



 ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

**BOTANICAL SURVEY REPORT
FOR THE BOEING COMPANY
SANTA SUSANA FIELD LABORATORY
SOILS AND GROUNDWATER REMEDIATION
PROJECT**

Prepared for:

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September 2014

Project No. 1402-0661

INTRODUCTION

The Boeing Company (Boeing) has developed a plan for remediation of affected soil and groundwater resulting from historical aerospace equipment development and experimentation within Boeing-owned Santa Susana Field Laboratory (SSFL) Areas I and III (Project). Associated with the Project are several areas located within the Boeing-owned Southern Undeveloped Land (SUL) that may be utilized as soil borrow areas. The California Environmental Protection Agency Department of Toxic Substances and Control (DTSC) is acting as lead agency under the California Environmental Quality Act (CEQA) to develop and prepare an Environmental Impact Report that addresses project alternatives and evaluates environmental impacts for the remediation activity.

In support of the CEQA analysis for the proposed project, a Biological Resources Study (Study) was prepared in December 2013 (Padre, 2013a) to document biological resources present or potentially present throughout the Project Study Area, which completely encompasses the Project Site. Upon review of the Study, DTSC requested that a more thorough assessment of botanical resources be completed throughout the Project Study Area as they pertain to special-status plant species. To fulfill this request, a botanical survey was performed throughout the Project Study Area during the spring and early summer months, focusing primarily on rare plants that are known to occur or have the potential to occur in the region.

METHODOLOGY

Padre Associates conducted a botanical survey of the entire 181-acre Project Study Area. Field work was conducted by Mr. Matt Ingamells (Padre Senior Biologist) and Mr. Chris Dunn (Padre Project Biologist) on April 16 and 23, and May 2, 2014. Both biologists have performed numerous botanical surveys in the region. Additional field work was conducted by Mr. Dunn at SSFL on June 9, 17 and 25, and July 22, 2014, resulting in observations of previously unrecorded Plummer's mariposa lily (*Calochortus plummerae*) and Santa Susana tarplant (*Deinandra minthornii*) individuals. A separate task was then completed by Mr. Dunn and Mr. Lucas Bannan (Padre GIS Analyst) on June 27, July 31 and August 1, 2014 to identify and map locations and concentrations of Santa Susana tarplant throughout Area III. All Santa Susana tarplant locations were recorded in the field with a Trimble GeoXT GPS unit capable of sub-meter accuracy. The survey period was selected to ensure all special-status plant species known from the area would be identifiable. The project-specific botanical surveys acted as a follow up to surveys conducted by Padre biologists throughout SSFL in previous years, in which a vascular plant list was generated. All vascular plant species observed during the subject survey were recorded and added to the existing list. Samples were taken as needed and plant identities were verified using a dissecting microscope and the *Jepson Manual, Higher Plants of California, Second Edition* (Baldwin et al., 2013). Most species were in flower or otherwise exhibited diagnostic features. Therefore, virtually all plants encountered could be positively identified.

Special-status plants species are defined in Table 1 below.

Table 1. Definitions of Special-Status Plant Species

Special-Status Plant Species
➤ Plants listed or proposed for listing as threatened or endangered under the Federal Endangered Species Act (50 CFR 17.12 for listed plants and various notices in the Federal Register for proposed species). ➤ Plants that are candidates for possible future listing as threatened or endangered under the Federal Endangered Species Act (Federal Register, November 9, 2009). ➤ Plants that meet the definitions of rare or endangered species under the CEQA (<i>State CEQA Guidelines</i>, Section 15380). ➤ Plants considered by the CNPS to be "rare, threatened, or endangered" in California (Lists 1B and 2 in CNPS, 2001). ➤ Plants listed by CNPS as plants about which we need more information and plants of limited distribution (Lists 3 and 4 in CNPS, 2001). ➤ Plants listed or proposed for listing by the State of California as threatened or endangered under the California Endangered Species Act (14 California Code of Regulations [CCR] 670.5). ➤ Plants listed under the California Native Plant Protection Act (California Fish and Game Code 1900 et seq.). ➤ Plants considered sensitive by other Federal agencies (i.e., U.S. Forest Service, Bureau of Land Management), state and local agencies or jurisdictions (i.e., Ventura County Planning Division Locally Important Plants, 2014). ➤ Plants on the Special Vascular Plants, Bryophytes, and Lichens List (California Department of Fish and Wildlife, Natural Diversity Database, October 2013 Quarterly publication). ➤ Trees protected under Ventura County Ordinance no. 4092 (Zoning Ordinance Section 8107-25).

The following special-status plants have been reported from the project area (Calabasas or surrounding 7.5' quadrangles) by the California Natural Diversity Data Base and California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants:

- Braunton's milk-vetch (*Astragalus brauntonii*) – CNPS List 1B, federal Endangered: flowers March-July;
- Round-leaved filaree (*California macrophylla*) – CNPS List 1B: flowers March-May;
- Catalina mariposa lily (*Calochortus catalinae*) – CNPS List 4: flowers March-May;
- Plummer's mariposa lily (*Calochortus plummerae*) – CNPS List 4: flowers May-July;
- Slender mariposa lily (*Calochortus clavatus* var. *gracilis*) – CNPS List 1B: flowers March-June;
- San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*) – CNPS List 1B, state Endangered, federal Candidate: flowers April-June;
- Santa Susana tarplant (*Deinandra minthornii*) – CNPS List 1B, state Rare: flowers June-November;
- Dune larkspur (*Delphinium parryi* var. *blochmaniae*) – CNPS List 1B; flowers April-May;

- Slender-horned spineflower (*Dodecahema leptoceras*) – CNPS List 1B, state Endangered, federal Endangered: flowers May-June;
- Blochman's dudleya (*Dudleya blochmaniae* ssp. *blochmaniae*) – CNPS List 1B: flowers April-June;
- Marcescent dudleya (*Dudleya cymosa* ssp. *marcescens*) – CNPS List 1B, state Rare, federal Threatened: flowers May-June;
- Santa Monica Mountains dudleya (*Dudleya cymosa* ssp. *ovatifolia* [inclusive of Agoura Hills dudleya, *D. cymosa* ssp. *agourensis*) – CNPS List 1B, federal Threatened: flowers May-June;
- Many-stemmed dudleya (*Dudleya multicaulis*) – CNPS List 1B: flowers May-June;
- Conejo buckwheat (*Eriogonum crocatum*) – CNPS List 1B: flowers April-June;
- Chaparral nolina (*Nolina cismontana*) – CNPS List 1B: flowers May-July; and
- Lyon's pentachaeta (*Pentachaeta lyonii*) - CNPS List 1B, state Endangered, federal Endangered: flowers March-August.

The Ventura County Locally Important Plant Species list was also used to determine the conservation status of species known to occur in the region, including:

- Crowned forget-me-not (*Cryptantha corollata*);
- Tiny poppy (*Meconella denticulata*); and
- Trask yerba santa (*Eriodictyon traskiae*).

RESULTS

VEGETATION

Most of SSFL was intensely burned during the Topanga wildfire in 2005, and most plant communities are still recovering. Plant communities at the Project Study Area are predominantly composed of yerba santa scrub, deerweed scrub, chamise-black sage scrub, annual grassland, laurel sumac scrub and coast live oak upland and riparian woodlands, but intergrades between communities, along with other specific scrubby vegetation types exist. Drought conditions were evident throughout the survey period as noted by substantial senescence of perennial vegetation, low amounts of new vegetation, and a very short blooming season in both 2013 and 2014. Summer surveys did note, however, the late-blooming phenology of species in the Asteraceae family, such as California aster (*Corethrogyne filaginifolia*), sawtooth goldenbush (*Hazardia squarrosa* var. *grindelioides*), California bush sunflower (*Encelia californica*) and Santa Susana tarplant.

BOTANICAL INVENTORY

In years prior to the project-specific botanical surveys, Padre compiled list of 259 plant species throughout SSFL, including (often multiple) visits to all of the project impact areas. The subject botanical survey recorded an additional 23 species for a total of 282 species. This may be an indication of completeness in regards to determining presence or absence of previously unrecorded species (including special-status species) within the Project Study Area despite the drought conditions currently existing in the region. Of these 282 species, 213 are native species. The percentage of non-native species was moderate (24 percent), given that portions of SSFL have been historically developed or cleared for fire suppression. A list of all vascular plant species collectively identified thus far throughout the entire SSFL is provided as Attachment A. Also attached are Figures 1 through 3, which provide a Site Location Map, a site-wide Special-Status Plant Species Map, and Area III Rare Plant Survey – Santa Susana Tarplant Map, respectively, and selected photographs.

The Ventura County Locally Important Plant Species list and CNPS Inventory of Rare and Endangered Plants of California were used to determine the conservation status of plant species found. Tree species protected under the County's Tree Protection Regulations (including all oak [*Quercus*] species) may also be considered special-status species, and are known to occur within the Project Study Area, but are not the focus of this report. Nonetheless, some recommended protective measures for oak trees are provided at the end of the report. Aside from these tree species, four (4) special-status plant species were found during the subject or previous botanical surveys within the Project Study Area:

- Catalina mariposa lily (*Calochortus catalinae*);
- Plummer's mariposa lily (*Calochortus plummerae*);
- Ocellated Humboldt lily (*Lilium humboldtii* ssp. *ocellatum*); and
- Santa Susana tarplant (*Deinandra minthornii*).

Other special-status plant species including Braunton's milk-vetch and Malibu baccharis (*Baccharis malibuensis*, a CNPS List 1B species), which are known from the area but were not found within the Project Study Area, were observed at various times in 2014 approximately 1,000 feet west of STL-IV. Based on positive identifications of these species in areas outside the Project Study Area, these species would have been identifiable if they were present within the Project Study Area.

Western sycamore (*Platanus racemosa*, a County protected tree species) and southern California black walnut (*Juglans californica* var. *californica*, a CNPS List 4 species) were also observed at multiple locations throughout SSFL during the survey period but were absent from the Project Survey Area, and would have been identifiable if they were present within the Project Study Area.

As listed above, two species of mariposa lily were observed during the survey period. Slender mariposa lily was absent from the Project Survey Areas, but was previously recorded approximately 1,300 feet southeast of Silvernale Pond (CNDDDB record), and would have been identifiable if it was present within the Project Study Area.

Two common *Dudleya* species (*D. lanceolata* and *D. pulverulenta*) are known to occur at SSFL and were infrequently observed within the Project Study Area; most notably on rock outcrops at Canyon in Area I, Plummer's Road Water Spraying Areas (east of Skyline) in Area I, and southwest of SPA in Area III. Due to the lack of igneous rock outcrops, special-status *Dudleya* species are not anticipated to be present in areas affected by the project. However, some of these species are only detectable for short periods when in flower, and could have been overlooked.

Lyon's pentachaeta, which was reported approximately 7 miles west of SSFL (Padre observation), may have a moderate potential to occur within the Project Study Area but was also not observed during the botanical surveys. This species typically occurs with and flowers at the same time as California goldfields (*Lasthenia californica*), which was found in flower during the botanical surveys. Therefore, Lyon's pentachaeta would have been identifiable if it were present at the Project Study Area.

None of the remaining special-status species listed above were observed. Despite substantial survey data that exist at SSFL to indicate the unlikelihood for occurrence of these species, the variability of habitat quality, levels of historical disturbance, and ongoing drought may have had minor effects on the success on the botanical survey results. Nonetheless, the species sightings information contained herein should be considered sufficient for environmental analysis of the project.

CATALINA MARIPOSA LILY

Catalina mariposa lily has been designated a plant of limited distribution by the California Native Plant Society. However, this species is the most common of the seven mariposa lily species found in Ventura County, and is not considered a locally important species by Ventura County Planning Division. Catalina mariposa lily is not rare or declining and does not meet the definition of rare or endangered under Section 15380 of the State CEQA Guidelines.

Roughly 3,000 Catalina mariposa lily individuals were found in the SUL in April 2014 within and adjacent to the westernmost potential soil borrow area. Approximately 500 plants were observed within the area identified as the soil borrow area on both sides of the existing unpaved access road in annual grassland intermixed with laurel sumac (*Malosma laurina*) scrub. Immediately southwest and across an ephemeral drainage was the location of a larger patch comprised of 2,500 or more individuals, which would be unaffected by project activities. An additional 392 Catalina mariposa lilies were found in the SUL in May 2014 at scattered areas in and around the easternmost potential soil borrow areas. Approximately 300 of these individuals would potentially be affected by excavation activities. Although Catalina mariposa lily is not currently rare, the loss of approximately 800 individuals may have an adverse effect on the local population and may contribute to this species becoming rare.

PLUMMER'S MARIPOSA LILY

Plummer's mariposa lily has been designated a plant of limited distribution by the California Native Plant Society, and is considered a locally important species by the Ventura

County Planning Division. Plummer's mariposa lily is not rare or declining and does not meet the definition of rare or endangered under Section 15380 of the State CEQA Guidelines.

Low numbers (less than 10 individuals each) of Plummer's mariposa lily have been observed at a total of 10 locations within SSFL, including five (5) of these sightings occurring most recently in June 2014. Seven (7) of these sightings are located within or immediately adjacent to the Project Study Area. Although Plummer's mariposa lily is not currently rare, sightings of large numbers of this species within the region are relatively uncommon in comparison to other mariposa lilies such as Catalina mariposa lily, which, where present, frequently grows in large patches. Therefore, the loss of approximately 20 Plummer's mariposa lily individuals with the potential for more individuals emerging in future years within the project impact areas may have an adverse effect on the local population and may contribute to this species becoming rare.

OCELLATED HUMBOLDT LILY

Ocellated Humboldt lily has been designated a plant of limited distribution by the California Native Plant Society, but is not considered a locally important species by the Ventura County Planning Division. Ocellated Humboldt lily is not rare or declining and does not meet the definition of rare or endangered under Section 15380 of the State CEQA Guidelines.

Ocellated Humboldt lily have been observed in recent years dating back to 2009 at a total of five (5) locations within SSFL. Numbers ranged from one (1) to 100 individuals each. Only one (1) location is within close proximity to the Project Study Area, on the shoulder of the existing unpaved access road near the Seeps in the SUL, which also provides access to the westernmost soil borrow area. Therefore, due to the fact that ocellated Humboldt lily is not currently rare, and protection measures along the roadside could be implemented to avoid affecting these individuals, adverse effects on the local population are not considered substantial enough to contribute to this species becoming rare.

SANTA SUSANA TARPLANT

Santa Susana tarplant has been designated a state Rare species by the California Department of Fish and Wildlife, and a plant considered rare or endangered in California and elsewhere by the California Native Plant Society, but is not considered a locally important species by the Ventura County Planning Division. Santa Susana tarplant meets the definition of rare or endangered under Section 15380 of the State CEQA Guidelines.

Santa Susana tarplant commonly occurs throughout SSFL and Sage Ranch Park, especially in areas of low competition (rock outcrops and disturbed areas such as abandoned lots), and is endemic to the Santa Susana Mountains and Simi Hills. Padre conducted a Santa Susana tarplant study in 2008 throughout Area I and the eastern portion of the SUL (with follow-up surveys through 2010, as presented on Figure 2). The study estimated that 4,635 to 8,000 individuals were located throughout Area I and approximately 110 acres of the SUL, and an additional 4,000 individuals were likely present throughout the remainder of SSFL (Padre, 2010). This total estimate of approximately 12,000 individuals SSFL-wide is roughly consistent with data compiled by others in NASA Area I, Area II, and Area IV. NASA (2010) estimates that the LOX Plant in Area I supports 324 locations of individual plants or clumps of plants, and Area

It supports 3,333 locations of individual plants or clumps of plants. HydroGeoLogic/Envicom (2009) estimates that Area IV and the Northern Undeveloped Lands support roughly 850 individuals.

A comprehensive survey of Area III was conducted by Padre in summer 2014, resulting in the tally and mapping of 1,183 individuals, as presented in Figure 3. As readily observable in Figure 3, the vast majority of Santa Susana tarplant individuals are located in sandstone rock outcrop areas, outside of the proposed project impact areas within Area III, and 20 or less individuals may undergo damage or removal by project activities.

Padre (2013a) stated that more recent observations in 2013 of Santa Susana tarplant throughout SSFL indicate that the population is stable, if not increasing. For example, many formerly developed areas particularly in Area I that have undergone removal of facility appurtenances followed up by interim restoration in recent years, have proliferated with Santa Susana tarplant where at least a few mature individuals were already locally present and were protected in place, providing a seed source for the species to colonize bare areas. Due largely to this recolonization in formerly developed areas where the remediation activities will be focused, it is estimated that approximately 1,865 individuals may undergo damage or removal by project activities within Area I (Padre, 2013a).

Although a comprehensive survey for Santa Susana tarplant has not been performed throughout the entire SUL, no individuals were observed during the botanical surveys within the proposed project impact areas. Numerous unrelated surveys conducted throughout the SUL have determined that Santa Susana tarplant is mostly absent from this portion of SSFL, with very low concentrations present or potentially present mainly on rock outcrops, which are also very limited in extent.

INVASIVE PLANTS

A small population of stinkwort (*Dittrichia graveolens*) was recently found in low concentrations (individual plants or small patches) at various locations in the Project Study Area. Salt cedar (or tamarisk, *Tamarix ramosissima*) was also recently found in swales at CTL-III (among other locations at SSFL). As a project mitigation measure, we recommend stinkwort and salt cedar be considered targets for removal of invasive species to prevent spreading during earthwork activities. Other naturalized non-native species with varying invasiveness ratings from the California Invasive Plant Council Inventory (2006) are listed in Attachment A, some of which may provide some habitat value, while others should also be considered for eradication as part of long-term restoration efforts at SSFL.

RECOMMENDATIONS

Pre-construction botanical surveys may be recommended to document any new individuals of species known to occur onsite, and to further determine the presence or absence of other species that have not been observed, but have the potential to occur onsite. This is especially true if the project disturbance occurs years later than when the surveys described

herein were performed, and once the project is underway, if the disturbance is protracted over a long time period. Particular focus may be applied to rare *Chorizanthe*, *Dodecahema*, *Dudleya*, and *Pentachaeta* species.

Avoidance of many of the rare plant individuals mapped throughout the Project Study Area can be avoided through protective measures such as temporary construction fencing. However, complete avoidance may not be feasible to fulfill the cleanup requirements and obtain sufficient amounts of clean fill material. Therefore, mitigation is focused on collection of seed and/or bulbs to maintain or improve the populations of each species at SSFL.

Measures to offset loss of Catalina mariposa lily and Plummer's mariposa lily may include:

- Collect seed (in May-June for Catalina mariposa lily, and July-August for Plummer's mariposa lily) from plants to be removed and plant (in fall) in areas to be preserved. Seed treatment is not required for these species (Emery, 1988). Planting areas should be dominated by non-native species (such as annual grassland) to prevent disturbance of native plant communities. A mitigation plan should be developed.
- Transplant bulbs when dormant (fall), if feasible.

Measures to offset loss of Santa Susana tarplant may include:

- Collect seed (in August-September) from plants to be removed and plant (in fall) in areas to be preserved. Seed treatment is not required for these species based on documentation of high germination success at several hand-broadcasted seeding locations within Canyon (Padre, 2013b). Planting areas should be located in low-competition areas such as backfilled areas to promote success and prevent disturbance of native plant communities. A mitigation plan should be developed.

Contract growing from seeds collected onsite of mariposa lily species, Santa Susana Tarplant and common native species is recommended to equip the restoration/mitigation effort with plant genotypes that are endemic to SSFL. A mitigation plan should be developed to describe the suite of species selected for the restoration and planting treatments.

Access routes should be designated in areas to minimize direct loss of oak trees. However, earthwork associated with soil excavation and groundwater well installations may encroach within the protected zone (canopy dripline plus 5 feet) of numerous oak trees and the long-term health of these trees may be adversely affected. In addition, inadvertent damage to oak trees adjacent to construction areas may occur. Implementation of the following measures is recommended to reduce indirect loss of oak trees:

- Prepare an oak tree report when grading plans have been finalized to fully identify oak tree impacts;
- During construction, fence all oak trees with canopy driplines within 10 feet of the limits of grading;

- When impacts within the tree protection zones are unavoidable, utilize hand crews (with shovels or vacuum truck hoses) to excavate affected soils to the minimum acceptable depth and avoid damaging as many roots as feasible. Backfill these areas with clean soil as soon as possible, or cover roots with jute netting and periodically wet down until confirmation samples are received and backfilling can occur. Utilize an ISA Certified Arborist to provide oversight for any pruning that may be required for roots and branches;
- Integrate oak tree planting into a mitigation plan to replace the species in-kind.

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ATTACHMENTS

Attachment A

Vascular Plant Flora Observed within Santa Susana Field Laboratory Ventura County, California

Scientific Name	Common Name	Habit	Family	Invasiveness Rating
<i>Achillea millefolium</i>	Yarrow	PH	Asteraceae	
<i>Acemisson americanus</i>	Spanish clover	AH	Fabaceae	
<i>Acemisson argophyllus</i> var. <i>argophyllus</i>	Silver lotus	PH	Fabaceae	
<i>Acemisson glaber</i>	Deerweed, California broom	PH	Fabaceae	
<i>Acemisson strigosus</i>	Strigose lotus	AH	Fabaceae	
<i>Acourtia microcephala</i>	Sacapellote	PH	Asteraceae	
<i>Adenostoma fasciculatum</i>	Chamise	S	Rosaceae	
<i>Adiantum jordanii</i>	California maidenhair fern	PF	Pteridaceae	
<i>Aesculus californica</i>	California Buckeye	T	Sapindaceae	
<i>Ailanthus altissima</i> *	Tree of heaven	T	Simaroubaceae	Moderate
<i>Alnus rhombifolia</i> **	White alder	T	Betulaceae	
<i>Amaranthus blitoides</i>	Amaranth	AH	Amaranthaceae	
<i>Ambrosia acanthicarpa</i>	Annual bursage	AH	Asteraceae	
<i>Ambrosia psilostachya</i>	Western ragweed	PH	Asteraceae	
<i>Amsinckia menziesii</i> var. <i>intermedia</i>	Fiddleneck	AH	Boraginaceae	
<i>Anagallis arvensis</i> *	Scarlet pimpernel	AH	Myrsinaceae	
<i>Antirrhinum coulterianum</i>	White snapdragon	AH	Plantaginaceae	
<i>Antirrhinum multiflorum</i>	Rose snapdragon	PH	Plantaginaceae	
<i>Arctostaphylos glauca</i>	Manzanita	S	Ericaceae	
<i>Artemisia californica</i>	California sagebrush	S	Asteraceae	
<i>Artemisia douglasiana</i>	Mugwort	PH	Asteraceae	
<i>Artemisia dracunculoides</i>	Wild tarragon	PH	Asteraceae	
<i>Asclepias eriocarpa</i>	Indian milkweed	PH	Asclepiadaceae	
<i>Asclepias fascicularis</i>	Narrow-leaf milkweed	AH	Asclepiadaceae	
<i>Aspidotis californica</i>	California lace fern	PF	Pteridaceae	
<i>Astragalus brauntonii</i>	Braunton's milkvetch	S	Fabaceae	
<i>Avena barbata</i> *	Slender wild oats	AG	Poaceae	Moderate
<i>Avena fatua</i> *	Wild oats	AG	Poaceae	Moderate
<i>Baccharis malibuensis</i>	Malibu baccharis	S	Asteraceae	
<i>Baccharis pilularis</i>	Coyote brush	S	Asteraceae	
<i>Baccharis salicifolia</i>	Mule fat, seep-willow	S	Asteraceae	
<i>Bloomeria crocea</i> var. <i>crocea</i>	Common goldenstar	AH	Themidaceae	
<i>Boechera sparsiflora</i>	Rock cress	PH	Brassicaceae	
<i>Brassica nigra</i> *	Black mustard	AH	Brassicaceae	Moderate
<i>Brickellia californica</i>	California brickellbush	S	Asteraceae	
<i>Bromus carinatus</i>	California brome	PG	Poaceae	
<i>Bromus diandrus</i> *	Ripgut grass	AG	Poaceae	Moderate
<i>Bromus hordeaceus</i> *	Soft chess	AG	Poaceae	Limited
<i>Bromus madritensis</i> ssp. <i>rubens</i> *	Red brome	AG	Poaceae	High
<i>Bromus tectorum</i> *	Cheat grass	AG	Poaceae	Limited
<i>Calandrinia ciliata</i>	Red maids	AH	Montiaceae	
<i>Calochortus catalinae</i>	Catalina mariposa lily	PH	Liliaceae	
<i>Calochortus clavatus</i> var. <i>pallidus</i>	Yellow mariposa lily	AH	Liliaceae	
<i>Calochortus plummerae</i>	Plummer's mariposa lily	AH	Liliaceae	
<i>Calochortus splendens</i>	Splendid mariposa lily	PH	Liliaceae	
<i>Calystegia macrostegia</i> ssp. <i>cyclostegia</i>	Chaparral morning glory	PV	Convolvulaceae	
<i>Camissonia campestris</i>	Evening primrose	AH	Onagraceae	
<i>Camissoniopsis micrantha</i>	Small evening primrose	AH	Onagraceae	
<i>Capsella bursa-pastoris</i> *	Shepherd's purse	AH	Brassicaceae	
<i>Cardamine californica</i>	Milk maids	AH	Brassicaceae	
<i>Carduus pycnocephalus</i> *	Italian thistle	AH	Asteraceae	Moderate
<i>Carex praegracilis</i>	Clustered field sedge	PH	Cyperaceae	
<i>Carpobrotus edulis</i> *	Hottentot fig	PH	Aizoaceae	Moderate
<i>Castilleja affinis</i> ssp. <i>affinis</i>	Indian paintbrush	PH	Scrophulariaceae	
<i>Ceanothus crassifolius</i>	Hoary-leaf ceanothus	S	Rhamnaceae	
<i>Ceanothus cuneatus</i>	Buckbrush	S	Rhamnaceae	
<i>Ceanothus oliganthus</i> var. <i>oliganthus</i>	Hairy ceanothus	S	Rhamnaceae	
<i>Centaurea calcitrapa</i> *	Purple starthistle	AH	Asteraceae	Moderate
<i>Centaurea melitensis</i> *	Tocalote	AH	Asteraceae	Moderate
<i>Cercocarpus betuloides</i> var. <i>betuloides</i>	Birch-leaf mountain mahogany	S	Rosaceae	
<i>Chenopodium album</i> *	Lamb's quarters	AH	Chenopodiaceae	
<i>Chenopodium californicum</i>	Soap plant	AH	Chenopodiaceae	
<i>Chlorogalum pomeridianum</i>	Soap plant	PH	Liliaceae	
<i>Chorizanthe stictoides</i>	Turkish rugging	AH	Polygonaceae	
<i>Cirsium occidentale</i>	Cobweb thistle	BH	Asteraceae	
<i>Cirsium vulgare</i> *	Bull thistle	AH	Asteraceae	Moderate
<i>Clarkia bottae</i>	Farewell-to-spring	AH	Onagraceae	
<i>Clarkia epilobioides</i>	White clarkia	AH	Onagraceae	
<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	Four spot	AH	Onagraceae	
<i>Clarkia unguiculata</i>	Elegant clarkia	AH	Onagraceae	
<i>Claytonia perfoliata</i>	Miner's lettuce	AH	Montiaceae	
<i>Collinsia heterophylla</i>	Chinese houses	AH	Scrophulariaceae	
<i>Collinsia parryi</i>	Blue-eyed Mary	AH	Scrophulariaceae	
<i>Cordylanthus rigidus</i> ssp. <i>setigerus</i>	Bird's beak	AH	Scrophulariaceae	
<i>Corethrogyne filaginifolia</i>	California aster	PH	Asteraceae	

Attachment A

Vascular Plant Flora Observed within Santa Susana Field Laboratory Ventura County, California

Scientific Name	Common Name	Habit	Family	Invasiveness Rating
<i>Cortaderia selloana</i> *	Pampas grass	PG	Poaceae	High
<i>Cotula australis</i> *	Cotula	AH	Asteraceae	
<i>Crassula connata</i>	Pygmy weed	AH	Crassulaceae	
<i>Croton setigerus</i>	Turkey mullein	AH	Euphorbiaceae	
<i>Cryptantha intermedia</i>	Large-flowered Cryptantha	AH	Boraginaceae	
<i>Cryptantha micromeres</i>	Small-flowered Cryptantha	AH	Boraginaceae	
<i>Cuscuta</i> sp.	Dodder	PV	Convolvulaceae	
<i>Cynodon dactylon</i> *	Bermuda grass	PG	Poaceae	Moderate
<i>Cyperus eragrostis</i>	Nutsedge	PH	Cyperaceae	
<i>Datura wrightii</i>	Jimsonweed	PH	Solanaceae	
<i>Deinandra fasciculata</i>	Fascicled tarplant	AH	Asteraceae	
<i>Deinandra minthornii</i>	Santa Susana tarplant	S	Asteraceae	
<i>Delphinium cardinale</i>	Scarlet Larkspur	PH	Ranunculaceae	
<i>Delphinium parryi</i>	Parry's larkspur	PH	Ranunculaceae	
<i>Dichelostemma capitatum</i>	Blue dicks	PH	Liliaceae	
<i>Dimorphotheca sinuata</i> *	Cape-marigold	AH	Asteraceae	
<i>Distichlis spicata</i>	Salt grass	PG	Poaceae	
<i>Diurachia graveolens</i> *	Stinkwort	AH	Asteraceae	Moderate
<i>Dodecatheon clevelandii</i> ssp. <i>clevelandii</i>	Shooting star	PH	Primulaceae	
<i>Drymocallis glandulosa</i>	Cinque-foil	PH	Rosaceae	
<i>Dryopteris arguta</i>	Wood fern	PF	Dryopteridaceae	
<i>Dudleya lanceolata</i>	Lanceleaf dudleya	PH	Crassulaceae	
<i>Dudleya pulverulenta</i>	Chalk dudleya	PH	Crassulaceae	
<i>Elymus condensatus</i>	Giant wild rye	PG	Poaceae	
<i>Elymus triticoides</i>	Creeping wild rye	PG	Poaceae	
<i>Emmenanthe penduliflora</i>	Whispering bells	AH	Hydrophyllaceae	
<i>Encelia californica</i>	California bush sunflower	S	Asteraceae	
<i>Encelia farinosa</i>	Brittlebush	S	Asteraceae	
<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuschia	PH	Onagraceae	
<i>Eriastrum sapphirinum</i>	Eriastrum	AH	Polemoniaceae	
<i>Ericameria palmeri</i> var. <i>pachylepis</i>	Palmer's goldenbush	S	Asteraceae	
<i>Erigeron canadensis</i>	Horseweed	AH	Asteraceae	
<i>Erigeron foliosus</i> var. <i>foliosus</i>	Flea-bane	PH	Asteraceae	
<i>Eriodictyon crassifolium</i>	Yerba santa	S	Hydrophyllaceae	
<i>Eriogonum elongatum</i> var. <i>elongatum</i>	Wand buckwheat	S	Polygonaceae	
<i>Eriogonum fasciculatum</i> var. <i>fasciculatum</i>	California buckwheat	S	Polygonaceae	
<i>Eriogonum gracile</i> var. <i>gracile</i>	Slender buckwheat	AH	Polygonaceae	
<i>Eriogonum wrightii</i> ssp. <i>membranaceum</i>	Wright's buckwheat	S	Polygonaceae	
<i>Eriophyllum confertiflorum</i>	Golden yarrow	S	Asteraceae	
<i>Erodium botrys</i> *	Storks-bill	AH	Geraniaceae	
<i>Erodium cicutarium</i> *	Redstem filaree	AH	Geraniaceae	Limited
<i>Erysimum capitatum</i> var. <i>capitatum</i>	Western wallflower	PH	Brassicaceae	
<i>Eschscholzia californica</i>	California poppy	AH	Papaveraceae	
<i>Eucalyptus globulus</i> *	Blue gum	T	Myrtaceae	Moderate
<i>Eucrypta chrysanthemifolia</i>	Eucrypta	AH	Hydrophyllaceae	
<i>Eulobus californicus</i>	Mustard evening primrose	AH	Onagraceae	
<i>Euthamia occidentalis</i>	Western goldenrod	PH	Asteraceae	
<i>Festuca arundinacea</i> *	Tall fescue	PG	Poaceae	Moderate
<i>Festuca microstachys</i>	Vulpia	AG	Poaceae	
<i>Festuca myuros</i> *	Rat-tail fescue	AG	Poaceae	Moderate
<i>Festuca perennis</i> *	Italian rye-grass	AG	Poaceae	
<i>Fraxinus</i> sp.	Ash	T	Oleacea	
<i>Galium angustifolium</i>	Bedstraw	PH	Rubiaceae	
<i>Galium aparine</i> *	Rubiaceae	AH	Rubiaceae	
<i>Geranium dissectum</i> *	Cutleaf geranium	AH	Geraniaceae	Limited
<i>Geranium molle</i> *	Wild geranium	AH	Geraniaceae	
<i>Gilia achilleifolia</i>	Gilia	AH	Polemoniaceae	
<i>Gnaphalium palustre</i>	Cud-weed	AH	Asteraceae	
<i>Gutierrezia californica</i>	Match-weed	S	Asteraceae	
<i>Hazardia squarrosa</i> var. <i>grindelioides</i>	Sawtooth goldenbush	S	Asteraceae	
<i>Helianthemum scoparium</i>	Peak rush-rose	PH	Cistaceae	
<i>Hesperoyucca whipplei</i>	Our lord's candle	S	Agavaceae	
<i>Heteromeles arbutifolia</i>	Toyon	T	Rosaceae	
<i>Heterotheca grandiflora</i>	Telegraph weed	PH	Asteraceae	
<i>Hirschfeldia incana</i> *	Summer mustard	BH	Brassicaceae	Moderate
<i>Hordeum murinum</i> *	Barley	AG	Poaceae	Moderate
<i>Hypochaeris glabra</i> *	Smooth cat's ear	AH	Asteraceae	Limited
<i>Juglans californica</i>	Southern California black walnut	T	Juglandaceae	
<i>Juncus macrophyllus</i>	Rush	PH	Juncaceae	
<i>Juncus patens</i>	Spreading rush	PH	Juncaceae	
<i>Keckiella cordifolia</i>	Heart-leaved penstemon	S	Scrophulariaceae	
<i>Lactuca serriola</i> *	Prickly lettuce	AH	Asteraceae	
<i>Lamarckia aurea</i> *	Goldentop	AG	Poaceae	
<i>Lamium amplexicaule</i>	Henbit	AH	Lamiaceae	
<i>Lasthenia californica</i>	Goldfields	AH	Asteraceae	

Attachment A

Vascular Plant Flora Observed within Santa Susana Field Laboratory Ventura County, California

Scientific Name	Common Name	Habit	Family	Invasiveness Rating
<i>Lathyrus vestitus</i>	Chaparral pea	AV	Fabaceae	
<i>Lepidospartum squamatum</i>	Scalebroom	PH	Asteraceae	
<i>Lilium humboldtii</i> ssp. <i>ocellatum</i>	Humboldt lily	PH	Liliaceae	
<i>Linanthus californicus</i>	Prickly phlox	S	Polemoniaceae	
<i>Lithophragma affine</i>	Woodland star	AH	Saxifragaceae	
<i>Logfia californica</i>	Filago	AH	Asteraceae	
<i>Logfia gallica</i> *	Narrow-leaf cottonrose	AH	Asteraceae	
<i>Lomatium lucidum</i>	Shining lomatium	PH	Apiaceae	
<i>Lonicera subspicata</i> var. <i>denudata</i>	Chaparral honeysuckle	S	Caprifoliaceae	
<i>Lupinus bicolor</i>	Miniature lupine	AH	Fabaceae	
<i>Lupinus hirsutissimus</i>	Stinging lupine	AH	Fabaceae	
<i>Lupinus truncatus</i>	Collar lupine	AH	Fabaceae	
<i>Madia sativa</i>	Coast tarweed	AH	Asteraceae	
<i>Malacothamnus fasciculatus</i> ssp. <i>fasciculatus</i>	Chaparral bush mallow	S	Malvaceae	
<i>Malacothrix saxatilis</i> var. <i>tenuifolia</i>	Cliff aster	PH	Asteraceae	
<i>Malosma laurina</i>	Laurel sumac	S	Anacardiaceae	
<i>Marah macrocarpa</i>	Wild cucumber	PV	Cucurbitaceae	
<i>Marrubium vulgare</i> *	Horehound	PH	Lamiaceae	Limited
<i>Matricaria discoidea</i> *	Pineapple weed	AH	Asteraceae	
<i>Medicago lupulina</i> *	Black medic	AH	Fabaceae	
<i>Medicago polymorpha</i> *	Bur clover	AH	Fabaceae	Limited
<i>Melica imperfecta</i>	Melic	PG	Poaceae	
<i>Melilotus indicus</i> *	Yellow sweet clover	BH	Fabaceae	
<i>Micropus californica</i>	Q-tips	AH	Asteraceae	
<i>Mimulus aurantiacus</i>	Bush monkeyflower	S	Scrophulariaceae	
<i>Mimulus guttatus</i>	Creek monkeyflower	PH	Scrophulariaceae	
<i>Mirabilis laevis</i> var. <i>crassifolia</i>	Wishbone bush	PH	Nyctaginaceae	
<i>Muhlenbergia microsperma</i>	Littleseed Muhly	AG	Poaceae	
<i>Muhlenbergia rigens</i>	Deergrass	PG	Poaceae	
<i>Navarretia atractylodes</i>	Navarretia	AH	Polemoniaceae	
<i>Nicotiana glauca</i> *	Tree tobacco	S	Solanaceae	Moderate
<i>Opuntia ficus-indica</i> *	Mission Prickly Pear	S	Cactaceae	
<i>Orobanche fasciculata</i>	Clustered broom-rape	PH	Orobanchaceae	
<i>Paeonia californica</i>	Wild peony	PH	Paeoniaceae	
<i>Parietaria hespera</i> var. <i>californica</i>	Pellitory	AH	Urticaceae	
<i>Pectocarya linearis</i> ssp. <i>ferocula</i>	Sagebrush combseed	AH	Boraginaceae	
<i>Pellaea andromedifolia</i>	Coffee fern	PF	Pteridaceae	
<i>Pellaea mucronata</i> var. <i>mucronata</i>	Bird's-foot fern	PF	Pteridaceae	
<i>Pennisetum setaceum</i> *	Fountain grass	PG	Poaceae	Moderate
<i>Pentagramma triangularis</i> ssp. <i>triangularis</i>	Goldback fern	PH	Pteridaceae	
<i>Persea americana</i> **	Avocado	T	Lauraceae	
<i>Phacelia cicutaria</i> var. <i>hispida</i>	Caterpillar phacelia	AH	Hydrophyllaceae	
<i>Phacelia grandiflora</i>	Large-flowered phacelia	AH	Hydrophyllaceae	
<i>Phacelia ramosissima</i> var. <i>ramosissima</i>	Branching phacelia	PH	Hydrophyllaceae	
<i>Pholistoma auritum</i> var. <i>auritum</i>	Fiesta flower	AH	Boraginaceae	
<i>Plagiobothrys collinus</i> var. <i>californicus</i>	Popcorn flower	AH	Boraginaceae	
<i>Platanus racemosa</i>	Western sycamore	T	Plantanaceae	
<i>Plantago erecta</i>	Plantain	AH	Plantaginaceae	
<i>Pluchea odorata</i> var. <i>odorata</i>	Salt marsh fleabane	AH/PH	Asteraceae	
<i>Poa secunda</i>	Bluegrass	PG	Poaceae	
<i>Polypodium californicum</i>	California polypody	PF	Polypodiaceae	
<i>Polypogon monspeliensis</i> *	Annual beard grass	AG	Poaceae	Limited
<i>Populus fremontii</i>	Fremont cottonwood	T	Salicaceae	
<i>Prunus ilicifolia</i> ssp. <i>ilicifolia</i>	Holly-leaved cherry	S/T	Rosaceae	
<i>Pseudognaphalium bioletti</i>	Two-tone everlasting	AH	Asteraceae	
<i>Pseudognaphalium californicum</i>	Green everlasting	AH	Asteraceae	
<i>Pseudognaphalium luteoalbum</i> *	Weedy cudweed	BH	Asteraceae	
<i>Pseudognaphalium microcephalum</i>	White everlasting	BH	Asteraceae	
<i>Pterostegia drymarioides</i>	Thread-stem	AH	Polygonaceae	
<i>Quercus agrifolia</i> var. <i>agrifolia</i>	Coast live oak	T	Fagaceae	
<i>Quercus berberidifolia</i>	Scrub oak	S	Fagaceae	
<i>Rafinesquia californica</i>	Rafinesquia	AH	Asteraceae	
<i>Ranunculus californicus</i>	Buttercup	PH	Ranunculaceae	
<i>Rhamnus ilicifolia</i>	Holly-leaved redberry	S	Rhamnaceae	
<i>Rhus integrifolia</i>	Lemonade berry	S	Anacardiaceae	
<i>Rhus ovata</i>	Sugar bush	S	Anacardiaceae	
<i>Ribes indecorum</i>	White chaparral currant	S	Grossulariaceae	
<i>Ribes malvaceum</i>	Chaparral currant	S	Grossulariaceae	
<i>Ribes</i> sp.	Gooseberry	S	Grossulariaceae	
<i>Rosa californica</i>	California wildrose	S	Rosaceae	
<i>Rubus ursinus</i>	California blackberry	PV	Rosaceae	
<i>Rumex californicus</i>	California willow dock	PH	Polygonaceae	
<i>Rumex crispus</i> *	Curly dock	PH	Polygonaceae	Limited
<i>Salix exigua</i>	Sandbar willow	S	Salicaceae	
<i>Salix laevigata</i>	Red willow	T	Salicaceae	

Attachment A

Vascular Plant Flora Observed within Santa Susana Field Laboratory Ventura County, California

Scientific Name	Common Name	Habit	Family	Invasiveness Rating
<i>Salix lasiolepis</i>	Arroyo willow	T	Salicaceae	
<i>Salsola tragus</i> *	Russian thistle	AH	Chenopodiaceae	Limited
<i>Salvia apiana</i>	White sage	S	Lamiaceae	
<i>Salvia columbariae</i>	Chia	S	Lamiaceae	
<i>Salvia leucophylla</i>	Purple sage	S	Lamiaceae	
<i>Salvia mellifera</i>	Black sage	S	Lamiaceae	
<i>Salvia spathacea</i>	Crimson pitcher sage	PH	Lamiaceae	
<i>Sambucus nigra</i> ssp. <i>caerulea</i>	Blue elderberry	T	Caprifoliaceae	
<i>Sanicula bipinnata</i>	Poison sanicle	BH	Apiaceae	
<i>Sanicula crassicaulis</i>	Pacific sanicle	PH	Apiaceae	
<i>Schinus molle</i> *	Pepper tree	T	Anacardiaceae	Limited
<i>Schismus barbatus</i> *	Mediterranean grass	AG	Poaceae	Limited
<i>Schoenoplectus californicus</i>	California bulrush	PH	Cyperaceae	
<i>Senecio flaccidus</i>	Shrubby ragwort	S	Asteraceae	
<i>Senecio vulgaris</i> *	Common groundsel	AH	Asteraceae	
<i>Sidalcea sparsifolia</i>	Few-leaved checkerbloom	PH	Malvaceae	
<i>Silene gallica</i> *	Windmill pink	AH	Caryophyllaceae	
<i>Silene laciniata</i> ssp. <i>laciniata</i>	Indian pink	PH	Caryophyllaceae	
<i>Silybum marianum</i> *	Milk thistle	AH	Asteraceae	Limited
<i>Sisymbrium altissimum</i> *	Tumble mustard	AH	Brassicaceae	
<i>Sisymbrium irio</i> *	London rocket	AH	Brassicaceae	Moderate
<i>Sisyrinchium bellum</i>	Blue-eyed grass	PH	Iridaceae	
<i>Solanum americanum</i>	American nightshade	AH	Solanaceae	
<i>Solanum douglasii</i>	White nightshade	AH	Solanaceae	
<i>Solanum xanti</i>	Purple nightshade	PH	Solanaceae	
<i>Solidago velutina</i> ssp. <i>californica</i>	California goldenrod	PH	Asteraceae	
<i>Sonchus asper</i> *	Prickly sow thistle	AH	Asteraceae	
<i>Sonchus oleraceus</i> *	Common sow thistle	AH	Asteraceae	
<i>Stellaria media</i> *	Chick-weed	AH	Caryophyllaceae	
<i>Stephanomeria virgata</i> ssp. <i>virgata</i>	Twiggy wreath plant	AH	Asteraceae	
<i>Stipa miliacea</i> var. <i>miliacea</i> *	Smilo grass	PG	Poaceae	Limited
<i>Stipa pulchra</i>	Purple needlegrass	PG	Poaceae	
<i>Symphoricarpos mollis</i>	Snowberry	S	Caprifoliaceae	
<i>Stylocline gnaphaloides</i>	Everlasting nest straw	AH	Asteraceae	
<i>Tamarix ramosissima</i> *	Salt cedar	T	Tamaricaceae	High
<i>Taraxacum officinale</i> *	Dandelion	PH	Asteraceae	
<i>Thysanocarpus curvipes</i>	Lace pod	AH	Brassicaceae	
<i>Thysanocarpus laciniatus</i>	Lace pod	AH	Brassicaceae	
<i>Toxicodendron diversilobum</i>	Poison oak	S	Anacardiaceae	
<i>Toxicoscordion fremontii</i>	Death camas	PH	Liliaceae	
<i>Trichostema lanatum</i>	Wooly blue curls	S	Lamiaceae	
<i>Trichostema lanceolatum</i>	Vinegar weed	AH	Lamiaceae	
<i>Trifolium ciliolatum</i>	Hairy clover	AH	Fabaceae	
<i>Trifolium hirtum</i> *	Rose clover	AH	Fabaceae	Moderate
<i>Trifolium willdenovii</i>	Tomcat clover	AH	Fabaceae	
<i>Ulmus parvifolia</i> *	Chinese elm	T	Ulmaceae	
<i>Umbellularia californica</i>	California bay	T	Lauraceae	
<i>Uropappus lindleyi</i>	Silver puffs	AH	Asteraceae	
<i>Urtica dioica</i>	Giant nettle	PH	Urticaceae	
<i>Venegasia carpesioides</i>	Canyon sunflower	PH	Asteraceae	
<i>Verbena lasiostachys</i>	Verbena	PH	Verbenaceae	
<i>Vicia benghalensis</i> *	Mediterranean vetch	AV	Fabaceae	
<i>Vicia hassei</i> (possibly <i>ludoviciana</i>)	Hasse's vetch	AV	Fabaceae	
<i>Vicia sativa</i> *	Common vetch	AV	Fabaceae	
<i>Viola pedunculata</i>	Johnny-jump-up	AH	Violaceae	
<i>Washingtonia robusta</i> *	Mexican fan palm	T	Arecaceae	Moderate
<i>Zeltnera venusta</i>	Charming Centaury	AH	Gentianaceae	

Notes:

Scientific nomenclature follows The Jepson Manual Second Edition (Baldwin et al., 2012).

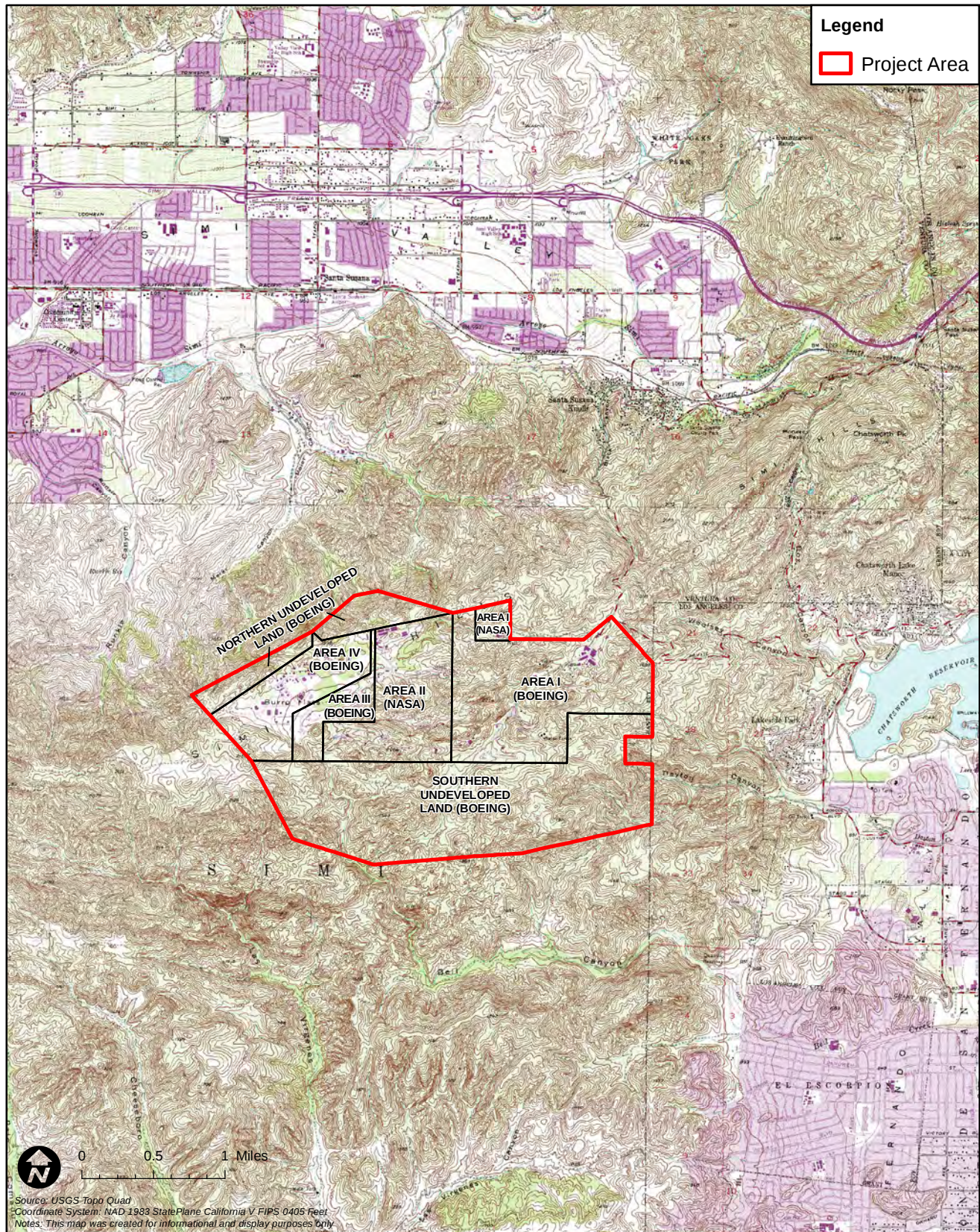
An "*" indicates non-native species which have become naturalized or persist without cultivation.

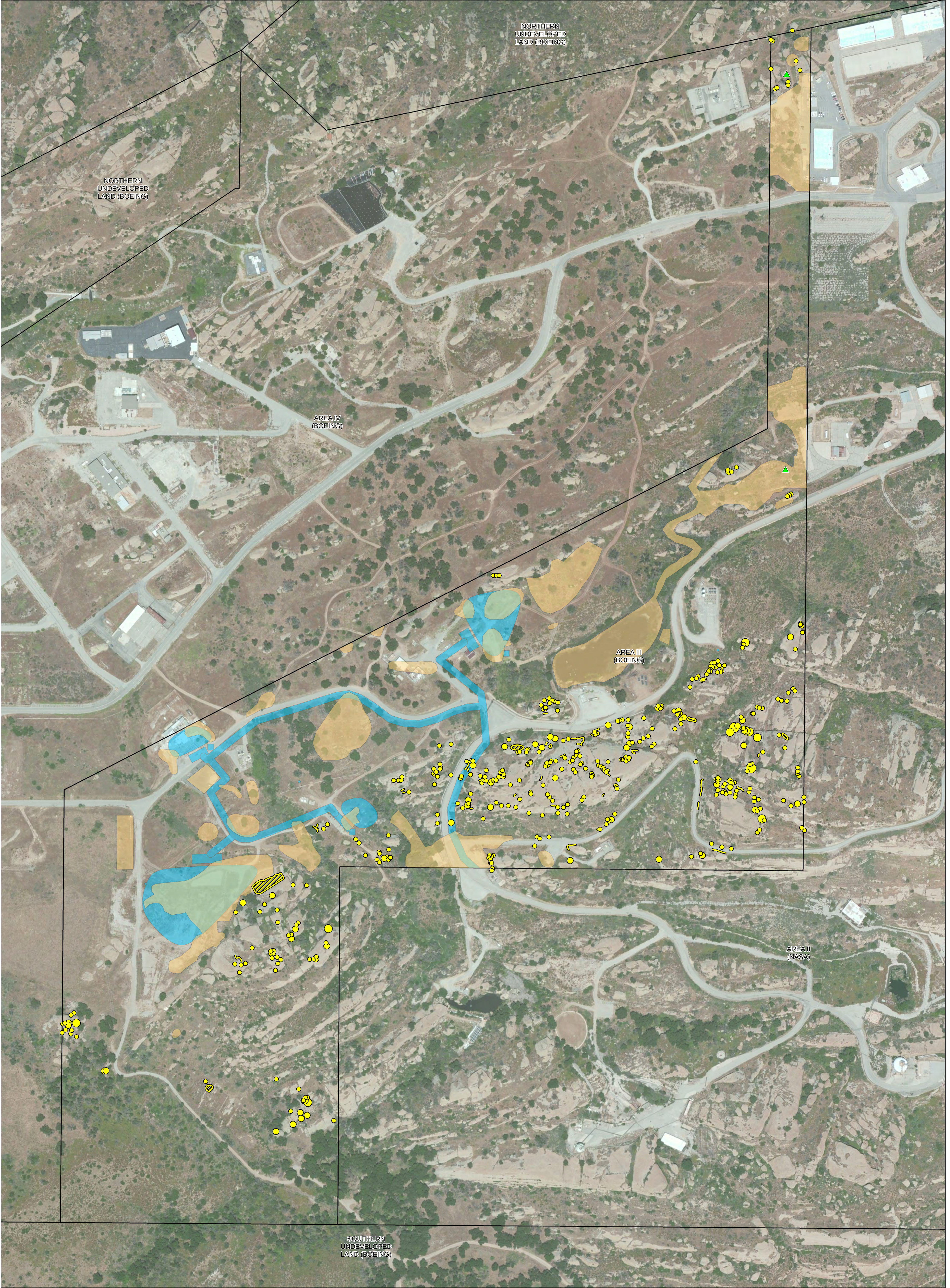
An "***" indicates species which have been planted and may not persist without cultivation.

Habit Definitions:

- AF = annual fern or fern ally.
- AG = annual grass.
- AH = annual herb.
- BH = biennial herb.
- PF = perennial fern or fern ally.
- PG = perennial grass.
- PH = perennial herb.
- PV = perennial vine.
- S = shrub.
- T = tree.

Invasiveness Rating from California Invasive Plant Inventory 2006





LEGEND:

- Administrative Boundary
- Plummers Mariposa Lily (*Calochortus plummerae*)
- Soil Remediation Impact Area
- Groundwater Remediation Impact Area
- Overlapping Soil and Groundwater Remediation Impact Area

Santa Susana Tarplant (*Deinandra minthornii*)
1183 Total Tarplant

- 11 - 75
- 3 - 51
- 0 - 2
- 3 - 5
- 6 - 10
- 11 - 15

SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

PROJECT NO.: 1402-0661
DATE: SEPTEMBER 2014

0 200 400
FEET

**AREA III RARE PLANT SURVEY-
SANTA SUSANA TARPLANT**

Source: ESRI Online Imagery Basemap
Coordinate System: NAD 1927 StatePlane California V FIPS 0405
Notes: This map was created for informational and display purposes only.

Kern County
Los Angeles County
Ventura County

Project Site Location

Pacific Ocean

padre
associates, inc.
ENGINEERS, GEOLOGISTS &
ENVIRONMENTAL SCIENTISTS



Photo 1. View of Area III with Santa Susana tarplant atop rock outcrop in foreground. Photo is toward the northeast.



Photo 2. View of Bowl area in Area I with restored areas in fore- and middle ground. Photo is toward the east.



Photo 3. View of westernmost potential soil borrow area in the Southern Undeveloped Land, supporting Catalina mariposa lily. Photo is toward the north.



Photo 4. Up-close view of Plummer's mariposa lily, located in the Southern Undeveloped Land.
