### *5.3.5 Scavenger/carcass removal trials*

In addition to searcher efficiency trials, carcass removal/scavenging trials will be conducted twice during the first monitoring year to estimate the length of time bird carcasses remain in the search area. The data from these trials is used to adjust carcass counts for removal bias in the determination of annual fatality rates. Carcass removal includes removal by predation or scavenging.

Sixty-day carcass removal trials will be conducted once in the spring and once in winter to incorporate varying weather conditions, vegetative conditions and other effects. Fresh carcasses (with the exception of golden eagles or other listed species) will be left in the field to be monitored. Carcasses will be marked with green tape hidden under the bird on the legs and left in place as a trial carcass. If fresh non-euthanized carcasses of target raptors or surrogates are available to supplement carcasses found during searches, these will be placed randomly throughout the survey area. Supplemental carcasses will be

placed within 20 meters of random power lines or within 10 meters of randomly selected solar arrays. For each of these structures, a random compass bearing between 1 and 360, and a random distance between 1 and 20 or 1 and 10 will be selected. In the field, a flag is placed at each random location, but the actual carcass is placed 10 meters north of the flag in order to help conceal the carcass. Each carcass is marked with green electrical tape on both legs for recognition by searchers and other personnel, and dropped from waist height. Upon placing carcasses, the species, UTM coordinates, date, and time is noted on the carcass removal datasheet (Appendix B).

Experimental carcasses are checked over a period of 60 days. Carcasses are checked every day for the first 3 days after placement, twice a week for the next two weeks, then once per week for the remainder of the 60-day trial. At each visit, it is noted whether the carcass is intact (I), scavenged (S), a feather spot (FS; >10 feathers), or absent (0; <10 feathers). In addition the type and degree of scavenging, possible scavengers are noted and photos are taken on each day of the trial surveys. All remaining trial carcasses and feathers will be removed after the 60-day trial is terminated.

## 5.4 Analysis Methods

### *5.4.1 Bird utilization rate*

The Bird Utilization Rate is calculated herein as the number of unique bird detections divided by the number of observation point counts. Unique bird detections may include a single bird or multiple birds observed together. Visual and auditory detections are included. Bird Utilization Rate can be extrapolated for different variables, as needed, such as number of bird detections per unit time.

### *5.4.2 Bird fatality rate*

Bird Fatality Rate is calculated herein as the number of unique bird carcasses detected divided by the number of plots searched. Avian Fatality Surveys will be conducted monthly and results reported quarterly. Therefore, the Bird Fatality Rate thus calculated would be for a 3-month period. This number can be re-calculated for monthly or yearly fatality rates, as needed, and adjusted for scavenger and searcher efficiency biases.

### *5.4.3 Bird risk index*

The Bird Risk Index is calculated herein as the Fatality Rate divided by the Utilization Rate. This index number will facilitate statistical analysis of avian mortality risk for Project component categories, compared against each other as well as compared to reference sites (controls). The significance threshold for avian mortality that would trigger adaptive management can be defined by either the Bird Fatality Rate or the Bird Risk Index (refer to Section 6.2).

## 5.5 Reporting Requirements

Results of the avian mortality monitoring will be reported quarterly to the County of San Luis Obispo, CDFG, and USFWS throughout the approximately three year construction period and for three years post-construction. Following the completion of each year's fourth quarter of monitoring, an annual report for the calendar year will be prepared that summarizes the entire year's data, analyzes any Project-related bird fatalities or injuries

detected in terms of the Bird Utilization Rate, Bird Fatality Rate and Bird Risk Index, and provides recommendations for future monitoring and any adaptive management actions needed (refer to Section 6.0).

# 6.0 BMAP Adaptive Management

Topaz Solar Farms LLC has incorporated siting criteria, design features and best management practices into the Project that will provide significant avoidance and minimization measures to reduce the potential for adverse effects on birds and bats. With these avoidance and minimization measures in place, Topaz Solar Farms, LLC is confident the Project would have little or no mortality on birds and/or bats.

However, Topaz Solar Farms LLC is committed to operating and maintaining a long-term project that successfully minimizes bird and bat exposure to potential collision and/or electrocution mortality. To this end, and utilizing the data and recommendations that will be gained from the BMAP, Topaz Solar Farms LLC will implement Adaptive Management practices as outlined herein.

## 6.1 Adapting the Level and/or Intensity of Monitoring Efforts

The level and/or intensity of the avian use and avian fatality monitoring efforts may be adjusted based on review of quarterly monitoring reports by the regulating agencies.

The following adjustments may be incorporated based on results of monitoring efforts:

- Higher percentage of Search Plots will be monitored;
- Lower percentage of Search Plots will be monitored;
- Higher or lower percentage of specific types of plots (Array Areas, Overhead Power Lines, or Substation/Switching Station) will be monitored;
- Monitoring of specific types of plots will be discontinued.

## 6.2 Significance Thresholds

Specific significance thresholds that would trigger Adaptive Management will be defined in the Year 1 annual report based on analysis of the Year 1 data. Significance thresholds will be based on statistical comparison of Project Site data and offsite reference plot data. Comparison with reference plots will provide insight regarding the significance of any detected fatalities, so that thresholds can be assigned with confidence. If, in the event that Year 1 data is insufficient to determine significance thresholds because the amount of construction was less than anticipated, the Year 2 annual report shall make these recommendations.

## 6.3 Project Site Findings and Actions

### *6.3.1 Significant electrocution mortality*

Finding: Significant electrocution mortality from energized equipment
Actions: Install insulating covers. Install perch deterrents. Retrofit equipment to provide for increased separation.

Finding: Significant mortality of listed species caused by electrocution from energized equipment (statistically higher than control plots)
Action: Consult with USFWS. Increase percentage of Search Plots within the search category associated with the mortality

Finding: Insignificant mortality and no fatalities of listed species due to electrocution
Action: Lower percentage of those plot types will be monitored or monitoring of those plot types will be discontinued

### *6.3.2 Significant collision mortality*

Finding: Significant mortality from collision with over head power lines (Statistically higher than control plots)
Action: Install bird flight diverters

Finding: Significant mortality from collision with solar arrays (statistically higher than control plots)
Actions: Determine underlying cause of collisions. Install bird flight diverters. Work with regulatory agencies to identify remedial actions.

Finding: Significant mortality of listed species caused by collision with Project components (statistically higher than control plots)
Action: Consult with USFWS. Increase percentage of Search Plots within the search category associated with the mortality

Finding: Insignificant mortality and no fatalities of listed species due to collision
Action: Lower percentage of those plot types will be monitored or monitoring of those plot types will be discontinued

### *6.3.3 Nest building*

Finding: Nest building on TSF structures observed
Actions: Determine condition of nest (active or inactive). Remove nesting material if inactive. Cover holes to discourage cavity nesters. Install nest discouragers. Install alternate nest platforms/nest boxes. Establish avoidance buffer zone around active nests for duration of breeding season.

*6.3.4 Avian use*

Finding: Burrowing owls inhabiting burrows on Project Site during construction phase, outside breeding season.

Action: No action, if no mortality occurs. Passively relocate burrowing owls off Project Site and collapse burrows, if approved by wildlife agencies.

Finding: Significant increase of avian use of Project Site due to attraction to man-made dust control pond or other Project components

Action: Install bird netting over pond. Remove surrounding vegetation to decrease attractiveness. Drain/fill area. Install perch discouragers.

*6.3.5 Nesting*

Finding: Listed/Fully Protected species nesting on or adjacent to Project Site.

Action: Establish appropriate avoidance buffer zone around nest for duration of breeding season. Monitor nesting birds for duration of breeding season.

*6.3.6 Avian Use*

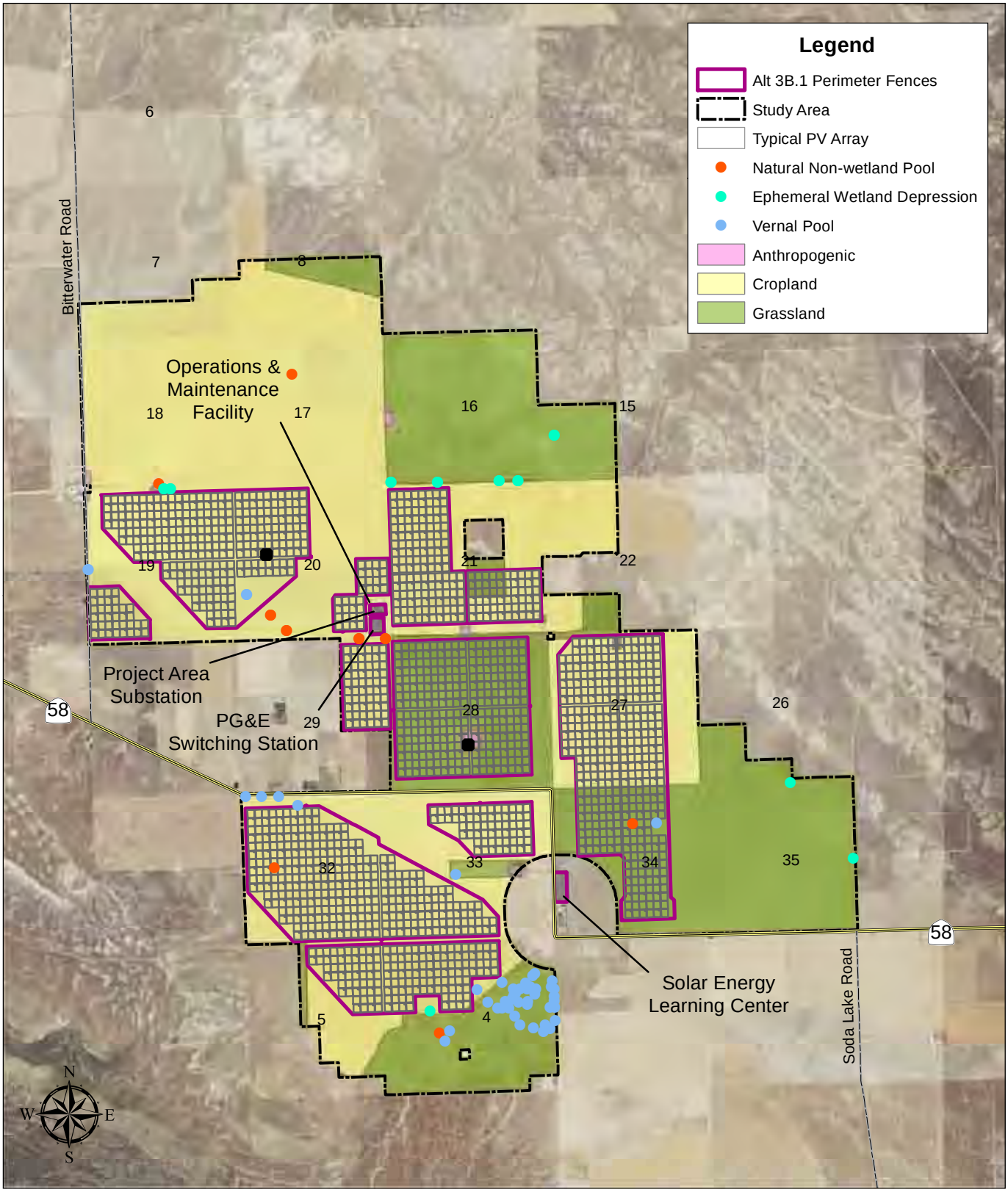
Finding: Significant increase in use of Project Site by raptors/scavengers due to scavenger/carcass removal trials.

Action: Discontinue trial study and use published study data to determine scavenging bias.

# 7.0 TSF Figures

- **Figure 1. Habitat Map**
- **Figure 2. Burrowing Owl Map**
- **Figure 3. Golden Eagle Aerial Nest Survey Results**
- **Figure 4. Topaz Conservation Lands**
- **Topaz Solar Farm: Site Plan**
- **Topaz Solar Farm: Project Components**
- **Topaz Solar Farm: Switchyard & Substation Layout**
- **Topaz Solar Farm: Electrical Collection System Plan**
- **Topaz Solar Farm: Tower & Pole Details**
- **Hendrix Spacer Cable System: Example Photograph**

# Figure 1. Habitat Map



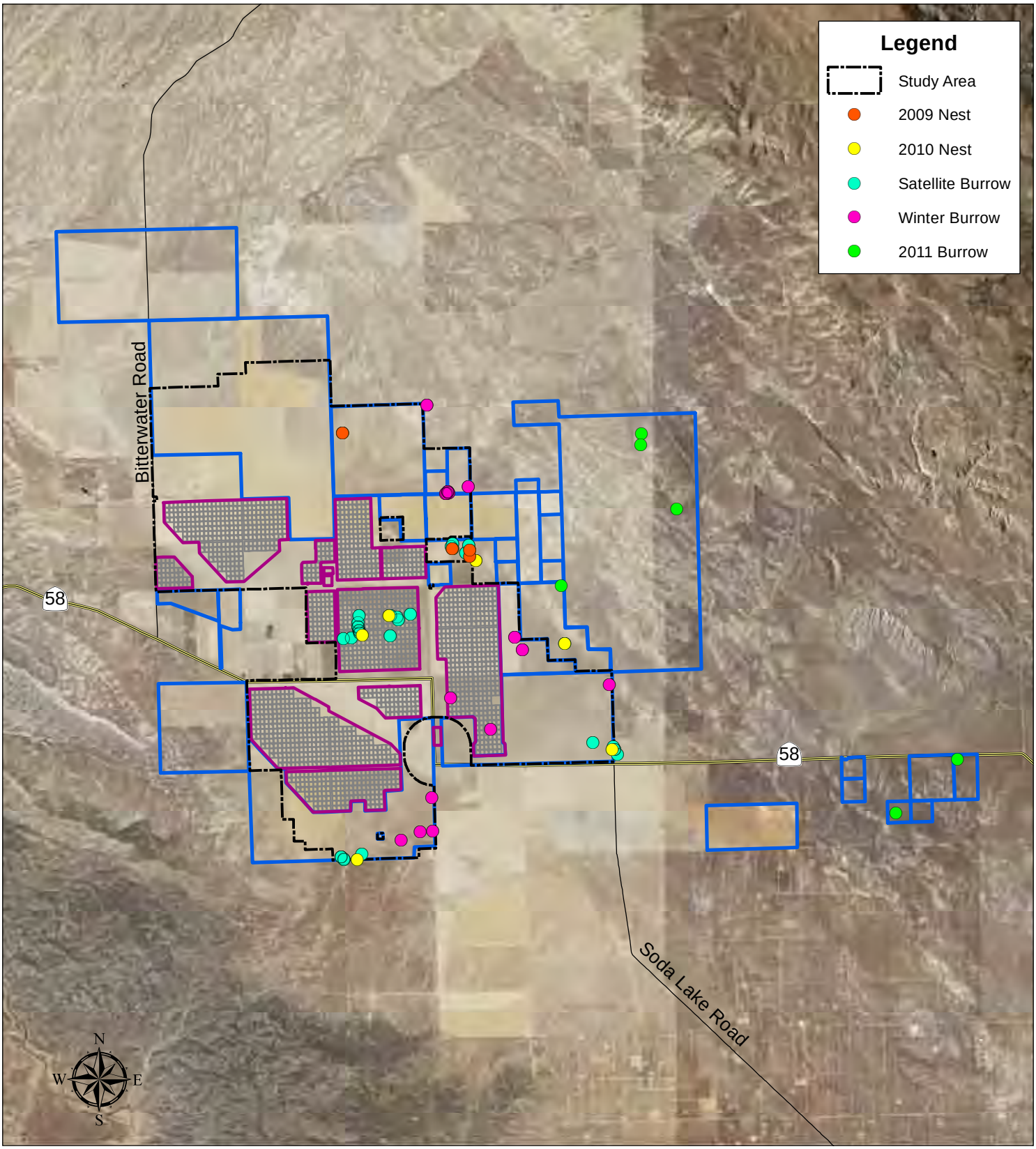


Topaz Solar Farms, LLC
1111 Broadway, 4th Floor
Oakland, CA 94607

2009 San Luis Obispo County
NAIP Aerial Photography
Map Updated: June 07, 2011

Althouse and Meade, Inc.
1602 Spring Street
Paso Robles, CA 93446

# Figure 2. Burrowing Owl Map

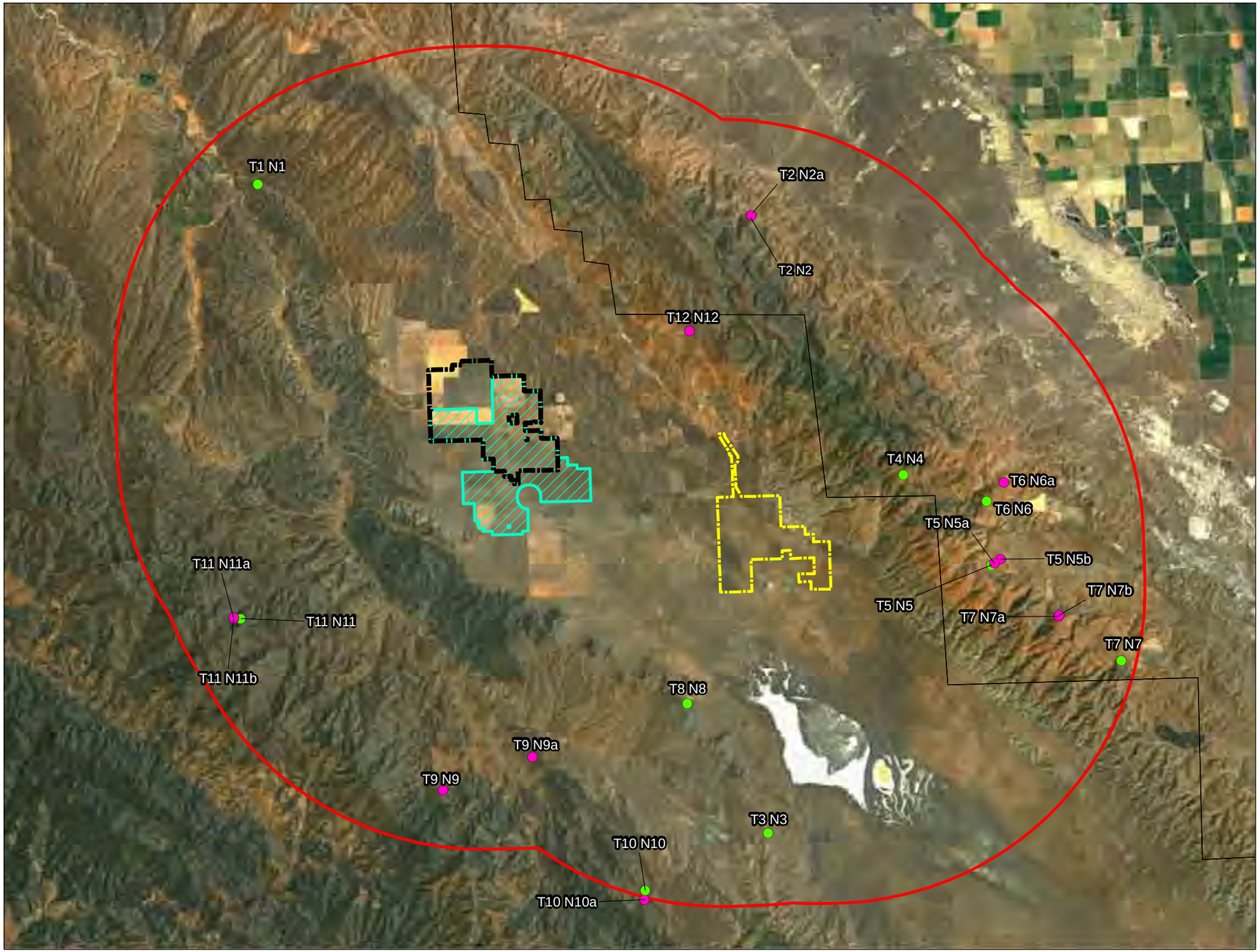



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Map Updated: June 7, 2011

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# Figure 3. Golden Eagle Aerial Nest Survey Results




## Legend

- Option A Study Area Boundary
- Option B Study Area Boundary
- Sun Power Study Area
- Survey Area (448,647 acres)
- California Condor Critical Habitat
- Active Nest
- Inactive Nest

T1= Eagle Territory Number
N1= Eagle Nest Number

N
W E
S

0 2 4 8 Miles

*Aerial nest surveys conducted by:*
*Brian Latta*
*Senior Raptor Biologist*
*230 Ross St.*
*Santa Cruz, CA 95060*

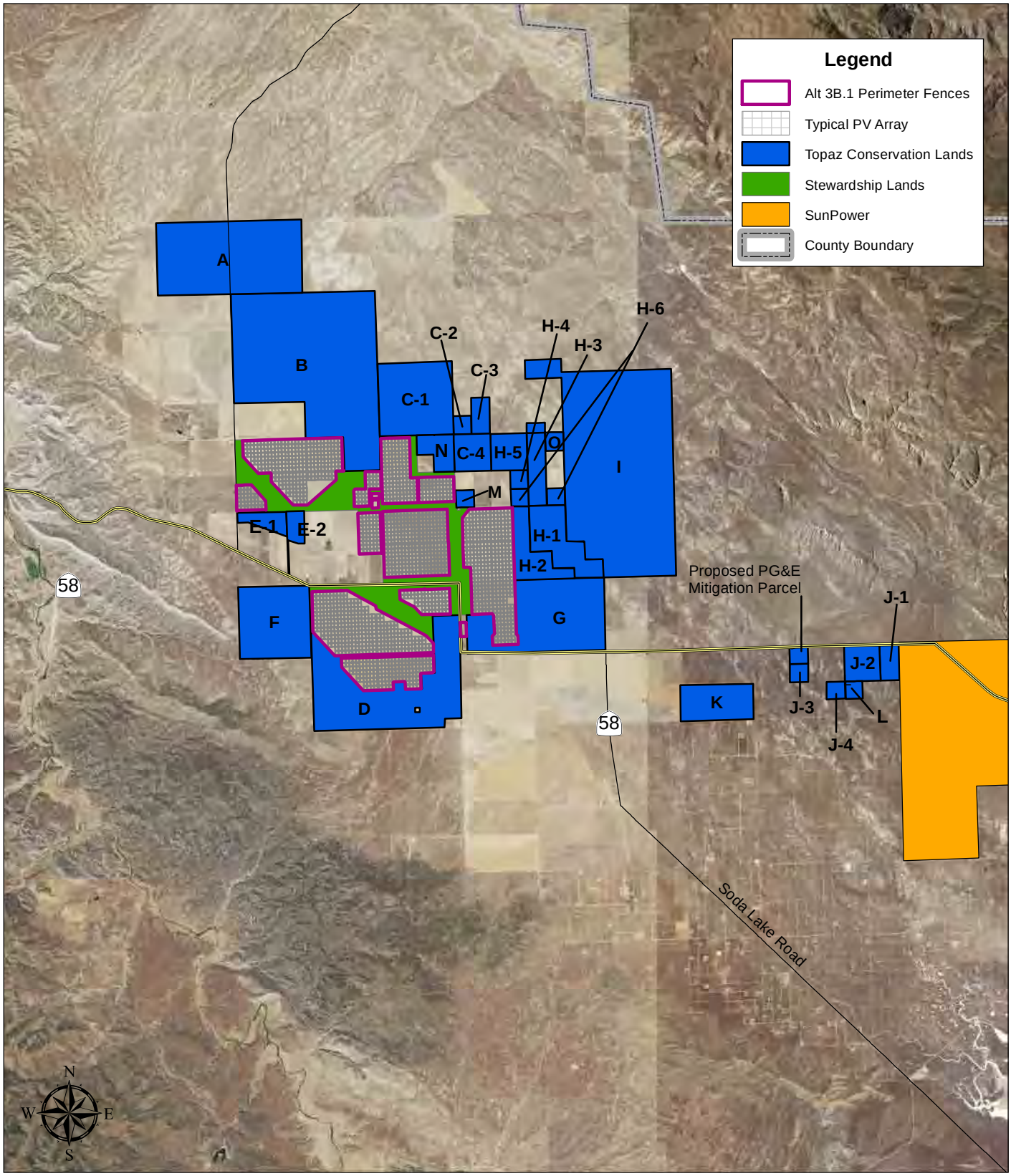
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Topaz Solar Farms LLC
1111 Broadway, 4th Floor
Oakland, CA 94607

2005 NAIP Aerial Photography
Map Updated June 7, 2011

Althouse and Meade, Inc.
1602 Spring Street
Paso Robles, CA 93446

# Figure 4. Topaz Conservation Lands



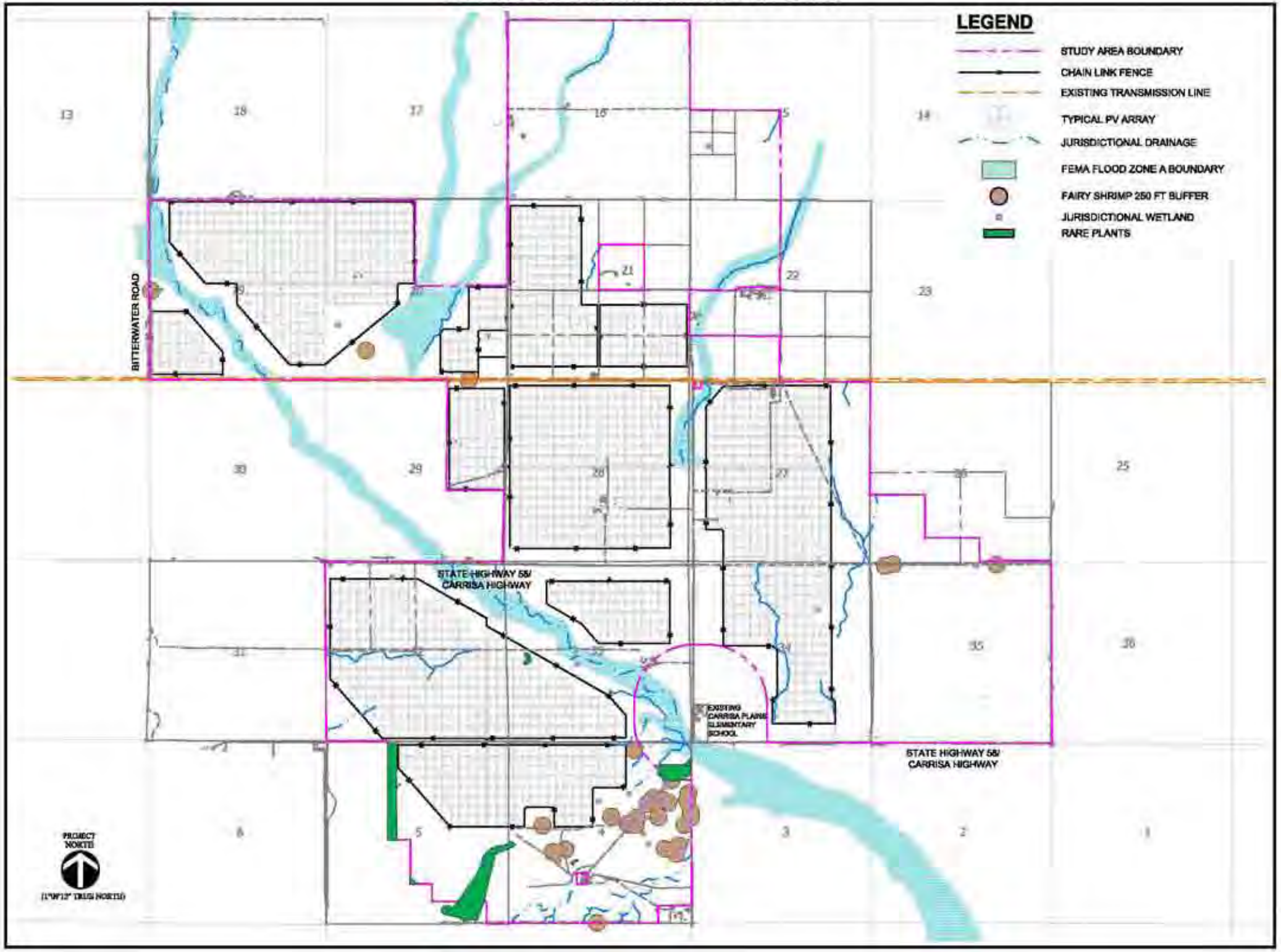


Topaz Solar Farms, LLC
1111 Broadway, 4th Floor
Oakland, CA 94607

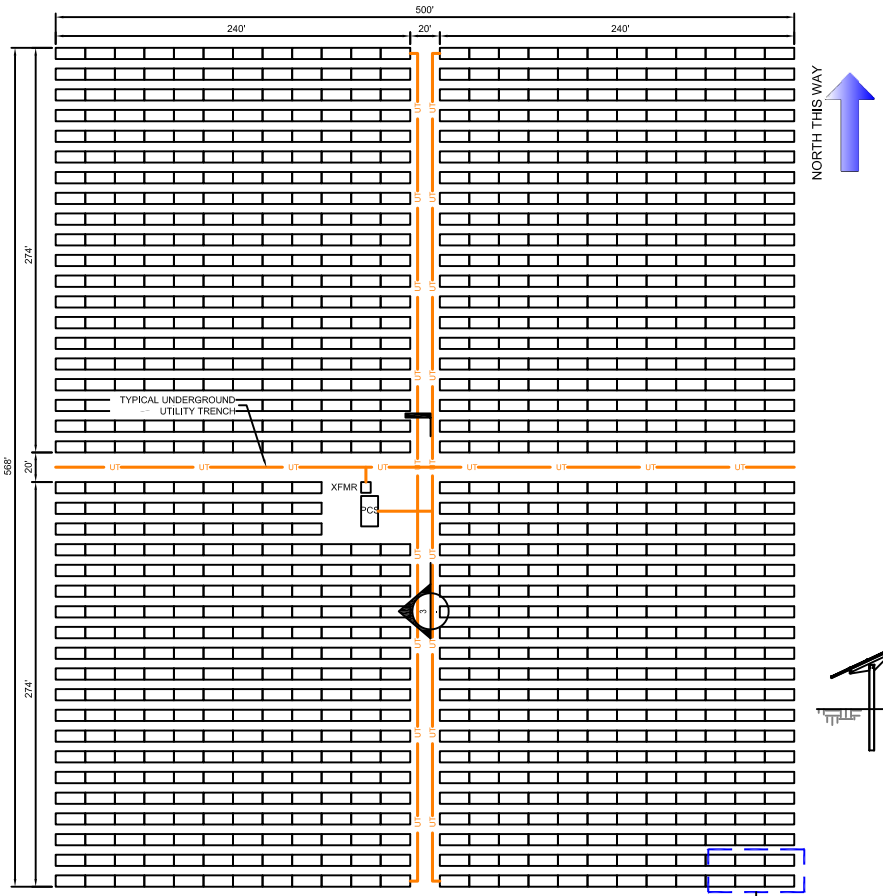

2009 San Luis Obispo County
NAIP Aerial Photography
Map Updated: June 2, 2011


Althouse and Meade, Inc.
1602 Spring Street
Paso Robles, CA 93446

# TOPAZ SOLAR FARM: SITE PLAN



# TOPAZ SOLAR FARM: PROJECT COMPONENTS

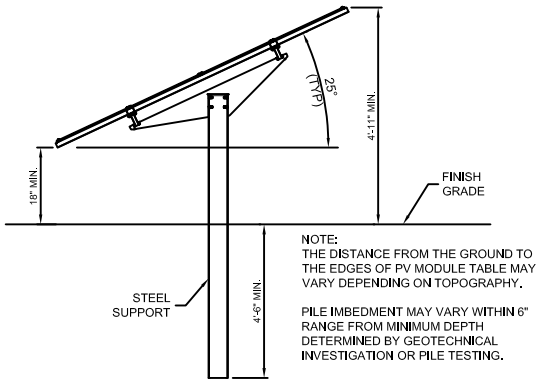



PHOTOVOLTAIC SYSTEM
TYPICAL ARRAY
1
Scale: NTS

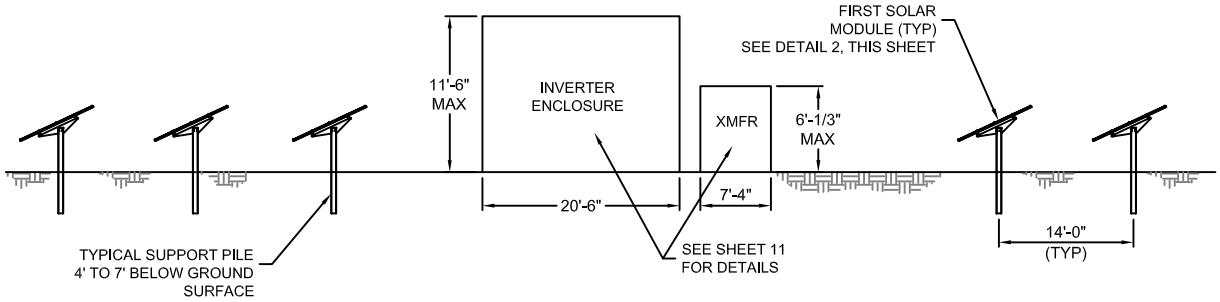


FOUR-PANEL PERSPECTIVE
Scale: NTS

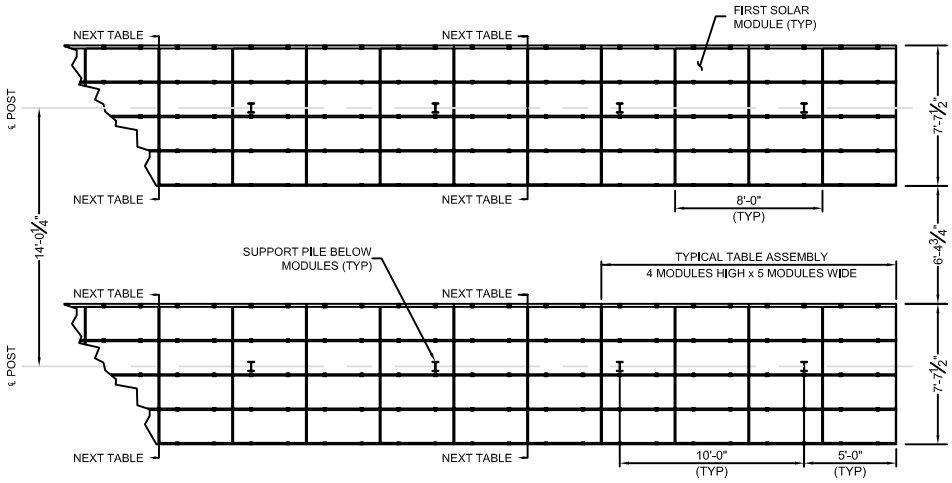
NOTE:
TYPICAL ARRAY CONFIGURATION SHOWN IS A PRELIMINARY DESIGN AND SUBJECT TO CHANGE.




2 DETAIL
Scale: NTS

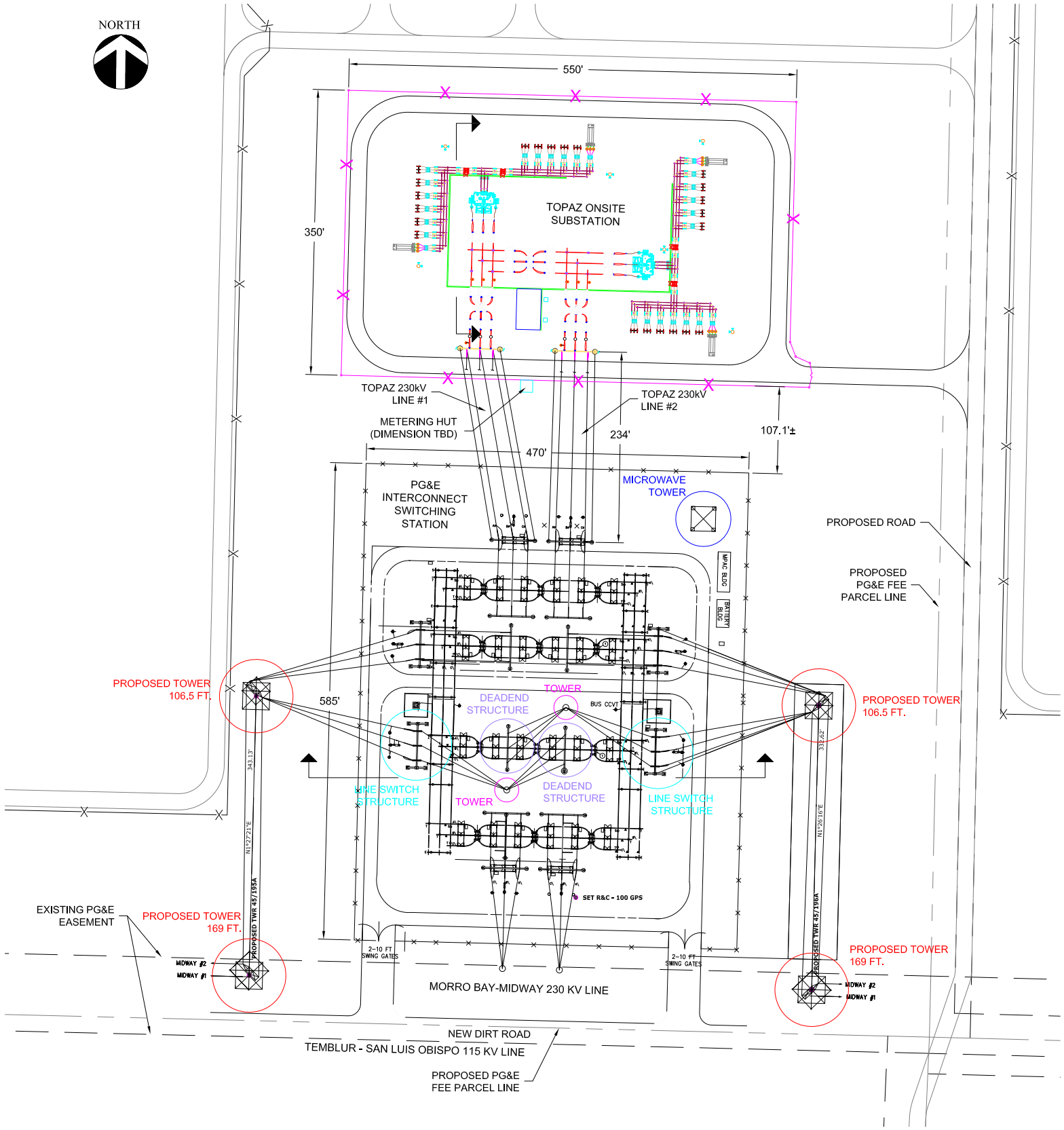



3 ARRAY ELEVATION SIDE VIEW
Scale: NTS

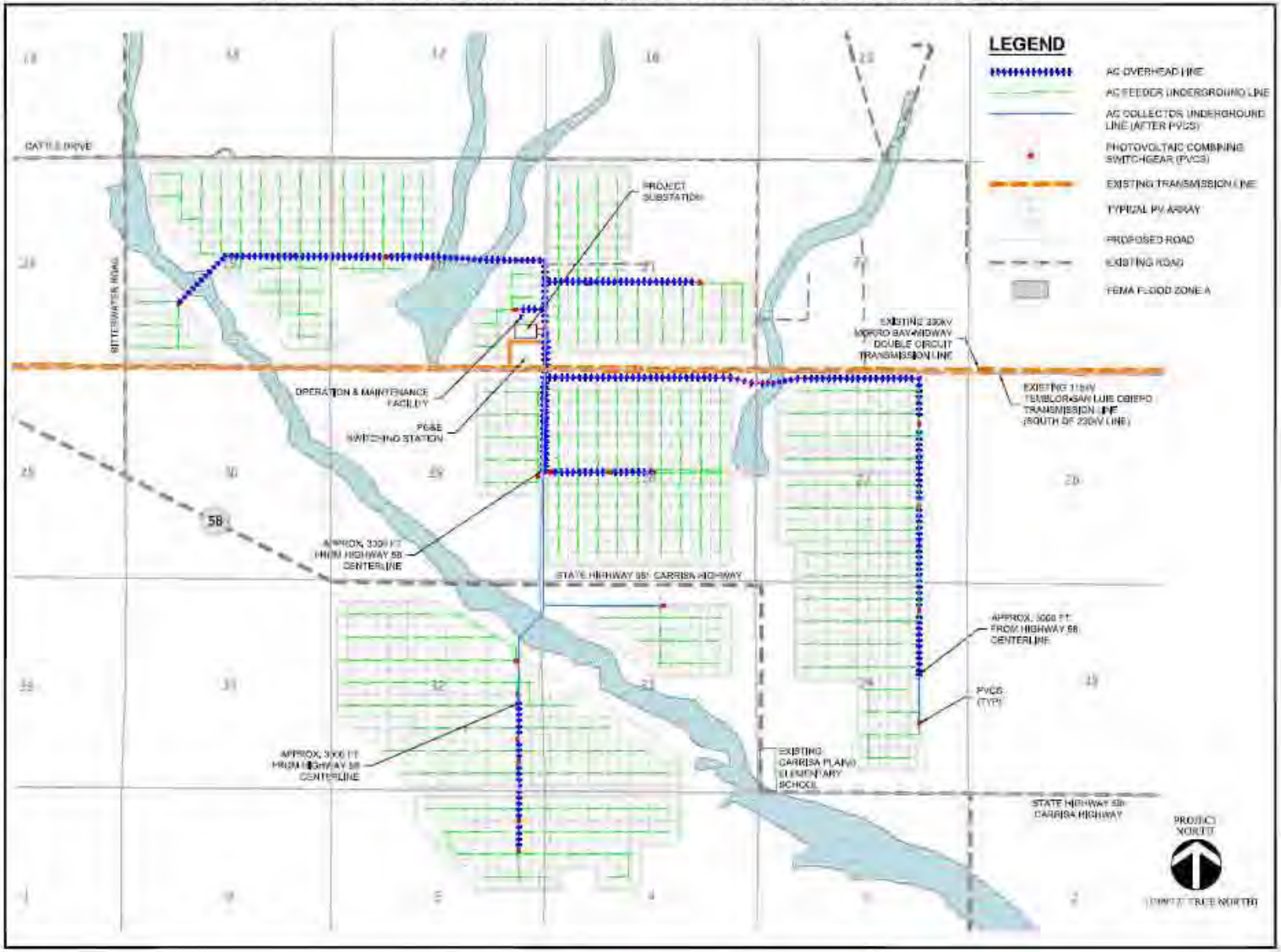



4 TABLE ASSEMBLY
Scale: NTS

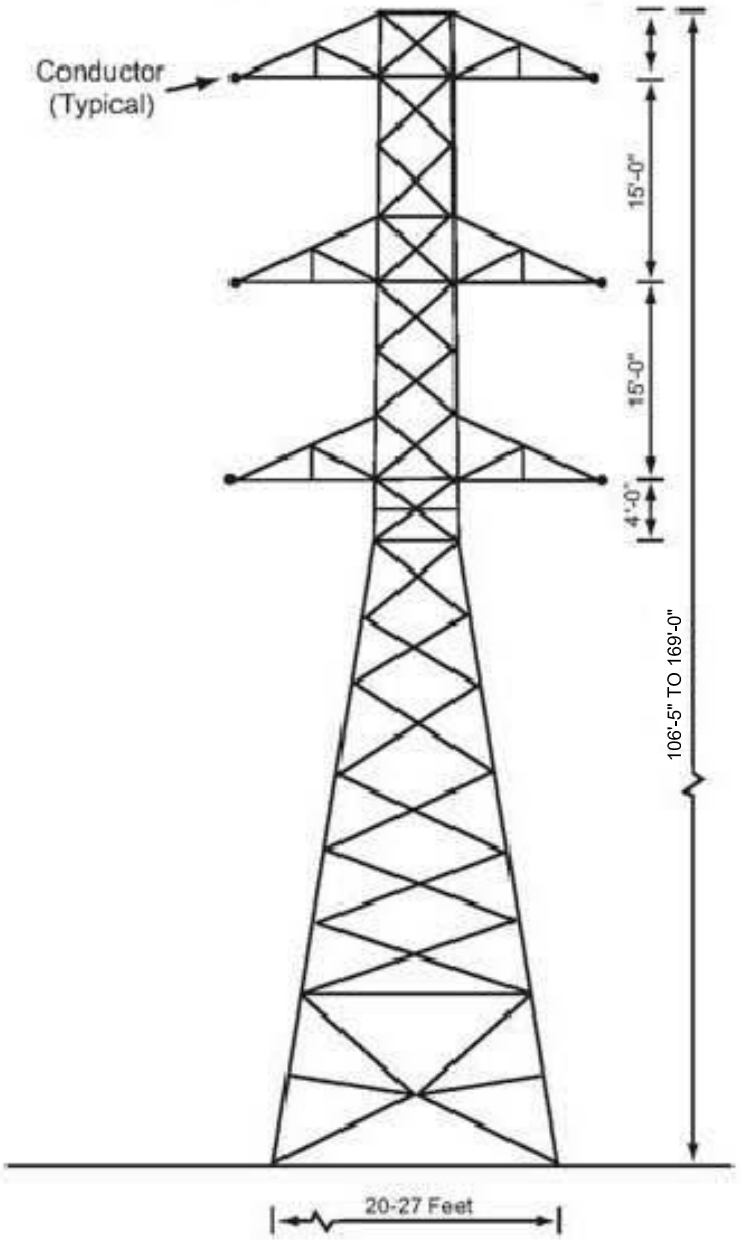
# TOPAZ SOLAR FARM: SWITCHYARD & SUBSTATION LAYOUT



# TOPAZ SOLAR FARM: ELECTRICAL COLLECTION SYSTEM PLAN

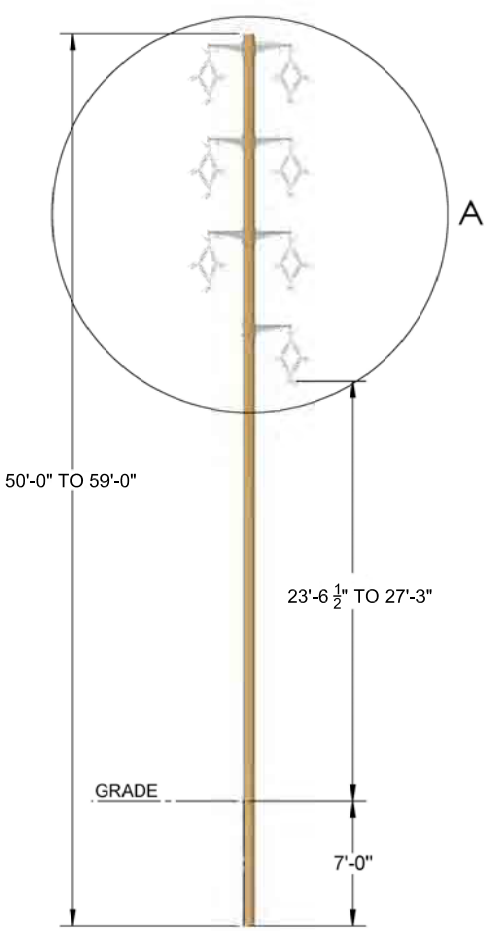


# TOPAZ SOLAR FARM: TOWER & POLE DETAILS

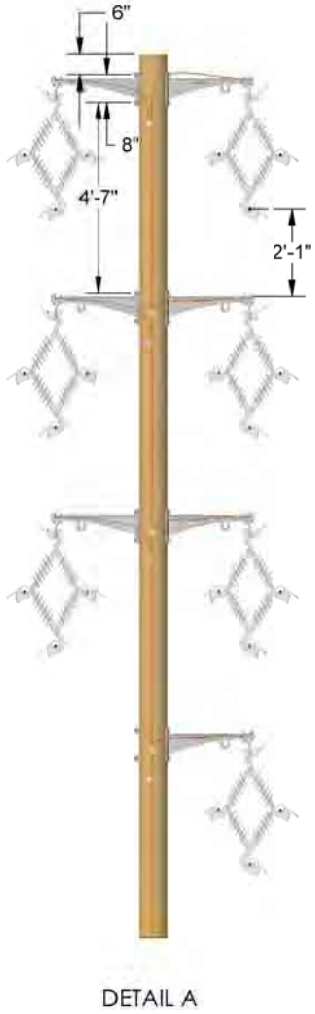



**LATTICE STEEL TOWER**

SCALE: NONE




POLE HEIGHT RANGES FROM 43' TO 52' ABOVE GROUND.




DETAIL A

**34.5kV WOODEN POLE**

SCALE: NONE



**Hendrix Spacer Cable System Example Photograph**

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# Appendix A – San Luis Obispo County CUP DRC2008-00009 Applicable Conditions of Approval

## CUP Condition 42

**MM BR-1.1 - Implement a Worker Training Program. Prior to issuance of a construction permit** a Worker Training Program (WTP) shall be submitted for County approval. **Prior to any site disturbance or other construction-related activities** on site (i.e., invasive, non-biological surveying; mobilization; fencing; grading; or construction), the approved WTP shall be implemented by Applicant. The County Environmental Monitor shall verify implementation and proper employee training. The WTP shall be implemented throughout the **duration of project construction**. The WTP, shall include, at a minimum, the following items:

a. Training materials and briefings shall include but not be limited to: a discussion of the Federal and State Endangered Species Acts, Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act; the consequences of non-compliance with these acts; identification and values of plant and wildlife species and significant natural plant community habitats; hazardous substance spill prevention and containment measures; a contact person and phone number in the event of the discovery of dead or injured wildlife; and a review of mitigation requirements.

b. A discussion of measures to be implemented for avoidance of the sensitive resources discussed above and the identification of an onsite contact in the event of the discovery of sensitive species on the site. This will include a discussion on microtrash and its potential harmful effects on California condors.

c. Protocols to be followed when road kill is encountered in the work area or along access roads to minimize potential for additional mortality of scavengers, including listed species such as the California condor and the identification of an onsite representative to whom the road kill will be reported. Road kill shall be reported to the appropriate local animal control agency within 24 hours.

d. Maps showing the known locations of special-status wildlife, populations of rare plants and sensitive vegetative communities, seasonal depressions and known waterbodies, wetland habitat, exclusion areas, and other construction limitations (e.g. limited operating periods, etc.). These features shall be included on the project plans and specifications drawings.

e. Literature and photographs or illustrations of potentially occurring special-status plant and/or wildlife species will be provided to all project contractors and heavy equipment operators.

f. The Applicant shall provide to the County of San Luis Obispo evidence that all onsite construction and security personnel have completed the WTP **prior to the start of site mobilization**. A special hardhat sticker or wallet size card shall be issued to all personnel completing the training which shall be carried with the trained personnel at all times while on the project site. All new personnel shall receive this training and may not work in the field without participating in the WTP. A log of all personnel who have completed the WTP training shall be kept onsite.

g. A weather protected bulletin board or binder shall be centrally placed or kept onsite (e.g., in the break room, construction foreman's vehicle, construction trailer, etc.) for the duration of the construction. This board or binder will provide key provisions of regulations or project conditions as they relate to biological resources or as they apply to grading activities. This information shall be easily accessible for personnel in all active work areas.

h. Develop a standalone version of the WTP, that covers all previously discussed items above, and that can be used as a reference for maintenance personnel **during project operations**.

## CUP Condition 50

**MM BR-6.1 - Conduct pre-construction surveys for nesting and breeding birds and implementation of avoidance measures. Prior to any site disturbance** within the recognized breeding season for nesting birds (i.e., mobilization, staging, grading or construction), the Applicant shall retain a County-approved biologist to conduct pre-construction surveys for those nesting birds in all areas within 500 feet of solar arrays, staging areas, substation sites, and access road locations. Surveys for raptors shall be conducted for all areas from February 1 to August 15. The required survey dates may be modified based on local conditions, as determined by the County-approved biologist, with the approval of the County of San Luis Obispo, in consultation with the USFWS and/or CDFG. Measures intended to exclude nesting birds shall not be implemented without prior approval by the County in consultation with USFWS and/or CDFG and shall not exceed County noise standards.

If breeding birds with active nests are found **prior to or during construction**, a biological monitor shall establish a 300-foot buffer around the nest for ground nesting species and a 500 foot buffer for raptors from ground-based construction activities and no activities will be allowed within the buffer(s) until the young have fledged from the nest or the nest fails.

If nesting bald or golden eagles are identified, a 0.5-mile no-activity buffer will be implemented. Should condors be found roosting within 0.5 miles of the construction area, no construction activity shall occur between 1 hour before sunset to 1 hour after sunrise, or until the condors leave the area. Should condors be found nesting within 1.5 miles of the construction area, no construction activity will occur until further authorization from the USFWS. All California condor sightings in the project area will be reported directly to the USFWS by the County-approved biologist.

The prescribed buffers may be adjusted to reflect existing conditions including ambient noise, topography, and disturbance with the approval of the County of San Luis Obispo, CDFG and USFWS as appropriate. The biological monitor(s) shall conduct regular monitoring of the nest to determine success/failure and to ensure that project activities are not conducted within the buffer(s) until the nesting cycle is complete or the nest fails. The biological monitor(s) shall be

responsible for documenting the results of the surveys and ongoing monitoring and will provide a copy of the monitoring reports for impact areas to the respective agencies.

If for any reason an active bird nest must be removed during the nesting season, the Applicant shall provide written documentation providing concurrence from the USFWS and CDFG authorizing the nest relocation. Additionally, the Applicant shall provide a written report documenting the relocation efforts. The report shall include what actions were taken to avoid moving the nest, the location of the nest, what species is being relocated, the number and condition of the eggs taken from the nest, the location of where the eggs are incubated, the survival rate, the location of the nests where the chicks are relocated, and whether the birds were accepted by the adopted parent.

Surveys shall be conducted to include all structural components of the incomplete solar arrays requiring further construction and related structures as well as all construction equipment. If birds are found to be nesting in facility structures, buffers as described above shall be implemented. If birds are found to be nesting in construction equipment, that equipment shall not be used until the young have fledged the nest or, if no young are present, until after the breeding season has passed.

If trees or existing poles/towers with raptor nests are to be removed as part of project-related construction activities they will be done so outside of the nesting season to avoid additional impacts to nesting raptors. If removal of a tree or existing pole/tower with a nest cannot be avoided during the nesting season then the biological monitor must confirm that the nest is vacant prior to its removal. If nests are found within these structures and contain eggs or young the biological monitor shall allow no activities within a 300-foot buffer for nesting birds and/or a 500-foot buffer for raptors (excluding golden eagle and condors, see above) until the young have fledged the nest.

**During construction**, compliance will be verified by the County Environmental Monitor, that would include conducting routine checks of nests during the known breeding season and, if young are present, monitor until young have fledged.

## CUP Condition 60

**MM BR-11.1 - Monitor construction in condor habitat and remove trash and microtrash from the work area daily.** To minimize project-related impacts to and avoid the loss of California condors, the Applicant shall employ the following measures:

a. **Microtrash –** All trash is required to be disposed of as indicated above under MM BR-1.2. Additional language has been added to this Mitigation Measure to address the disposal of microtrash. Workers, as part of the WTP, shall be trained on the issue of microtrash (what it is, its potential effects to California condors, and how to avoid the deposition of microtrash). In addition, the

Applicant shall assign a specific person(s) to conduct daily sWTPs of the work area to collect and remove trash in locations with the potential for California condors to occur.

b. **Education – Prior to the commencement of construction activities**, all workers will attend the WTP. The Applicant shall develop a fact sheet or other notice, to be presented as part of the WTP, which will be distributed to all workers on the project **prior to the start of construction** containing information on the California condor. Information to be included consists of the following: species description with photos and/or drawings indicating how to identify the California condor and how to distinguish condors from turkey vultures and golden eagles; protective status and penalties for violation of the Endangered Species Act; avoidance measures being implemented on the project; and contact information for communicating condor sightings.

c. **Avoidance** – Should a condor land within the project area all work shall be stopped within 500 feet of the condor until the bird has left the area on its own. If the bird fails to leave the area because of injury or other factors the Applicant shall contact the USFWS /CDFG and County for direction.

d. **Reporting** – All California condor sightings in the project area shall be reported directly to the USFWS/CDFG and County within 24 hours.

**During construction**, compliance will be verified by the County Environmental Monitor.

## CUP Condition 61

**MM BR-13.1 - Implement Avian Power Line Interaction Committee guidelines (APLIC).** The Applicant will be required to construct all transmission facilities, towers, poles and lines in accordance with and comply with all policies set forth in the *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* (APLIC), to minimize avian electrocutions as a result of the construction of the Project. Details of design components shall be indicated on all construction plans and measures to comply with APLIC policies and guidelines shall be detailed in a separate attachment, all of which will be submitted with the construction permit application for County approval **prior to construction permit issuance**.

The Applicant shall be required to monitor for new versions of the APLIC guidelines and update designs or implement new measures as needed during project construction provided these actions do not require the purchase of previously ordered transmission line structures. A review by the County Environmental Monitor of compliance with County-approved plans will be conducted **prior to the final County inspection**.

## CUP Condition 62

**MM BR-14.1 - Prepare and implement a Bird Monitoring and Avoidance Plan.** The Applicant shall retain a County-approved biologist (ornithologist with a record of publication in peer-reviewed journals) to prepare a Bird Monitoring and Avoidance Plan in consultation with California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS). This plan shall follow the Avian Protection Plan guidelines outlined by USFWS. The Bird Monitoring Study shall consider prior studies by McCrary et al. (1986) or other applicable literature. The Bird Monitoring and Avoidance Plan shall be submitted to the County for approval **prior to the issuance of a construction permit**.

The plan will require monitoring the death and injury of birds and bats from collisions with facility features such collector/distribution lines, solar modules, and dust control ponds. The study design shall be approved by the County of San Luis Obispo in consultation with CDFG and USFWS. The Bird Monitoring Study shall include at a minimum detailed specifications on data, a carcass collection protocol and a rationale justifying the proposed schedule of carcass searches. The study shall also include seasonal trials to assess bias from carcass removal by scavengers as well as searcher bias.

During construction and for three years following the beginning of the solar farm operation the County-approved biologist shall submit quarterly reports to the County of San Luis Obispo, CDFG, and USFWS describing the dates, durations, and results of monitoring and data collection. The quarterly reports shall provide a detailed description of any project-related bird or wildlife deaths or injuries detected during the monitoring study or at any other time. Following the completion of the fourth quarter of monitoring the biologist shall prepare an annual report that summarizes the year's data, analyzes any project-related bird fatalities or injuries detected, and provides recommendations (in consultation with the County) for future monitoring and any adaptive management actions needed.

**Thresholds.** Thresholds for bird impacts will be determined by the County in consultation with CDFG and USFWS. If the County determines that bird mortality caused by solar facilities is substantial, the Applicant shall be required to implement some or all of the mitigation measures below.

**Implementation Measures**. To minimize bird mortality caused by solar facilities, the Applicant may be required to install additional bird/bat flight diverters, alter project components that have been identified as key mortality features (i.e., relocation or undergrounding of some features, when compatible with other avoidance and minimization measures, the modification of project colors or coatings), or implement other appropriate actions approved by the County and regulatory agencies based on the findings of the Bird Monitoring and Avoidance Plan.

If mitigation actions are required, the annual reporting shall continue until the County of San Luis Obispo, in consultation with CDFG and USFWS determines whether more years of monitoring are needed, and whether additional adaptive management measures are necessary. After the Bird Monitoring Study is

determined by the County of San Luis Obispo to be complete, the Applicant shall prepare a paper that describes the study design and monitoring results to be submitted to a peer-reviewed scientific journal or to the County. Proof of submittal shall be provided to the County of San Luis Obispo, CDFG and USFWS within one year of concluding the monitoring study.

The County Environmental Monitor shall verify the monitoring of impacts to birds **during construction** and for **one year after completion of construction**.

## CUP Condition 73

**MM BR-22.1 - Complete focused pre-construction burrowing owl surveys and implement avoidance measures.** No more than 15 days **prior to the commencement of initial ground disturbing activities for each phase** (construction of each solar array) of the project, the Applicant shall implement focused pre-construction reconnaissance level surveys for burrowing owls. Surveys shall be conducted **prior to the initiation of ground disturbance** and be conducted by a County-approved biologist(s), knowledgeable about the species. In conformance with federal and State regulations regarding the protection of raptors, surveys for burrowing owls shall be conducted in conformance with the California Burrowing Owl Consortium's 1993 protocols, which are recommended by the CDFG and consist of a minimum of one site visit. If owls are present or active burrows are found then, per the protocols noted above, a minimum of four additional site visits will be required to document the on-site population. Surveys shall be completed within all areas proposed for ground disturbance and shall include the following avoidance measures:

a. Occupied burrows shall not be disturbed during the nesting season (1 February through 31 August) unless a County-approved biologist approved by CDFG verifies through non-invasive methods that either the birds have not begun egg-laying and incubation or that juveniles from the occupied burrows are foraging independently and are capable of independent survival. Burrowing owls present onsite after 1 February will be assumed to be nesting unless evidence indicates otherwise. This protected buffer area will remain in effect until 31 August, or based upon monitoring evidence, until the young owls are foraging independently or the nest is no longer active.

b. Unless otherwise authorized by CDFG and the County, a 250-foot buffer, within which no activity will be permissible, will be maintained between Project activities and nesting burrowing owls during the nesting season. This protected area will remain in effect until 31 August or based upon monitoring evidence, until the young owls are foraging independently. For burrowing owls present during the non-breeding season (generally 1 September to 31 January), a 150-ft buffer zone will be maintained around the occupied burrow(s).

c. If there is any danger that owls will be injured or killed as a result of construction activity, during the non-breeding season, the birds may be passively relocated. Relocation of owls during the non-breeding season will be performed by a

County-approved biologist using one-way doors, which should be installed in all burrows within the impact area and left in place for at least two nights. These one-way doors will then be removed and the burrows backfilled immediately **prior to the initiation of grading**. To avoid the potential for owls evicted from a burrow to occupy other burrows within the impact area, one-way doors will be placed in all potentially suitable burrows within the impact area when eviction occurs.

d. Any damaged or collapsed burrows will be replaced with artificial burrows in adjacent habitat at a 2:1 ratio.

**During construction**, compliance will be verified by the County Environmental Monitor.

## CUP Condition 76

**MM BR-27.1 - Conduct pre-construction maternity colony or hibernaculum surveys for sensitive bats**. No more than 15 days **prior to grading** near or the removal of towers, trees or other structures, the Applicant shall retain a County-approved biologist, to conduct pre-construction surveys for sensitive bats. Surveys shall also be conducted during the maternity season (1 March to 31 July) within 300 feet of project activities.

If active maternity roosts or hibernacula are found, the structure, tree or tower occupied by the roost shall be avoided (i.e., not removed), if feasible. If avoidance of the maternity roost is not feasible, the biologist shall survey (through the use of radio telemetry or other CDFG methods) for nearby alternative maternity colony sites. If the biologist determines in consultation with the CDFG and County that there are alternative roost sites used by the maternity colony and young are not present then no further action is required, and it will not be necessary to provide alternate roosting habitat. (i.e., MM BR-27.2 would not apply although MM BR-27.3 would still apply). However, if there are no alternative roosts sites used by the maternity colony, MM BR-27.2 is required. If no active roosts are found, then no further action is required. If active maternity roosts are absent, but a hibernaculum (i.e., a non-maternity roost) is present, then MM BR-27.2 is not necessary, but MM BR-27.3 is required.

**During construction**, compliance will be verified by the County Environmental Monitor.

# Appendix B – Datasheet Examples

- **Datasheet 1. Bird and Bat Fatalities**
- **Datasheet 2. Searcher Efficiency Trail**
- **Datasheet 3. Scavenger/Carcass Removal Trail**
- **Datasheet 4. Avian Reporting System**

Datasheet 1. Fatalities discovered by Monitoring Team

Searchers:_____

Fatality #_____ Date_____ Species_____

Age and Sex_____ Plot #_____Photo #s_____

Nearest Structure_____ Degree_____ Distance_____

GPS (UTM, NAD27)_____

Body Parts_____

_____

_____

Cause of Death (Circle):

Electrocution Overhead Line Strike Collision Predation Other Unknown

Evidence:_____

_____

Estimated Time Since Death:

0-3 days (fresh) 4-7 days < a month > a month Unknown

How ID'ed:_____

Scavenger/Predator Type: n/a Vertebrate Invertebrate Undetermined

Scavenger/Predator Effects:_____

Insects Present Y / N Types: beetles / ants / flies / larva / pupa / other

Decay: fresh / feathers & flesh / flesh & bone / bone & feathers / bone / feather spot

Flesh: fresh / gooey / dried / n/a

Eyes round, fluid filled / sunken / dried / empty sockets / no head

Enamel culmen : present not present n/a

Cere: present not present n/a

Color: leg scales: n/a original partly bleached bleached

Cere: n/a original partly bleached bleached

Notes:_____

_____

_____

Datasheet 2. Searcher Efficiency Trials:

**Searcher Efficiency Trials: Carcass Placement Log**

General Information: Season_____ Month_____ Other_____

| No. | Species/Age | Placed By | Date | Time | Plot: Location | Found? (yes/no) | Retrieved? (yes/no) | Notes |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |

Weather notes for days that carcasses are placed:

Date_____ Time_____ Temp_____ Wind Dir._____ Wind Speed_____ Precip_____

Date_____ Time_____ Temp_____ Wind Dir._____ Wind Speed_____ Precip_____

Date_____ Time_____ Temp_____ Wind Dir._____ Wind Speed_____ Precip_____

Datasheet 3. Scavenger/Carcass Removal Trials

| Carcass Removal Trials Form (page 1) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General Information: Season Month Other | | | | | | | | | | | | | | | | | | | |
| Information Regarding Carcass When Placed | | | | | | | Condition[1] of Carcass on Days Checked | | | | | | | | | | Possible Scavenger | Notes |
| No. | Species /Age | Plot & Location | Expos.[2] | Placed By | Date | Time | Day | Day | Day | Day | Day | Day | Day | Day | Day | Day | | |
| 1 | | | | | | | | | | | | | | | | | | (1) |
| 2 | | | | | | | | | | | | | | | | | | (2) |
| 3 | | | | | | | | | | | | | | | | | | (3) |
| 4 | | | | | | | | | | | | | | | | | | (4) |
| 5 | | | | | | | | | | | | | | | | | | (5) |
| 6 | | | | | | | | | | | | | | | | | | (6) |
| 7 | | | | | | | | | | | | | | | | | | (7) |
| 8 | | | | | | | | | | | | | | | | | | (8) |
| | | | | | Checked by: | | | | | | | | | | | | | |

[1] Condition: I = intact, no evidence of scavenging, S = evidence of scavenging, FS = feather spot, 0 = carcass not present or <10 feathers
[2] Exposure: 1 = exposed position, 2 = hidden, 3 = partially hidden

General Comments:

Notes about location of each carcass and other carcass specific comments and photo numbers (continued on back):

(1)_____
(2)_____
(3)_____
(4)_____
(5)_____
(6)_____
(7)_____
(8)_____

Datasheet 4. Sample Avian Reporting System Datasheet

Dead Bird/Nest Form

Operations Area:_____

_____

| Dead Bird (circle one) | or | Nest (circle one) |
|---|---|---|
| Crow / magpie / raven | | Active |
| Hawk / falcon / osprey | | Inactive |
| Small bird (protected) | | |
| Eagle | | |
| Owl | | |
| Waterfowl | | |
| Unknown species | | |

Bird Count:_____

Date Found:_____ Time Found:_____

Sign of Death (circle one)

Collision Electrocution Unknown Other:_____

County:_____

Finder's Name:_____

Finder's Phone:_____

Line Name/Circuit #/Array ID #:_____

Pole ID #:_____

Recommended Action (circle one or more)

| *Dead Bird Actions* | *Nest Actions* |
|---|---|
| Cover transformer equipment | Initiate buffer area |
| Install insulator covers | Install nest platform |
| Install perch deterrent (triangle) | Relocate nest |
| Reframe structure | Install nest discourager |
| Replace structure | Remove nest |
| Remove pole | Seek expert advice |
| Install bird flight diverters | No action |
| De-energize | |
| No action (Justification required) | |

Comments:_____

# Appendix C – ABPP/BMAP Action Items

| Permit/ Plan | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section(s) |
|---|---|---|---|---|---|---|
| **Prior to Issuance of Construction Permits** | | | | | | |
| CUP | 42.MM BR-1.1.1 | Prepare and Implement a Worker Training Program | Submit Worker Training Program to County for approval | Prior to issuance of construction permits | Project Biologist | 4.2 Appendix A |
| CUP | 62.MM BR-14.1.1 | Prepare and implement a Bird Monitoring and Avoidance Plan | Prepare Bird Monitoring Plan in consult with CDFG and USFWS | Prior to issuance of construction permits | Project Biologist | 4.4 Appendix A |
| CUP | 61.MM BR-13.1.1 | Implement Avian Power Line Interaction Committee guidelines (APLIC). | Details of design components shall be indicated on all construction plans | Prior to issuance of construction permits | Wallace Group/ First Solar | 4.3.2 Appendix A |
| **Prior to Start of Work** | | | | | | |
| CUP | 42.MM BR-1.1.2 | Prepare and Implement a Worker Training Program | Implement Worker Training Program | Prior to any site disturbance or other construction-related activities on site | Project Biologist | 4.2, 4.4, 4.5 Appendix A |
| CUP | 60.MM BR-11.1.1 | Monitor construction in condor habitat and remove trash and microtrash from the work area daily | Conduct employee education on Condor protection measures under WTP | Prior to mobilization | Project Biologist | 4.4, 4.5 Appendix A |
| CUP | 50.MM BR-6.1.1 | Conduct pre-construction surveys for nesting and breeding birds and implementation of avoidance measures | Retain biologist to conduct nesting bird surveys | Prior to new site disturbance or mobilization | Project Biologist | 4.4, 4.5, 4.6 Appendix A |
| CUP | 73.MM BR-22.1.1 | Complete focused pre-construction burrowing owl surveys and implement avoidance measures | Survey for burrowing owls, relocate or implement avoidance measures if found | Within 15 days prior to commencement of construction activity | Project Biologist | 4.4, 4.5, 4.6 Appendix A |

| Permit/ Plan | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section(s) |
|---|---|---|---|---|---|---|
| CUP | 73.MM BR-22.1.2 | Complete focused pre-construction burrowing owl surveys and implement avoidance measures | Passively relocate wintering burrowing owls if there is any danger of injury or death from construction activities | Prior to initiation of grading | Project Biologist | 4.4 Appendix A |
| CUP | 76.MM BR-27.1.1 | Conduct pre-construction maternity colony or hibernaculum surveys for sensitive bats | Conduct pre-construction survey for roosting or maternity colonies of sensitive bats | Within 15 days prior to grading near, or removal of, vertical structures or trees | Project Biologist | 4.4 Appendix A |
| BMAP | Task 1.1.1 | Implement Avian Use Surveys | Initiate Avian Use Surveys | After issuance of construction permit and prior to start of work | Project Biologist | 5.2 |
| **During Construction** | | | | | | |
| CUP | 50.MM BR-6.1.2 | Conduct pre-construction surveys for nesting and breeding birds and implementation of avoidance measures | Implement protection measures when sensitive species occur | As needed prior to and/or during construction | Project Biologist | 4.4 Appendix A |
| CUP | 50.MM BR-6.1.3 | Conduct pre-construction surveys for nesting and breeding birds and implementation of avoidance measures | Conduct routine checks of nests during the known breeding season and, if young are present, monitor until young have fledged | As needed prior to and/or during construction | County Environmental Monitor | 4.4 Appendix A |
| CUP | 60.MM BR-11.1.2 | Monitor construction in condor habitat and remove trash and microtrash from the work area daily | Daily sweeps of construction areas to pick up microtrash; report condor sightings; stop work within 500' of condors. | Daily during construction | Project Biologist and Construction personnel | 4.4 Appendix A |
| CUP | 61.MM BR-13.1.2 | Implement Avian Power Line Interaction Committee guidelines (APLIC) | Monitor for new versions of APLIC policies and policy updates | As needed, during construction | Project Biologist | Appendix A |

| Permit/ Plan | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section(s) |
|---|---|---|---|---|---|---|
| CUP | 62.MM BR-14.1.3 | Prepare and implement a Bird Monitoring and Avoidance Plan | Report results quarterly to County, USFWS, and CDFG throughout construction. Prepare an annual report with adaptive management recommendations, if applicable | Quarterly and annually throughout construction | Project Biologist | 5.5 Appendix A |
| CUP | 73.MM BR-22.1.3 | Complete focused pre-construction burrowing owl surveys and implement avoidance measures | Install on-way doors on burrowing owl dens if construction could affect owls. Replace damaged or collapsed burrows with artificial burrows | As needed if burrowing owls are near construction, and are passively relocated | Project Biologist | 4.4, 4.5, 4.6 Appendix A |
| BMAP | Task 1.1.2 | Implement Avian Use Surveys | Continue Avian Use Surveys | Throughout the construction period | Project Biologist | 5.2 |
| BMAP | Task 1.2.1<br>Task 2.3.1<br>Task 3.1.1<br>Task 4.1.1 | Submit quarterly and annual monitoring reports | Prepare and submit monitoring reports to County of San Luis Obispo, CDFG, and USFWS | Quarterly and Annually | Project Biologist | 5.0 Appendix A |
| BMAP | Task 2.1.1 | Implement Avian Fatality Monitoring Surveys, Searcher Efficiency Trials, and Scavenger/Carcass Removal Trials | Conduct Avian Fatality Surveys, Searcher Efficiency Trials, and Scavenger Removal Trials | Throughout the approximately three year construction period | Project Biologist | 5.0 Appendix A |
| BMAP | Task 2.2 | Run calculations on survey data | Calculate Bird Utilization Rate, Bird Fatality Rate, and Bird Risk Index for Array Areas, Overhead Power Lines, Substation/ Switching Station | Annually | Project Biologist | 5.4 |
| **During Operations and Maintenance** | | | | | | |
| CUP | 62.MM BR-14.1.4 | Prepare and implement a Bird Monitoring and Avoidance Plan | Continue implementing bird and bat monitoring and avoidance plan | First three years after completion of construction | Project Biologist | 5.0, 6.0 Appendix A |

| Permit/ Plan | Requirement ID | Requirement Title | Task to be Performed | Timing | Responsible Entity | Document Section(s) |
|---|---|---|---|---|---|---|
| CUP | 62.MM BR-14.1.5 | Prepare and implement a Bird Monitoring and Avoidance Plan | Report results quarterly to County, USFWS, and CDFG throughout construction. Prepare an annual report with adaptive management recommendations, if applicable | Quarterly and annually for first three years after completion of construction | Project Biologist | 5.5 Appendix A |
| ABPP/ BMAP | ABPP | Conduct pre-activity nesting bird surveys | Conduct pre-activity surveys for nesting birds prior to maintenance and management activities that affect vegetation during the nesting season | During operation, February 1 through August 31 | Project Biologist and First Solar O&M | 4.5, 4.6 |
| BMAP | Task 1.1.3 | Implement Avian Use Surveys | Continue Avian Use Surveys | First three years of Project operation after construction is complete | Project Biologist | 5.2 |
| BMAP | Task 1.2.2<br>Task 2.3.2<br>Task 3.1.2<br>Task 4.1.2 | Submit quarterly and annual monitoring reports | Prepare and submit monitoring reports to County of San Luis Obispo, CDFG, and USFWS | Quarterly and Annually | Project Biologist | 5.0 Appendix A |
| BMAP | Task 2.1.2 | Implement Avian Fatality Monitoring Surveys, Searcher Efficiency Trials, and Scavenger/Carcass Removal Trials | Continue Avian Fatality Surveys, Searcher Efficiency Trials, and Scavenger Removal Trials | First three years of Project operation after construction is complete | Project Biologist | 5.0 Appendix A |
| BMAP | Task 2.2.2 | Run calculations on survey data | Calculate Bird Utilization Rate, Bird Fatality Rate, and Bird Risk Index for Array Areas, Overhead Power Lines, Substation/ Switching Station | Annually | Project Biologist | 5.4 |
| BMAP | Task 5.1 | Prepare scientific paper | Prepare and submit a scientific paper to the County of San Luis Obispo | Within one year of completion of the BMAP field studies | Project Biologist | 5.1 |

# Appendix F
# Cultural Resources, Including Section 106 Consultation