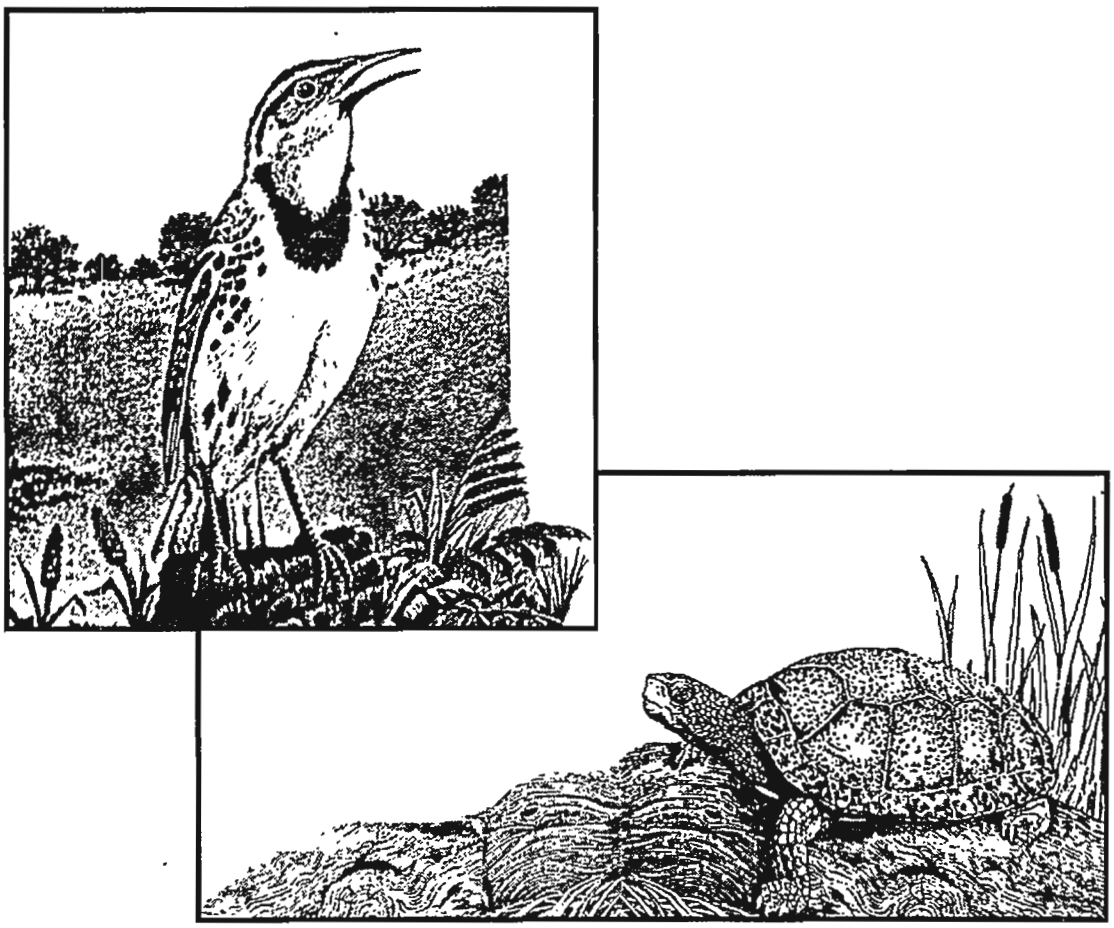
Willow Creek Wildlife Mitigation Project

Final Environmental Assessment



Bonneville
POWER ADMINISTRATION

DOE-EA-1023
April 1995

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FINDING OF NO SIGNIFICANT IMPACT

6450-01-P

DEPARTMENT OF ENERGY

Bonneville Power Administration

Finding of No Significant Impact for
Willow Creek Wildlife Mitigation Project

AGENCY: Bonneville Power Administration (BPA), Department of Energy (DOE).

ACTION: Finding of No Significant Impact (FONSI) for land acquisition or conservation easement over land and wildlife management plan.

SUMMARY: Today's notice announces BPA's proposal to fund land acquisition or acquisition of a conservation easement and a wildlife management plan to protect and enhance wildlife habitat at the Willow Creek Natural Area in Eugene, Oregon. This action would provide partial mitigation for wildlife and wildlife habitat lost by the development of Federal hydroelectric projects in the Willamette River Basin. The project is consistent with BPA's obligations under provisions of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 as outlined by the Northwest Power Planning Council's 1994.Columbia River Basin Fish and Wildlife Program. BPA has prepared an environmental assessment (DOE/EA-1023) evaluating the proposed project. Based on the analysis in the EA, BPA has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an environmental impact statement (EIS) is not required and BPA is issuing this FONSI.

MASTER

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ADDRESS: For copies of this FONSI, please call BPA's toll-free document request line: 800-622-4520.

FOR FURTHER INFORMATION, CONTACT: Nancy Weintraub, ECN-1500 Bldg., Bonneville Power Administration, P.O. Box 3621, Portland, Oregon, 97208-3621, phone number 503-230-5373, fax number 503-230-5699.

Public Availability: This FONSI will be distributed to all persons and agencies known to be interested in or affected by the proposed action or alternatives.

SUPPLEMENTARY INFORMATION: BPA is obligated by the Northwest Power Act to take actions consistent with the Northwest Power Planning Council's 1994 Columbia River Basin Fish and Wildlife Program to mitigate for native wildlife habitat types that were lost as a result of development of Federal hydroelectric projects within the Willamette River drainage basin. This opportunity to fund wildlife habitat improvement and restoration at the Willow Creek Natural Area will partially fulfill that obligation. The Willow Creek Natural Area is west of Eugene, in Lane County, Oregon, at the southern end of the Willamette Valley. Grasslands, wetlands, woodlands and forests at the site compose a diversity of habitats that support a variety of animal and plant species typical of the Willamette Valley.

The EA considers five alternatives. All alternatives except Alternative 5, the No Action alternative, include BPA acquisition of fee title to land or conservation easements over land. All alternatives, except Alternative 5, provide for protection and maintenance of existing wildlife habitat at the Willow Creek Natural Area. Alternatives 1, 2, and 3 include management activities that enhance existing, degraded wildlife habitat. The alternatives are designed to provide different levels of habitat management which would ultimately result in different mixes of habitat due to plant succession. The habitat types include prairies, forests, savannas and wetlands.

Alternative 1 proposes to maximize wildlife and biodiversity values by restoring and increasing the extent of existing habitats. Oak and ash forest would be thinned to provide savanna habitats. Grasslands would be plowed and reseeded with native species to establish prairie habitats. Priority would be given to control of habitat-modifying non-native and animal species. Habitat Units for targeted species would increase from 575.39 to 814.71.

Alternative 2 proposes to restore the site to its presettlement condition which occurred prior to the arrival of early settlers during the 1800's. This alternative would require a major program to remove invasive non-native species and woody plants and convert some areas of mature oak and ash forests back to prairie or savanna. It would also require restructuring of existing streams to recreate pre-existing headwater wetlands and prairies. Habitat Units for targeted species would increase from 575.39 to a total of 801.06

Alternative 3 proposes to maintain the existing conditions; this would require a lower level of active management than either Alternatives 1 or 2. Habitats would be managed for the existing conditions on the site. No habitats would restored. Expansion of non-native species beyond the present level would be controlled, however, no effort to restore prairie or wetland habitat, or control non-native species would be undertaken. Habitat for targeted species would remain at a total 575.39 Habitat Units.

Alternative 4 proposes no active management and would allow existing habitat trends to continue. Prairie habitat would eventually become revegetated with non-native species of plants and animals. Habitat Units for targeted species would decrease from 575.39 to 414.27.

Alternative 5 proposes No Action. BPA would not acquire land or conservation easements or fund wildlife management and habitat restoration and improvement activities. Private land would be unprotected from potential development that would fragment existing natural habitat. Non-native grasses, shrubs, and trees would

probably increase in abundance, and most native prairie species would eventually be extirpated. Habitat Units for targeted species could not be determined but it is expected that they would decrease.

Identified Impacts: Activities that restore or enhance wildlife habitat could cause impacts to the existing environment. Long term wildlife benefits are expected to occur from restoring habitats at Willow Creek Natural Area to those most likely to be used by the targeted species.

Short term, impacts could occur under Alternatives 1 and 2 as a result of implementation of wildlife habitat management actions. These would include local trampling of vegetation by workers, noise produced by operation of woody plant cutting and chipping equipment or smoke produced by prescribed burns. Equipment used would be small or hand-held machines; vehicles such as pick-up trucks would be limited and restricted to a marked route and conventional farm equipment would be used for plowing. Prescribed burns would be limited and closely restricted by Lane County burning permits. Under these alternatives, impacts would be minimized by timing the activities to occur during non-breeding or nesting seasons or during dry seasons when the ground is dry and hard and little or no erosion would occur. The short term impacts from these activities would be minor. Long term impacts could occur with Alternative 2 which would require substantial alteration of existing drainage patterns using large earth-moving vehicles.

Alternatives 3, 4 and 5 would not increase wildlife benefits. These alternatives would either reduce wildlife habitat benefits or result in existing maintenance of habitat benefits. Alternative 2 would increase wildlife habitat benefits but would cause substantial long-term disturbance from earth moving equipment and alteration of hydrology. Restoring habitats under Alternative 1 would increase wildlife habitat benefits and would not cause significant environmental impacts.

The project would be consistent with land use plans and is part of an inter-agency West Eugene Wetlands Plan. Wetland restoration on the Willow Creek site has been approved by the Order of the Director of the Division of State Lands approving the West Eugene Wetlands Plan in September, 1994. The Portland District of the US Army Corps of Engineers also approved the plan and will provide a Letter of Permission to expedite the wetland restoration permitting process under Section 404 of the Clean Water Act.

The proposed action, Alternative 1, would not have a significant adverse effect on floodplains, species listed as threatened or endangered under the Endangered Species Act, historic or cultural resources, air or water quality. No alteration or disturbance to floodplains will occur from restoration activities. Because the Willow Creek Natural Area is an element of the West Eugene Wetlands Plan no significant disturbance to endangered species will occur. All activities will be consistent with the U.S. Fish and Wildlife Service's adopted Recovery Plan for Bradshaw's lomatium (*Lomatium bradshawii*)a Federally listed endangered plant and with the West Eugene Wetlands Plan that provides protection to rare plant and animal species. Activities that cause disturbance to the ground will be monitored by an archeologist as recommended by the Cultural Resources survey. Air quality control will be monitored by Lane County during prescribed burns. Water quality will be closely monitored by the Eugene Comprehensive Stormwater Management Plan.

Determination: Based on the information in the EA, as summarized here, BPA determines that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA, 42 U.S.C. 4321 et seq. Therefore, an EIS will not be prepared and BPA is issuing this FONSI.

Issued in Portland, Oregon, on April 6, 1995.

Randall W. Hardy
Administrator and Chief Executive Officer

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CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 Introduction

The Willow Creek Wildlife Mitigation Project is a combined Management Plan and Preliminary Environmental Assessment (EA) that has been prepared by the Bonneville Power Administration (BPA) to disclose and document the potential environmental effects related to implementing the mitigation project. The project proposes various strategies for mitigating certain wildlife habitat losses.

1.1 Proposed Action

The BPA proposes to fund habitat acquisition (of land or a conservation easement), wildlife management, and habitat enhancement at the Willow Creek Natural Area in Eugene, Oregon. These efforts would partially fulfill BPA's obligations to protect, mitigate and enhance wildlife habitat affected by the development of federal hydroelectric projects in the Columbia River Basin, including the Willamette River drainage. Target species identified for wildlife mitigation at Willow Creek are beaver (*Castor canadensis*), black-capped chickadee (*Parus atricapillis*), red-tailed hawk (*Buteo jamaicensis*), valley quail (*Callipepla californica*), western meadowlark (*Sturnella neglecta*), yellow warbler (*Dendroica petechia*), and western pond turtle (*Clemmys marmorata marmorata*).

This Management Plan/Environmental Assessment (EA) describes alternatives for management, habitat enhancement, and restoration at Willow Creek, and considers the environmental impacts that may result from the different alternatives. This Management Plan/EA also provides a descriptive overview of the site, describes its ecological and geographic context, and its social and economic environment. Also included is a preliminary plan for monitoring and evaluating implemented actions, which will be revised and refined as experience and insight are gained.

1.2 Purpose and Need for Action

The Bonneville Power Administration proposes this action to partially meet the need for mitigation for wildlife and wildlife habitat adversely affected by the development of Federal hydroelectric projects in the Willamette River Drainage. The purposes of the proposed action are:

1. Provide for protection and improvement of wildlife habitat for mitigation of habitat lost as outlined in the Northwest Power Planning Council's 1994 Columbia River Basin Fish and Wildlife Program;

2. Be consistent with BPA's obligation under provisions of the Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act) of 1980;

3. Secure protection for lands necessary to maintain target species and habitats, provide for key ecological processes, and reduce off-site impacts to critical habitat areas;

4. Protect important ecological processes that are essential to the long term ecological viability of the site;

5. Manage the area for plant and animal habitat as the highest priority;

6. Manage the site to maintain a diversity of native plants and animals, and protect native Willamette Valley habitats;

7. Manage human use of the site to minimize impacts to wildlife, wildlife habitats, and rare, threatened and endangered species; and

8. Contribute to the protection of rare, threatened, and endangered plant and animal species.

1.3 Background and Site History

Prior to selecting a course of action, the National Environmental Policy Act (NEPA) requires that Federal agencies assess the potential environmental implications of the proposed action and a range of alternatives. The Willow Creek Wildlife Mitigation Project/EA has been prepared in order to comply with the requirements of NEPA and with the Department of Energy Implementing Procedures and Guidelines for preparing NEPA documents.

In order to mitigate for wildlife losses BPA has determined the potential for increasing the quality and extent of habitats that occur within the Willow Creek Natural Area. Wildlife losses are measured in terms of Habitat Units (HUs) that were lost from by the construction of hydroelectric projects in the Willamette River drainage. HU's are determined through application of the Habitat Evaluation Procedure (HEP) developed by the U.S. Fish and Wildlife Service. The HEP is a statistical method used to determine the impact of a proposed action by comparing the existing or baseline habitat condition to a predicted future habitat condition. The Willow Creek Habitat Evaluation identified a total of 575.39 HUs existing and compares several alternatives that would change the existing number of HUs present on the site. Seven wildlife species were selected as target species. The criteria for selecting these species to represent habitat quality were based on: (1) the priority goals developed in the Willamette River Basin Wildlife Mitigation Plan, and target species for the Willamette Basin Projects; (2) habitat use; (3) ecological role; and (4) discussions between The Nature Conservancy, BPA, and the U.S. Fish and Wildlife Service.

The Willow Creek Natural Area is located just west of Eugene in Lane County, Oregon. It lies within the 1,052 ha (2600 ac) Willow Creek watershed at the southern end of the Willamette Valley (Figure 1). Willow Creek is a tributary of Amazon Creek, which flows northward into the Long Tom River, which then flows into the Willamette. The Natural Area is a 142 hectare (350 acre) area (Figures 2a. and 2b.), bounded on the north by West 18th Ave, on the west by Willow Creek Road and Rathbone Lane, on the south by Gimpl Way and Gimpl Hill Road, and on the east by Bertelsen Road and Bailey Hill Road. The site is generally located within Sections 3, 4, and 9 of Township 18 South, Range 4 West.

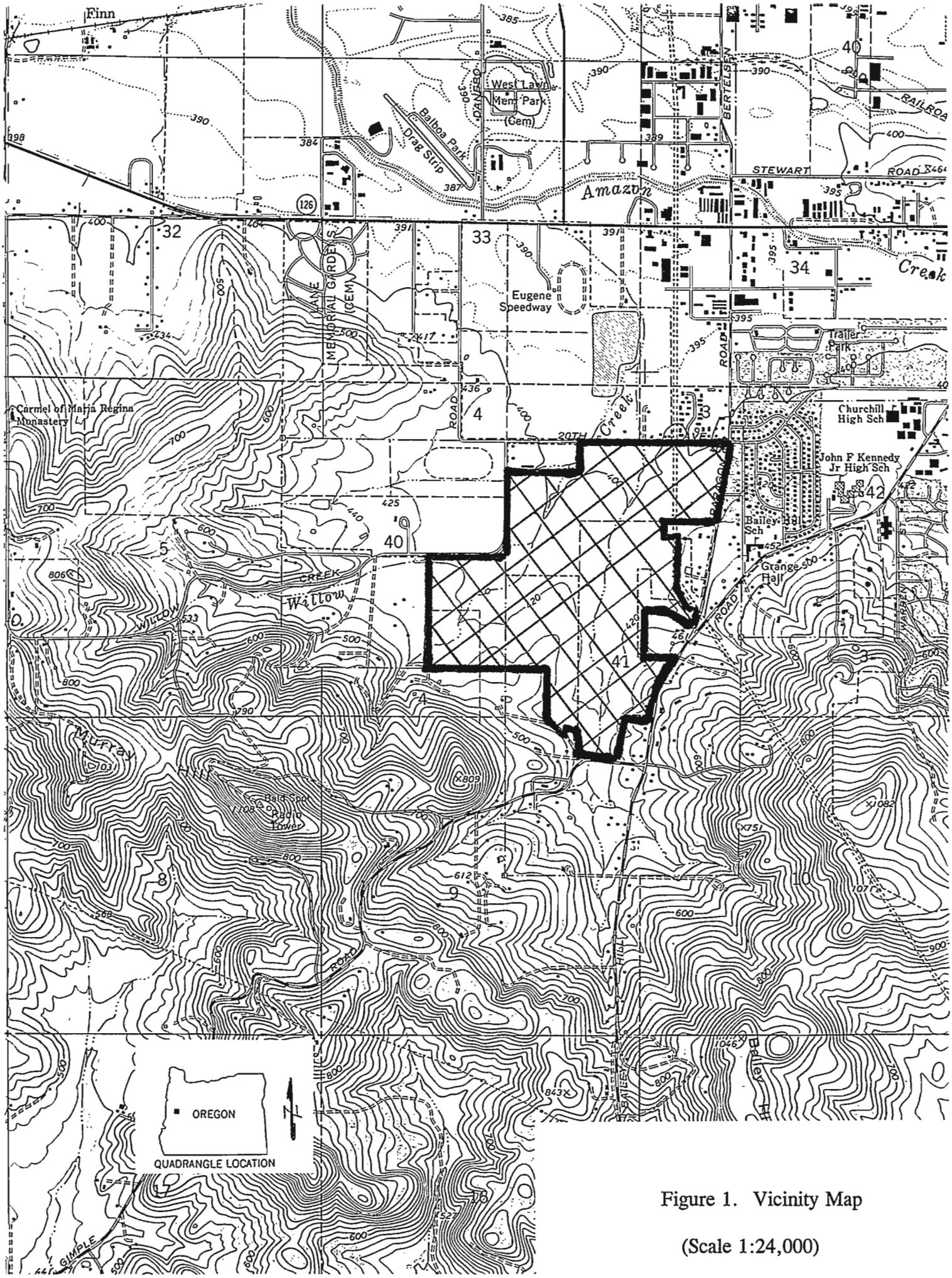

Figure 1. Vicinity Map

(Scale 1:24,000)

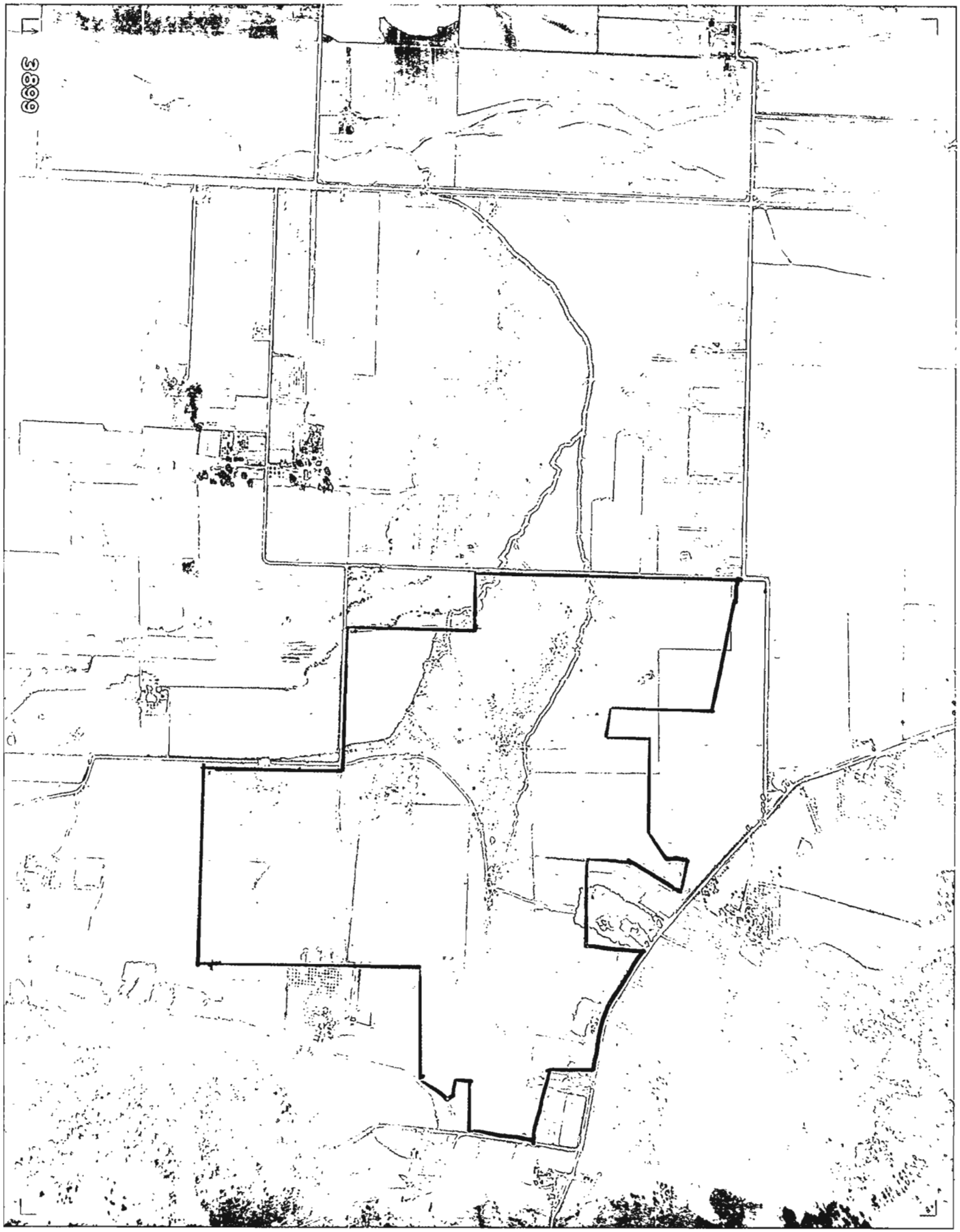

Figure 2a. 1936 Air Photo of Willow Creek
(scale approximately 1:15,000)

Figure 2b. 1990 Air Photo of Willow Creek
(scale approximately 1:12,500)

Approximately 86 hectares (210 acres) of the site are presently owned by The Nature Conservancy and another 2 hectares (5 acres) are owned by the City of Eugene. Nearly all of the remaining land within the site boundary [51 hectares (125.6 acres)] is owned by the Bailey Hill Land Company, and is under option for purchase of land or conservation easement by the Bonneville Power Administration.

The Nature Conservancy (TNC) manages the Willow Creek Natural Area through lease agreements with private land owners. In 1990 TNC and the Oregon Department of Fish and Wildlife (ODFW) jointly proposed the area for consideration as a wildlife mitigation site under BPA's implementation planning process. In the fall of 1991 a proposal was submitted the Wildlife Scoping Group at BPA and ranked second out of 46 projects in 1992. It was recommended by BPA staff to the Policy Review Group for implementation that fall. In the meantime, TNC proceeded to acquire parcels that had previously been protected under management lease. In 1993 BPA acquired an option to purchase land or conservation easement on the last remaining large, privately owned parcel within the Willow Creek Natural Area, the 51 hectare (125.6 acre) Bailey Hill parcel.

1.3.1 Mitigation Process under the Northwest Power Act

Under provisions of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act), BPA has the obligation and authority to fund wildlife mitigation activities, including those are approved by the Northwest Power Planning Council through its Fish and Wildlife Program. The initial phase of mitigation planning for wildlife habitat losses was submitted to the Council for amendment into the Council's Fish And Wildlife program in 1989. In 1989, the Council amended the Program to include wildlife habitat losses resulting from the construction of hydroelectric projects in the Willamette River Basin.

1.3.2 Review Schedule for the Willow Creek Wildlife Management Plan

The Final Willow Creek Wildlife Management Plan would be periodically reviewed by BPA on the following schedule: once every year for the first three years, then once every five years, unless unforeseen circumstances dictate the need for a schedule change.

1.3.3 Relationship to Other Actions

Considerable planning efforts have been undertaken in the west Eugene area. The three other land use plans that relate to the Willow Creek Natural Area are: the original Willow Creek Special Area Study plan; the West Eugene Wetlands Plan that entails a broad spectrum of wetlands in the Eugene area; and the Recovery Plan for Bradshaw's lomatium. These are discussed below.

- Willow Creek Special Area Study, 1982

The Willow Creek Special Area Study is a refinement plan to the Eugene-Springfield Metropolitan Area General Plan, which was developed under the Oregon Land Use Planning Act. The Willow Creek Special Area Study recommends land use designations and policies for development of much of the Willow Creek basin. This document provides for protection of 40.8 hectares (100 acres) of the core wetlands within the Willow Creek Natural Area through a protective zoning designation (this ultimately became a "Natural Resource" designation). At the same time, the study allows transfer of development density from the natural resource zoned lands to adjacent lands zoned for residential development. To date, the residential development anticipated through this density transfer mechanism has not occurred.

- West Eugene Wetlands Plan, 1992

In 1989, a comprehensive Wetland Conservation Plan, was undertaken by the City of Eugene and Lane County for 2,040 hectares (5,000 acres) west of Eugene. The plan is a complete inventory of the wetlands in the West Eugene urban growth boundary. It provides for long term ecological protection to many wetland sites, one of which is the Willow Creek Natural Area. The West Eugene Wetlands Plan (WEWP), which was adopted by the City of Eugene and Lane County in 1992 designates all of the jurisdictional wetlands in the Willow Creek Natural Area as "wetlands to be protected" (WEWP Map 3, p. 27). The WEWP also provides direction for protection of wildlife corridors or linkages on land adjacent to the Willow Creek Natural Area, and as such, provides opportunities to increase its long-term viability.

- *Lomatium bradshawii* Recovery Plan, 1993

Bradshaw's lomatium (*Lomatium bradshawii*) is a plant that was listed by the U.S. Fish and Wildlife Species as a federally listed, Endangered species in 1988. This species is found in wet prairie habitats in the Willow Creek Natural Area and occurs elsewhere only at a few other sites in the Willamette Valley. The US Fish and Wildlife Service has adopted a Recovery Plan that sets criteria to meet the goal of downlisting the species from Endangered to Threatened status. Willow Creek is one of 14 known locations for the species, but the estimated population size of 25,000 plants at Willow Creek accounts for about one half of all the known plants throughout the species' range.

- Eugene Comprehensive Stormwater Management Plan, 1993

In response to federal water quality mandates, the City of Eugene adopted the Comprehensive Stormwater Management Plan (CSWMP). CSWMP is a local policy plan that expands the scope of the City's traditional stormwater program to include multiple objectives (e.g., flood control and drainage services, water quality treatment, and the management of natural resources that provide important stormwater benefits, education and recreation opportunities). Implementation of CSWMP is guided by over 30 Best Management Practices (BMPs). These BMPs constitute a multi-faceted, programmatic approach for managing stormwater quality, including: public education; source controls, treatment controls, industrial monitoring, and enforcement. The new

stormwater program is funded primarily through stormwater user fees, system development changes, grants, and other funds. The program calls for the protection and enhancement of the City's creeks, rivers, open channels, and wetlands, while ensuring adequate drainage services and protection from flooding. Willow Creek, and other similar natural resources that perform stormwater functions, are to be incorporated and managed as part of the overall stormwater system.

- National Pollutant Discharge Elimination System (NPDES Permit) - 1994

As required by federal and state law, the City of Eugene obtained an NPDES permit from the Oregon Department of Water Quality. The permit details the specific water quality actions to be taken over a five-year permit period. The NPDES permit and CSWMP were coordinated so that program policy and implementation actions (BMPs) are consistent. One of the BMPs requires the adoption of stormwater standards for new development. These standards will place greater responsibility on new development for managing the quantity and quality of runoff prior to its discharge to waters of the United States. As a result, the City will have greater management authority for preventing and enforcing new water quality standards. This provides greater certainty that important resources, such as Willow Creek, will be protected from nonpoint source pollution as the basin transitions from rural to urban uses.

- Willow Creek Water Quality Assessment Study - 1994

As part of Eugene's strategy to implement its Comprehensive Stormwater Management Plan, basin plans are to be prepared for addressing the multiple objective opportunities within each basin and for guiding the management of future public improvement projects. The Willow Creek Basin plan will be prepared over the next two-year period. To obtain baseline water quality data, at $50,000 Environmental Protection Agency grant {Section 104(b)(3)} was awarded to the City of Eugene. The grant will fund the assessment of the basin's existing water quality characteristics, including chemical, biological, and physical data along the major tributaries. This data will be used to help define and apply appropriate water quality management measures that can be monitored for their effectiveness as the basin transitions from rural to urban uses. The grant period ends September 1995.

CHAPTER 2: ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.0 Summary of the Alternatives Under Consideration

The following alternatives are designed to capture the issues outlined in the purposes and need for action identified in Chapter 1. The alternatives provide a range of approaches to wildlife habitat management, based on the dynamic nature of habitat succession that is occurring on the site. Table 1 compares major features of the alternatives under consideration. All alternatives (except for Alternative 5, no action) provide for protection and maintenance of the wildlife habitat that currently exists at Willow Creek. Several of the alternatives also include management activities for the enhancement of native plant communities and wildlife habitat.

The differences between the alternatives reflect a variety of potential approaches to the issue of what is "natural" in the Willamette Valley. At the time of the arrival of the first settlers in the mid-1800's, the valley floor in the vicinity of Eugene was predominantly open prairie, and probably supported wildlife species that prefer open environments, such as the western meadowlark and western pond turtle. Low-lying prairie lands with heavy clay soils were seasonally wet, inundated or saturated to the soil surface in the winter and early spring, but becoming completely dry by late summer. While the regional climate is capable of supporting forest vegetation, open prairies were maintained primarily by fires set by Native Americans. Over the past 140 years, lack of fires has allowed trees and shrubs to establish and spread in former open prairie areas, which in turn has led to loss of habitat for prairie wildlife. This pattern of ecological succession has been taking place at Willow Creek, as documented by 1850's land surveys, and by aerial photographs taken as early as 1936.

All alternatives except for Alternative 5 would involve BPA acquisition of lands or conservation easements at Willow Creek. BPA is considering exercising their option to purchase the Bailey Hill Property, acquiring additional properties or conservation easements now owned by TNC, and funding habitat maintenance and (except under Alternative 3) enhancement activities. The area of each habitat type that would result under each alternative is summarized in Table 2.

Alternative 1 - Proposed action - maximize wildlife and biodiversity values. Future management efforts would result in a diverse mix of wildlife habitats including open prairie, savanna, woodland, and riparian forest and wetland. The site would be managed for a variety of native wildlife species, reflected in the diversity of the target species listed in Section 1.1. In some places, active habitat management would be initiated to maintain or restore open prairie and savanna habitats, especially in areas where lack of past disturbance has resulted in the survival of high quality native prairie habitat. Extensive forested areas would be maintained as well. High priority would be given to control of invasive, habitat-modifying non-native plant species, and other non-native plants would be controlled to the extent possible.

Alternative 2 - Restoration of presettlement habitat conditions. This alternative would involve the greatest management efforts with the goal of restoring the site to habitat conditions that occurred in the mid-1800's. Native wildlife species of open prairie and savanna habitats would benefit most under this alternative. This alternative would require a major program to restore presettlement

drainage patterns and to remove invasive non-native species and woody plants. These actions would result in the conversion of some areas of mature forest back to prairie or savanna.

Alternative 3 - Maintain existing conditions. This alternative would entail a lower level of active management than Alternatives 1 or 2. Habitat would be managed for the mix and population levels of native wildlife species currently existing on the site, although some species currently present at low population levels may not be sufficient to be viable over the long term. Expansion of woody plants or non-native vegetation beyond present coverage would be controlled, but expanded efforts to restore grassland/wetland habitat and control non-native species would not be undertaken.

Alternative 4 - No active management. With no active management, existing trends in vegetation change would continue. Habitat conditions would change through vegetative succession, benefiting native wildlife species that prefer forested habitats. All areas that are presently open prairie would gradually change into closed forest. Non-native grasses, shrubs, and trees would probably increase in abundance, and most native prairie species would eventually be extirpated.

Alternative 5 - No BPA action. BPA would not acquire lands at Willow Creek or fund future management efforts. Attempts could be made to find other ways to fund management activities. Without funding, success would not be assured, and some of the upland habitat may be developed. Even if the site were protected through other means, management resources necessary to ensure the long-term survival of the natural area's wildlife values and biological diversity may not be available.

2.1 Alternative 1: Proposed Action - Maximize Wildlife and Biodiversity Values

The goal of Alternative 1 is to provide high quality habitats for a variety of wildlife species typical of natural or near-natural conditions in the Willamette Valley. This would be accomplished by land acquisition and enhancement or restoration of wildlife habitats. These habitats include open prairie, savanna, ash woodland, oak woodland, and riparian forest and wetland. A diversity of native wildlife species would be managed for, including native reptiles (e.g. western pond turtle, which requires both open water and open upland habitats), and species such as the red-tailed hawk, which utilize wooded areas for nesting and open areas for hunting. Under Alternative 1, public access would be controlled to allow only pedestrians to enter the site, and would be limited to existing developed trails, with exceptions for educational uses and volunteer projects.

Summary of the Range of Alternatives Under Consideration

Alternatives	Property Acquisition	Wildlife Management	Wildlife Habitat Enhancements	Public Access
Alternative 1--Proposed Action	BPA acquisition of fee title or conservation easement.	Protect and enhance wildlife values, biodiversity.	Maintain and restore a diversity of habitats; emphasis on prairie, savanna, and forest.	Access controlled, pedestrians only, including wetland, limited to existing trails or guided tours.
Alternative 2--Restore to Presettlement Conditions	BPA acquisition of fee title or conservation easement.	Protect and enhance wildlife values, emphasis on native prairie wildlife.	Maintain and restore habitats with emphasis on prairie and savanna habitats.	Access controlled, pedestrians only. Public access limited to outer portions of the site.
Alternative 3--Maintain Existing Conditions	BPA acquisition of fee title or conservation easement.	Protect existing wildlife values, no enhancement.	Maintain existing habitats, control spread of non-native vegetation.	Access controlled, pedestrians only. Existing trails kept open to public.
Alternative 4--No Active Management	BPA acquisition of fee title or conservation easement.	No active effort to maintain or enhance wildlife values.	No habitat maintenance, habitats may change due to spread of non-native vegetation, plant succession.	Access controlled, pedestrians only. No other management of public use.
Alternative 5--No BPA Action	No BPA acquisition of fee title or conservation easement.	None by BPA; unknown activities by present or future property owners.	None by BPA; unknown activities by present or future property owners.	Unknown; public access could be lost on private lands.

Table 1

2.1.1. Wildlife Habitat Management

Active management would be initiated, where necessary, to maintain or restore native prairie, savanna, woodland, and riparian habitats. The extent of each habitat type proposed under this alternative is summarized above (see Table 2). Habitat modifications resulting from enhancement would emphasize restoration of the plant community composition and structure of these presettlement plant communities, to the extent possible or practicable, given existing conditions and present or future technology. However, an exact duplication of the spatial distribution of presettlement habitats would not be the specific goal. Non-native plant species would be controlled to the extent possible to maintain a dominance of native species. An emphasis would be placed upon maintaining or restoring the integrity of natural ecological processes, as a tool for achieving and maintaining vegetation and wildlife habitat goals. These processes include natural hydrologic patterns, fire ecology, and animal use (such as herbivory, predation, and stream manipulation by beaver).

The different habitats envisioned under Alternative 1 are described below. These brief summaries are intended to provide a general target condition that would ultimately be achieved over a management time frame of 50 years. The proposed configuration of the different habitats is shown on Figure 3.

Upland Prairie - 48.6 hectares (119 acres).Upland prairie is dominated by mix of upland grasses and forbs, with few or no trees or shrubs. Habitat for wildlife species that utilize open grass and forb dominated sites would be maintained or enhanced by removing non-native plant species or invasive woody plants such as Scot's broom (*Cytisus scoparius*) and Himalaya blackberry (*Rubus discolor*). Habitat enhancement is designed to benefit both target wildlife species and rare or sensitive animal and plant species (such as the western meadowlark, valley quail, Fender's blue butterfly (*Icaricia icarioides fenderi*), and the Willamette daisy (*Erigeron decumbens* ssp. *decumbens*). Areas of upland pasture now dominated by non-native grass species would be enhanced by planting native grasses and forbs characteristic of upland prairie habitats.

Habitat management methods would be selected that avoid negative impacts to native wildlife species. For example, mechanical removal of non-native plant species would not be conducted during times of the year when native wildlife species are likely to be nesting in those habitats.

Forested Wetland (ash) - 37.1 hectares (91 acres). This is a densely forested habitat with nearly continuous canopy coverage, a well-developed shrub layer, and ground cover of shade-tolerant forbs and grasses. It is a seasonal wetland, with the water table at or near the surface during the winter and early spring. This is the most extensive habitat for forest-dwelling wildlife species at Willow Creek. This unit consists primarily of Oregon ash (*Fraxinus latifolia*) trees that are mostly about 100 year old. Under this alternative the density of ash trees and other native woody plants would not be altered through clearing or prescribed fire; changes that occur would be a result of natural growth, recruitment, and mortality.

Management of vegetation would be necessary to remove invasive non-native species, particularly understory species such as English hawthorn (*Crataegus monogyna*) and Himalaya blackberry.

Open Wet Prairie - 34.7 hectares (85 acres). Wet prairie provides habitat for many of the same wildlife species as upland prairie. The primary differences are the seasonally saturated soils providing wetland conditions in winter and early spring and composition of the native plant community. Tufted hairgrass (*Deschampsia cespitosa*) is the dominant native grass species in this system. Much of the wet prairie habitat is currently undergoing vegetative succession, as tree species colonize from adjacent forested habitats. While historical evidence indicates that few trees were present in the wet prairie at Willow Creek as recently as the 1930's and 1940's, many young Oregon ash and pear (*Pyrus communis*) trees are now present. Under this alternative, these areas would be retained as wet prairie by careful clearing of the trees belonging to this younger cohort.

Habitat management would occur during the late summer and early fall, when the wildlife breeding season has ended, the ground is dry, and the vegetation is mostly dormant. Existing patches of native shrubs such as Douglas spiraea (*Spiraea douglasii*) would be retained at their present extent to provide wildlife cover. Prescribed burning would be used to maintain open habitat conditions and enhance the growth of native grasses and forbs. Because of the documented importance of fires in maintaining Willamette Valley prairies in presettlement times, it is believed that most if not all wildlife species native to prairie habitats are tolerant of late summer prescribed burns. However, burn units would generally be limited in extent during any given year to minimize smoke output, and to provide refugia for wildlife species that may be somewhat sensitive to fire.

Oak Savanna - 8.5 hectares (21 acres). Several small groves of black and white oak (*Quercus garryana* and *Quercus kelloggii*) occur over the site. Though localized within the site, the oak stands increase habitat diversity, and are of particular importance to wildlife species that utilize acorns as a food source. Wildlife habitat management goals for oak stands would emphasize maintaining oak dominance over later successional species such as Douglas-fir (*Pseudotsuga menziesii*) or bigleaf maple (*Acer macrophyllum*), increasing acorn production, increasing the abundance of tree cavities that provide wildlife nesting sites, and maintaining native plant species in the understory (shrub and forb) layers. Many of these management goals may be met as individual trees gradually increase in size and stand density decreases.

Habitat management would include gradual, selective thinning of smaller diameter stems to reduce the overall density of trees and increase the size of remaining trees. Remaining trees would develop more widely spreading crowns, and produce more substantial side branches, which eventually lead to the development of sizable cavities (Gumtow-Farrier, 1992). Acorn production should increase as more of the trees' crowns are exposed to sunlight. Where Himalaya blackberry or other invasive plants have established in the understory, mechanical or manual methods would be used for their control.

Wooded Wetland (ash savanna) - 4.9 hectares (12 acres). This habitat is located between forested wetland and wet prairie, and as such is fairly limited in extent. However, this habitat would be beneficial for wildlife species that utilize both open and wooded habitats. The structural habitat potential of ash savanna is evidenced by the scattered, older Oregon ash trees that occur within the area that was formerly mostly open wet prairie. These trees are short for their age, have large

48 ha	Upland prairie (1a)	35 ha	Open wet prairie (3a)
1 ha	Oak forest (2a)	34 ha	Forested wetland: ash (4a)
8 ha	Oak savanna (2b)	5 ha	Wooded wetland, ash savanna (4b)
1 ha	Conifer forest (2c)	4 ha	Riparian forest: cottonwood-ash-willow (4c)

Meters

0 200 400

Oregon, South Zone

1:10000

Figure 3.

Alternative 1: Proposed Action

WILLOW CREEK

WILDLIFE HABITAT MANAGEMENT

spreading crowns, and have greater diameters than the trees in the dense ash forest. The larger side branches of open-grown ash trees increase the density of tree cavities. Where existing ash trees are too dense to provide savanna conditions, selective removal of mostly smaller and younger trees would be implemented using the techniques and constraints described above for the open wet prairie habitat type.

Where Himalaya blackberry or other invasive plants have established in the understory, mechanical or manual methods would be used for their control. For those areas of ash savanna adjacent to open wet prairie and with fire breaks, prescribed burns would be implemented to maintain savanna conditions, as mature Oregon ash trees are quite tolerant of low intensity surface fires. Those areas of ash savanna that are outside of fire breaks would require a low level of manual or mechanical maintenance to maintain the low density of trees.

Riparian Forest (black cottonwood-Oregon ash-Piper's willow) - 4.1 hectares (10 acres). This habitat is restricted to the narrow corridor along the two forks of Willow Creek. Active beaver dams are present along much of the stream corridor, and the seasonal beaver ponds, with their open water habitats, are an integral part of the riparian habitat. The riparian forest varies in structure and dominance, from dense thickets of shrubby willows (*Salix piperi*) to groves of tall cottonwoods (*Populus trichocarpa*). As such, this habitat is relatively dynamic and any given location is likely to change over time due to natural factors such as vegetative succession, flooding, and sedimentation. However, it is anticipated that the mosaic of riparian species and habitat structure that presently exists will likely continue to persist for the near future without significant active management.

Only limited habitat management, such as removal of patches or colonies of invasive, non-native plant species such as reed canary grass (*Phalaris arundinacea*) and Himalaya blackberry, would occur in riparian forest.

Conifer Forest - 1.3 hectare (3 acres). Two groves of conifers, mostly Douglas-fir are found at Willow Creek. Most of the trees are fairly young; none appear to be more than about 80 or 90 years old. The tall conifers play an important role as perching and nest trees for raptors and other birds. Under this alternative these groves would be maintained.

2.1.1.1. Management of Invasive or Non-native Vegetation

About 100 species of non-native plants have been recorded at Willow Creek. Many of these have fairly specific habitat requirements, or are not strongly competitive, and thus are not significantly displacing the native flora. A small number of the non-native species are highly invasive, habitat modifying plants that, if left unchecked, will form dense monocultures. These habitat modifiers include certain species of trees, shrubs, grasses, and forbs; examples include common pear, Scot's broom, Himalaya blackberry, teasel (*Dipsacus sylvestris*), and reed canary grass. Because they can form dense stands that exclude all other native species, these habitat modifiers would be the primary focus of non-native plant species control.

Control methods would include, where most appropriate, manual methods, mechanical means, prescribed fire, or selective application of herbicides. Control efforts would be conducted under a written plan that documents the invasive species of concern and their present distribution, prioritizes short-term and long-term control efforts, and allocates resources where they would be most effectively applied.

2.1.1.2. Management of Rare, Threatened, and Endangered Plant Species

A number of rare, threatened, and endangered plant species occur at Willow Creek (see Appendix A). Management of rare, threatened, and endangered plant species would emphasize habitat enhancement and restoration to maintain and improve the viability of existing populations. For listed species with an adopted Recovery Plan, such as Bradshaw's lomatium (*Lomatium bradshawii*), management would be conducted under the guidelines for the Recovery Plan. Otherwise, management actions for these species may be implemented under recommendations from State and Federal agencies. Quantitative monitoring of these species would continue (as it has since 1986), as a means of assessing success.

2.1.2 Wildlife Management

Under Alternative 1, wildlife populations would be managed for a diversity of native wildlife species. Management and maintenance of plant communities and site conditions would be the primary means of achieving wildlife management goals. In certain circumstances, artificial structures for improvement of wildlife habitat could be used. An inventory of wildlife species would be conducted during the first year of project implementation, to help evaluate the appropriateness of proposed management actions. Long-term monitoring would occur to evaluate the success of management activities.

2.1.2.1 Management of Native Wildlife Species

Wildlife populations at Willow Creek would be managed for a diversity of native species, such as the target species listed in Section 1.1, associated with the mix of native plant communities proposed under this alternative. Where a recovery plan exists for a listed species, management would be consistent with the recovery plan. Appendix A identifies State sensitive and Federally listed and candidate wildlife species that may occur at Willow Creek. An inventory of wildlife species would be conducted during the first year of project implementation, to help evaluate the appropriateness of proposed management actions. Long-term monitoring would occur to evaluate the success of management activities.

Enhancement activities may include the use of artificial structures for improvement of wildlife habitat where such structures are presently absent or scarce, cannot be provided in sufficient quantity through natural processes, and are necessary to meet BPA's wildlife mitigation goals. This may include installation of nesting or basking structures, and creation of snags that may serve as perches for raptors, or provide cavities for nesting of wildlife. If artificial structures are considered necessary and appropriate, highest priority would be to provide structures for wildlife species that are target species of wildlife mitigation at Willow Creek.

Maintaining viable wildlife populations depends upon many factors in addition to habitat quantity or quality. Spatial relationships and presence of corridors linking habitat areas located off-site are of particular importance. As time passes, conditions on adjacent lands may change through ecological succession or changes in land use. However, the WEWP addresses some of these concerns by designating adjacent wetland areas to the north for protection, and by establishing habitat corridors that link protected habitats at Willow Creek with the hills to the south, and with Amazon Creek to the north.

The potential exists for several species, such as black-tailed deer (*Odocoileus hemionus columbianus*) or raccoons (*Procyon lotor*) to become so numerous that they cause habitat alteration or have adverse effects on other wildlife species. Causes for this potential increase include habitat alteration on lands adjacent to Willow Creek, or the lack of predators such as black bears (*Ursus americanus*) or cougars (*Felis concolor*). Recreational hunting would not be permitted at Willow Creek. While the use of firearms is prohibited within the city limits of Eugene, controlled hunts could be allowed, outside the city limits, as a means of population control for non-native species or to control native species' populations to reduce habitat degradation, if alternative means are not practical or effective. Controlled hunts would then be permitted only in a manner that is consistent with ODFW guidelines and regulations, is compatible with other management plan objectives, and does not cause adverse impacts to other wildlife species. Recreational trapping for wildlife at Willow Creek would not be permitted. Species specific, controlled trapping could also be allowed as a means of population control for non-native species or native species that are so abundant as to cause habitat degradation. Trapping would be permitted only in a manner that is consistent with ODFW guidelines and regulations, is compatible with other management plan objectives, and does not cause adverse impacts to other wildlife species.

Wildlife at Willow Creek could be captured, marked and released onsite as part of an approved and permitted (by ODFW and/or Federal Agencies depending upon the species) scientific research project. Projects would be permitted only upon demonstration of a need to manage the species or habitats. Recreational or educational capture and banding of wildlife would not be permitted. Scientific collection of wildlife species from Willow Creek would be discouraged unless it would improve management of the species. Scientific collecting must meet the permit requirements of ODFW under OAR 635-43-023 to 050.

Injured or sick wildlife would not be captured, treated, or killed unless they pose a threat to humans, other wildlife populations, or listed species. Injured, sick, or rehabilitated wildlife would not be released at Willow Creek. Any such introductions should be considered an unnecessary outside influence on the dynamics of wildlife populations at Willow Creek.

2.1.2.2. Fisheries Management

All streams and ponds at Willow Creek are intermittent or seasonal, drying completely by the late summer. It appears that this is the natural condition for the site. Historical information, including interviews with long-time residents and field notes from the 1850's General Land Office surveys, support this conclusion. Based on observations of similar streams in the Willamette Valley, it is possible that a variety of fish may be present at Willow Creek on a seasonal basis. These species could include cutthroat trout (*Salmo clarki*), bluegill (*Lepomis macrochirus*), bass (*Micropteris* spp.), crappie (*Pomoxis* spp.), carp (*Cyprinus carpio*), and redside shiner (*Richardsonius balteatus*). Small minnows, possibly the red-sided shiner, have been observed in beaver ponds. It is also possible that the Oregon chub (*Oregonichthys crameri*), a listed endangered species, occurs in Willow Creek. However, no systematic inventory or survey has been done. Surveys would be conducted prior to implementation of any stream restoration projects.

2.1.2.3 Management of Rare, Threatened, and Endangered Animal Species

No State or Federally listed wildlife species are known with certainty to occur at Willow Creek. Appendix B identifies listed and candidate wildlife species that may occur at Willow Creek. The Fender's blue butterfly (*Icaricia icarioides fenderi*), a Federal candidate species, is present at Willow Creek (this is one of only about a half dozen populations large enough to be considered viable). A significant potential exists at Willow Creek to restore and increase Fender's blue habitat in former agricultural lands at Willow Creek. Two other Federal candidate species, the western pond turtle and red-legged frog (*Rana aurora aurora*), may also be present at Willow Creek. Specific habitat enhancements for these species may be implemented under recommendations from State and Federal fish and wildlife management agencies.

2.1.2.4. Management of Non-native Wildlife Species

Under Alternative 1, non-native wildlife would be controlled or eliminated from the area if possible. No non-native wildlife should be released at Willow Creek. When it is necessary to remove non-native wildlife from Willow Creek, it should be done in a manner that will not harm native wildlife, and is legal and humane. Methods to remove non-native wildlife could include trapping and netting.

Non-native wildlife can compete with native wildlife and have adverse effects on native plant communities. Some non-native species of concern that have been found at Willow Creek are Virginia opossum (*Didelphus marsupialis*), nutria (*Myocastor coypus*), house cat (*Felis domesticus*), European starling (*Sturnus vulgaris*), and bullfrog (*Rana catesbeiana*). Other feral domestic animals that could be found in the future include domestic rabbits (*Sylvilagus* spp.), dogs (*Canis familians*), and domestic ducks (*Anas* spp.). An analysis of established non-native populations would be conducted prior to population control efforts to determine the significance of the problem and the prospects for their reduction. Control or removal of newly established non-native or feral domestic animals would be based upon consultation with ODFW.

2.1.3. Hydrologic Resources Management

Evidence from General Land Office survey notes and maps suggest that the site's surface hydrology prior to European settlement was significantly different than it is today. Stream channels were present in the upper part of the basin, but were much narrower and presumably shallower than the current stream channels. In the lower part of the basin, stream channels were not well defined and water moved overland through a network of shallow swales. Neither open water ponds or arboreal riparian vegetation were recorded during the 1850's land surveys. However, the current stream channels and associated woody riparian vegetation provide important habitat diversity at the site, particularly for beaver and western pond turtle.

Under this alternative, the current stream channels would be maintained to support the existing riparian and open water habitat. Active headcuts along the channels would be monitored and necessary actions would be taken to prevent their migration upstream. Otherwise, further stream incision could degrade terrestrial habitat and potentially undermine existing beaver dams. The artificial ditch on the Spady parcel, south of Willow Creek Rd., would be filled or otherwise blocked to restore the historical hydrology of adjacent habitats in the vicinity of the ditch. Other artificial ditches on the site may be altered in a similar manner if this method is shown to provide ecological benefits, and if adjacent privately owned lands are sufficiently distant or elevated that they are not affected by increased surface water levels.

A long-term hydrologic monitoring program would be established to collect baseline data and monitor future change in the watershed. This would include assessment of the hydrologic effect of off-site development activities such as logging, road building, etc.

2.1.4. Public Access/Recreation Management

The overriding goal of management at Willow Creek is to provide habitats for native wildlife and plants. Under this alternative, public access would be controlled to permit only pedestrians to enter the site; no horses, bicycles, or motorized vehicles (except for service vehicles) would be allowed. For the general public, use of the site would be limited to 1) existing trails, such as the firebreak loop, 2) field trips led by TNC staff, Federal agency, State agency, or City of Eugene staff, or volunteers assisting those staff, or 3) members of the general public assisting in a volunteer capacity with management or restoration projects on the site. If visitor use in future years exceeds thresholds of acceptable damage or habitat intrusion, such areas could be closed on a seasonal or permanent basis. Alternative access points would be provided as necessary.

Public access now occurs primarily from West 18th Avenue, on the north edge of the site. In the future, access points may be established, if and where appropriate, along the east and west edges of the site, but not from the south. If needed, first consideration would be given to locating a parking area, access point, and short trail on the east edge of the site, across from the intersection of Bailey Hill Road and Bertelsen Road. High visibility interpretive displays and signage would not be installed except in appropriate locations along the periphery of the site.

Establishment of future trails would meet strict criteria for justification and route selection. Any future trails should be constructed in response to existing needs rather than to encourage greater public use, and provide a strong education function. Trails would be located away from sensitive habitats, and would be designed so as to not encourage off-trail access to sensitive habitats.

The City of Eugene has proposed a public trail corridor through Willow Creek that would connect the proposed Ridgeline Trail with the Amazon bike path. As currently proposed, this trail corridor would follow along the East Fork of Willow Creek. However, an alternative to this alignment should be sought because of the proximity of this route to sensitive and easily damaged plant and wildlife habitats. An alternative alignment should be located off-site if at all possible, and if not should 1) follow the perimeter of the protected area, 2) avoid sensitive habitats and wetland impacts, and 3) be located away from adjacent private residences (unless on public rights-of-way). Probably the best route would follow along the rights-of-way of Bailey Hill Road and Bertelsen Road.

A four-strand, smooth wire fence would be constructed along Willow Creek Road and Bertelsen Road where parcels included within the project road abut the site. The purpose of this fence would be to prevent unauthorized vehicles from entering the site.

2.1.5. Cultural Resources Management

Inspections for cultural or archaeological resources would be performed prior to any management or maintenance work that involved soil disturbance. Any sites found would be protected and managed according to protocols developed during State Historic Preservation Office consultation.

2.1.6. Operations and Maintenance

A variety of maintenance techniques, including manual clearing, mechanical removal, prescribed fire, use of herbicides, and seeding and planting may be considered to maintain or restore wildlife habitat to the desired conditions. Techniques would be implemented based upon their practicality, cost, safety, off-site impacts, and their role in natural ecosystem processes. To the extent possible, these habitat management activities would be scheduled so as to avoid wildlife during the critical seasons of nesting and rearing of young.

Some parts of Willow Creek are fairly close to their desired condition and would only require routine maintenance to achieve management goals. Other areas have changed sufficiently, either through ecological succession or because of past agricultural use, that a significant amount of manipulation of site conditions would be required to meet management goals.

Qualitative or quantitative monitoring of high quality habitat areas would provide a means of determining when actions are necessary in these areas. Likely actions in these high quality areas would be manual removal of small colonies of invasive plant species, and prescribed burning to restore natural processes.

Where more significant site manipulation is required to achieve desired habitat conditions, scheduling and prioritization would be based upon available funding and equipment, the relative significance of the area as habitat for target wildlife species or rare species, and the magnitude of the change necessary to convert the existing conditions to the desired conditions. For portions of the site that have never been plowed but have experienced an increase in tree or shrub density, trees and/or shrubs may be removed. Most trees that would be removed are small and young (<8" dbh and <50 years old) Oregon ash or pear. Removal of invasive shrubs such as Himalaya blackberry and Scot's broom would be followed by ongoing maintenance to control new seedlings or resprouts.

Areas that have been farmed, such as the old field habitats, are generally free of woody plants but are dominated by non-native herbaceous plants. Appropriate site preparation (such as plowing, disking, and fallowing) would be followed by planting of seeds of native plants appropriate for native prairie plant communities. Follow up monitoring and maintenance would be necessary to ensure the success of the plantings. Only local genotypes of native plant species would be used as seed sources for restoration plantings.

In general, natural disasters or catastrophic events such as floods or windstorms should be considered part of the natural ecosystem, and not be ameliorated or cleaned up after. However, because of the proximity of private property and structures adjacent to Willow Creek, any wildfires, arson fires, or accidentally set fires should be suppressed and prevented from spreading to adjacent private lands.

2.2 Alternative 2: Restoration of Presettlement Habitat Conditions

The goal of Alternative 2 is to return the Willow Creek landscape to the habitat structure and spatial configuration of habitats present on the site at the time of arrival of the first settlers in the mid 1800's. This would occur through acquisition of land and restoration or enhancement of wildlife habitat. A smaller number of habitat types (especially upland prairie and wet prairie) would be emphasized under this alternative as compared to Alternatives 1 or 3. Where trees are present, they would occur mostly as savanna, with trees with broadly spreading crowns occurring at low density. As a result, habitat conditions would be managed for wildlife species that are characteristic of open or predominantly open sites. Under Alternative 2, public access would be allowed for pedestrians only, and would be restricted to certain areas of low sensitivity along the margins of the site.

2.2.1. Wildlife Habitat Management

Active management would be initiated on a large scale to maintain or restore open prairie and savanna habitats. The extent of each habitat type proposed under this alternative is summarized in Table 2. Throughout the site, habitat modifications would be designed to reflect the plant community composition and structure characteristic of presettlement plant communities. Furthermore, a close duplication of the spatial distribution of presettlement habitats would be sought. Non-native plant and animal species would be controlled to the extent possible to maintain a dominance of native species. An emphasis would be placed upon maintaining or

restoring natural ecological processes as the primary tool for achieving and maintaining vegetation and wildlife habitat goals. These processes are described under Alternative 1.

The different habitats envisioned under Alternative 2 are described below. These brief summaries are intended to provide a general target condition that would ultimately be achieved over a management time frame of 50 years. The proposed configuration of the different habitats is shown on Figure 3.

Open Wet Prairie - 71 hectares (174 acres). Under this alternative, wet prairie would be the most extensive habitat type at Willow Creek. This would favor wildlife species characteristic of seasonally wet prairies, which would have sufficient habitat to return to their presettlement population numbers. Because of the increase in the density and extent of trees over much of the site since the time of settlement, extensive removal of individuals of Oregon ash and pear would be necessary to implement this alternative. All of the trees that be removed have established since the time of settlement, and most are less than 50 years old. The clearing would be done during the late summer and early fall, as described under Alternative 1.

Prescribed burning would be used to maintain open habitat conditions and enhance the growth of native grasses and forbs. Because of the documented importance of fires in maintaining Willamette Valley prairies in presettlement times, it is believed that most if not all wildlife species native to prairie habitats are tolerant of late summer prescribed burns.

One objective of this alternative would be to return existing riparian habitats to their presumed presettlement condition by grading topography to form broad, shallow swales. The best available evidence from General Land Office survey notes and old aerial photographs, suggests that riparian areas were broad, open, shallow swales that were not well differentiated from the adjacent wet prairie. The well defined stream channels presently on the site are, under this interpretation, a result of downcutting (due to lowering of the streambed elevation downstream from the site) and, in a few places, excavation ("ditching") of the stream bed. Such wet swales would probably be dominated by emergent wetland vegetation, such as species of sedges (*Carex* spp.), spikerushes (*Eleocharis* spp.), and rushes (*Juncus*), and vernal pool species. Other than patches of willows and spiraea (*Spiraea douglasii*), little woody vegetation would be present. Wildlife species that use shallow open water and emergent wetlands would be most likely to utilize these habitats.

Upland Prairie - 54.7 hectares (134 acres). The habitat conditions and restoration methods for upland prairie would be the same as described for this type under Alternative 1, except that the acreage restored to this type under Alternative 2 would be greater.

Wooded Wetland (ash savanna) - 11.8 hectares (29 acres). The habitat conditions and restoration methods for ash savanna would be the same as described for this type under Alternative 1, except that the acreage restored to this type under Alternative 2 would be greater, and ash savanna would essentially be replacing the ash forest.

Oak Savanna - 5.3 hectares (13 acres). The habitat conditions and restoration methods for oak savanna would be the same as described for this type under Alternative 1, except that the acreage restored to this type under Alternative 2 would be less.

2.2.1.1. Management of Invasive or Non-native Vegetation

Management of invasive or non-native vegetation under Alternative 2 would be similar to the approach described under Alternative 1, but more intensive. While priority would be given to controlling the highly invasive, habitat modifying non-native species, attempts would be made to control all non-native species. The types of control measures to be utilized would be the same as those described in Alternative 1.

2.2.1.2. Management of Rare, Threatened, and Endangered Plant Species

Management of rare, threatened, and endangered plant species under Alternative 2 would be the same as described under Alternative 1, except that the areas of suitable habitat available to these plant species will be greater. Because of this, it would be necessary to place a greater emphasis on expanding populations into areas of suitable habitat by planting seeds or propagated seedlings.

2.2.2 Wildlife Management

Under Alternative 2, wildlife populations would be managed primarily for the native wildlife species characteristic of open prairie and savanna habitats. Management and maintenance of plant communities and site conditions would be the primary means of achieving wildlife management goals. No artificial structures would be installed for improvement of wildlife habitat.

Inventory and monitoring would take place as described under Alternative 1.

2.2.2.1 Management of Native Wildlife Species

Wildlife populations at Willow Creek would be managed primarily for native species typical of Willamette Valley prairies and savannas. Large, contiguous blocks of upland prairie and wet prairie would provide for the maximum amount of available habitat for species that prefer or are restricted to prairie habitats. If any emphasis were placed in certain wildlife species, it would be for species listed under the Endangered Species Act, and only under the guidelines of a recovery plan.

No artificial nesting or basking structures would be installed at Willow Creek under this alternative, nor would any manipulation of habitat structure be done. Other guidelines for wildlife management, including removal of non-native wildlife species, recreational hunting and trapping, scientific research, and treatment of sick and injured wildlife, would be the same as described under Alternative 1.

2.2.2.2. Fisheries Management

As with Alternative 1, systematic inventories or surveys of fisheries resources would be conducted prior to implementation of any the stream restoration projects or other management activity proposed for riparian and aquatic habitats under this alternative.

2.2.2.3 Management of Rare, Threatened, and Endangered Animal Species

Management of rare, threatened, and endangered animal species under Alternative 2 would be the same as under Alternative 1.

2.2.2.4. Management of Non-native Wildlife Species

Management of non-native wildlife species under Alternative 2 would be the same as under Alternative 1, except that all non-native wildlife should be controlled or eliminated from the area to the maximum extent possible.

2.2.3. Hydrologic Resources Management

The presettlement surface hydrology conditions are inferred from General Land Office survey notes and maps. A narrow and presumably shallow channel existed in the current drainage of the east branch of Willow Creek. Water in this channel merged into a network of shallow swales when it reached the relatively level valley floor in the vicinity of the current wet prairie. To recreate these conditions, the site's existing stream channels and open water ponds would be graded or filled to recreate the original topography and stream morphology. Overland flow processes would then dominate water movement through the site.

Changes to the area's surface hydrology to restore it to presettlement conditions would be integrated into the watershed's current hydrologic system. Water entering the Willow Creek site from the south as concentrated stream flow would be captured and redirected as overland flow. Once the water had reached the northern border of the site, it would be captured again in order to route it into off-site water conveyances, such as the drainage ditch currently channeling Willow Creek north of 18th Avenue.

A long-term hydrologic monitoring program would be established to collect baseline data on the basin's hydrologic resources and to identify future changes in its hydrology, particularly changes driven by activities taking place elsewhere in the basin.

2.2.4. Public Access/Recreation Management

The overriding goal of management at Willow Creek is to provide habitats for native wildlife and plants. Under this alternative, public access would be restricted to the outer margins of the site, primarily within 150 to 300 meters (500 to 1000 feet) of the roads on the north, west, and east portions of the site. Only pedestrians would be permitted to enter the site; no horses, bicycles, or motorized vehicles would be allowed. Except for staff, researchers, and other workers, the

53 ha — Upland prairie (1a)

67 ha — Open wet prairie (3a)

5 ha — Oak savanna (2b)

11 ha — Forested wetland, ash savanna (4b)

Meters

0 200 400

Oregon, South Zone

1:10000

N

Figure 4.

Alternative 2: Restore to Presettlement Conditions

WILLOW CREEK

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interior of the site would not be open to public access. To accomplish this, the existing fire break loop trail would be closed. Alternative routes may be developed as necessary to provide loop trails that allow appropriate access. One such trail could be located on the Bailey Hill parcel just east of Willow Creek Road between the road and the West Fork of Willow Creek. Interpretive displays and signage would not be installed except for along the periphery of the site at access points.

The City of Eugene has proposed a public trail corridor through Willow Creek that would connect the proposed Ridgeline Trail with the Amazon bike path. As currently proposed, this trail corridor would follow along the East Fork of Willow Creek. However, such a trail would not be compatible with the management philosophy of this alternative.

2.2.5. Cultural Resources Management

Management of cultural resources under Alternative 2 would be the same as is described under Alternative 1.

2.2.6. Operations and Maintenance

Operations and maintenance under Alternative 2 would generally be the same as under Alternative 1, except that the extent to which different types of management activities are utilized would vary, depending upon what would need to be done to meet habitat management goals. Because of its focus on restoring presettlement habitat conditions, habitat maintenance would generally be more extensive and intensive under this alternative than for the other alternatives under consideration.

2.3 Alternative 3: Maintain Existing Conditions

The goal of Alternative 3 is to maintain the existing baseline wildlife habitat values currently present at Willow Creek, at least over the next 50 year time period. This would be accomplished by land acquisition and a program of ongoing habitat maintenance. However, habitat restoration or enhancement would not occur. Areas presently supporting high quality native habitats would be maintained as such, while other areas that are currently in a degraded state, for example, because of an abundance of invasive, non-native vegetation, would continue to remain in that state. Under Alternative 3, access to Willow Creek would be controlled to only allow pedestrians, but all portions of the site would be open to foot traffic. Only if the impacts of visitor use exceeded acceptable impact thresholds would sensitive habitats be closed to the public.

2.3.1. Wildlife Habitat Management

Active management would occur only where necessary to maintain existing wildlife habitat conditions. The extent of each habitat type proposed under this alternative is summarized in Table 2. Invasive and non-native plant species would be controlled only where they are actively invading or altering habitats, with significant habitat change the probable result. Actions intended to prevent woody vegetation from invading prairie habitats would be undertaken only as necessary to maintain the areas that are presently open prairie, or to maintain habitats as necessary

to fulfill obligation under the Endangered Species Act. Maintaining the integrity of natural ecological processes, such as hydrology, fire ecology, and animal use (such as herbivory, predation, and beaver activity) would be emphasized only to the extent necessary to maintain existing habitat conditions.

The different habitats envisioned under Alternative 3 are described below. These brief summaries are intended to provide a general target condition that would ultimately be achieved over a management time frame of 50 years. The proposed configuration of the habitats is shown on Figure 4.

Open Wet Prairie - 6.1 hectares (15 acres). At present there are a number of seasonal wetland types at Willow Creek that support an herbaceous vegetation layer dominated by grasses. This particular habitat type most closely resembles the natural structure and species composition of these seasonal wetlands. Some of this habitat type is classified as such because the invading trees have been intentionally removed in the recent past, while other areas have not been invaded to any significant degree. Under this alternative, active management would occur to maintain the existing areas of open prairie, to maintain suitable habitat for Bradshaw's lomatium, a Federally listed endangered species. Active management would be necessary to prevent establishment of tree seedlings or sprouts from cut stumps, and to prevent encroachment of non-native species such as reed canary grass, teasel, or Himalaya blackberry. Active management could occur in the form of manual or mechanical removal of vegetation, or prescribed burning in the late summer or early fall.

Invaded Wet Prairie - 11.8 hectares (29 acres). Much of the area that was open wet prairie in the 1930's has changed into this category due to vegetative succession. This habitat type is characterized by a residual component of grasses and forbs characteristic of open prairie, along with a canopy of 20 to 50 year old deciduous trees (Oregon ash, pear, and apple). Some of the trees have been top-killed by prescribed burns conducted since 1986, but most of these trees have produced stump sprouts. Under this alternative, only a minimal amount of active management would occur. Active management would be necessary to prevent invasive, non-native species such as reed canary grass, teasel, or Himalaya blackberry from establishing or expanding. Because it is a federally listed endangered species, active management may also be necessary to maintain existing habitat for Bradshaw's lomatium. This could involve prescribed burning, and/or clearing individual trees or small areas of woody vegetation around existing lomatium patches, to prevent incremental tree growth from reducing the extent of the lomatium habitat.

Wet Pasture - 21.6 hectares (53 acres). Wet pasture represents seasonal wetlands that have been converted to "improved pasture" and utilized for hay production at some time in the past, or have been so intensively grazed that they are dominated by non-native pasture grasses. Because of this past disturbance, this habitat type is characterized by less invasion of woody plants than the invaded wet prairie type. To maintain existing conditions, some active management would be necessary, including removal of invasive woody plants or non-native species. These species, (such as Oregon ash and Himalaya blackberry), would continue to occur at their current levels, but would not be allowed to expand beyond their present extent. Mowing or cutting hay could be

undertaken, at least in part, to meet these management needs and maintain the degree of openness that currently exists.

Wet Old Field - 0.8 hectares (2 acres). This habitat type is limited to two small patches of low ground within an area that has a long history of agricultural crop production. Up until 1990 this field was used for grass seed production; since then it has been mowed every July and the cuttings have been baled for hay. To maintain existing conditions, this haying would continue on an annual basis.

Upland Prairie - 7.8 hectares (19 acres). A similar situation exists for upland prairie as for the open prairie. This habitat type represents areas of open habitat that exist as such either because of active habitat management or because the successional changes that have occurred elsewhere simply have not happened. This type is found in several scattered patches around the site that still support significant composition of native grasses and forbs. Under this alternative, existing wildlife habitat values would be maintained. However, these habitats would not be further restored or enhanced to improve wildlife habitat conditions. Certain invasive, non-native plant species such as Scot's broom and Himalaya blackberry would continue to occur at their current levels, but would not be allowed to expand beyond their present extent. Other habitat enhancement would not occur unless rare species present in this type, such as the Fender's blue butterfly or the Willamette daisy, are listed as Federal threatened or endangered species (both are presently candidates for listing).

Upland Pasture - 26.5 hectares (65 acres). Like the wet pasture, upland pasture represents areas that have been converted to "improved pasture" and utilized for hay production at some time in the past, or have been so intensively grazed that they are dominated by non-native pasture grasses. Because of this past disturbance, this habitat type is characterized by a lesser invasion of woody plants than the invaded wet prairie type. To maintain existing conditions, some active management would be necessary, including removal of invasive non-native plant species. These species, which include Scot's broom and Himalaya blackberry, would continue to occur at their current levels, but would not be allowed to expand beyond their present extent. Mowing or cutting hay could be undertaken, at least in part, to meet these management needs and maintain the degree of openness that currently exists.

Upland Old Field - 16.3 hectares (40 acres). This habitat type is represented by a single block of land that has a long history of agricultural crop production. Up until 1990 this field was used for grass seed production; since then it has been hayed every July. To maintain existing conditions, haying would continue on an annual basis. Other than this, no habitat enhancement would be undertaken.

Upland Fill - 6.1 hectares (15 acres). This type occurs on the northeast corner of the site where fill material was brought in between 1975 and 1990 in anticipation of the area being developed. The area is dominated by dense cover of non-native vegetation, with species such as Himalaya blackberry and Scot's broom being very abundant. Since these species have probably reached their maximum density and abundance within this type, no active habitat management would be considered under this alternative.

Forested Wetland (ash) - 37.1 hectares (91 acres). This unit consists primarily of stands of Oregon ash that are about 100 year old or younger. Under this alternative, little active management would occur in this habitat. Only where invasive, non-native plant species such as reed canary grass, Himalaya blackberry, English hawthorn, or English ivy (*Hedera helix*) are expanding from their present distribution would control of these populations be undertaken.

Oak Forest - 5.3 hectares (13 acres). Both black and white oak are present in several small groves. At present they form fairly dense woodland or forest stands. Under this alternative, the density of the oak trees would not be modified. Some patches of invasive non-native species such as Himalaya blackberry are present, and under this alternative would not be allowed to expand further.

Riparian Forest (black cottonwood-Oregon ash-Piper's willow) - 4.1 hectares (10 acres). This riparian community occurs in the narrow corridor along the two forks of Willow Creek. Active beaver dams are present along much of the stream corridor, and the seasonal beaver ponds, with their open water habitats, are an integral part of the riparian habitat. As such, this habitat is relatively dynamic and any given location is likely to change over time due to these natural forces. However, it is anticipated that the mosaic of riparian species and habitat structure as is presently exists will likely continue to persist, at least for the next 50 years, without significant active management. Maintenance would occur to remove expanding patches or colonies of invasive, non-native plant species such as reed canary grass and Himalaya blackberry.

Conifer Forest - 1.2 hectares (3 acres). Two groves of conifers, mostly Douglas-fir are found at Willow Creek. Most of the trees are fairly young; none appear to be more than about 80 or 90 years old. The tall conifers play an important role as perching and nest trees for raptors and other birds. Under this alternative these groves would be maintained at their current extent.

2.3.1.1. Management of Invasive or Non-native Vegetation

This alternative proposes to maintain populations of non-native species at their present levels. Species presently existing on the site would be controlled to prevent further expansion. Newly invading species, especially those with potential to become habitat modifiers, would be prevented from becoming established. Control methods would be the same as those described under Alternative 1.

2.3.1.2. Management of Rare, Threatened, and Endangered Plant Species

Habitat management would be the primary means of maintaining existing populations of rare, threatened, and endangered plant species. The wildlife habitat management proposed for each habitat type in section 2.3.1. should maintain areas of habitat for rare, threatened, or endangered species at present levels. Other guidelines for management of rare, threatened, or endangered plant species would be the same as under Alternative 1.

2.3.2 Wildlife Management

Under Alternative 3, wildlife populations would be managed to maintain the current abundance and species diversity of native wildlife species. Maintenance of existing plant communities and site conditions would be the primary means of achieving wildlife management goals. No artificial nest boxes or other structures beneficial to wildlife would be installed, nor would snags be created artificially to provide cavities or perches. Non-native species would be controlled only if they threaten to reduce populations of native wildlife species to below existing levels. Inventory and monitoring would take place as described under Alternative 1.

2.3.2.1 Management of Native Wildlife Species

Wildlife populations at Willow Creek would be managed to maintain the current abundance and species diversity of native wildlife species. To a considerable extent these would be species typical of undeveloped lands on the urban/rural fringe, and species that utilize edge habitats and successionally transitional areas. Other aspects of management of native wildlife species would be the same as under Alternative 1.

2.3.2.2. Fisheries Management

Fisheries management would be the same as for Alternative 1.

2.3.2.3 Management of Rare, Threatened, and Endangered Animal Species

Management of rare, threatened, and endangered animal species would be the same as for Alternative 1, except that existing habitat for the Fender's blue butterfly, a Federal candidate species, would be maintained, but the habitat would not be expanded through restoration of former agricultural land.

2.3.2.4. Management of Non-native Wildlife Species

Under Alternative 3, non-native wildlife would be maintained at their existing population levels. Control efforts on non-native species would be implemented only if populations increase. Control methods and other aspects of management of non-native wildlife species would be the same as for Alternative 1.

2.3.3. Hydrologic Resources Management

The existing stream channels and surface hydrology features would be maintained. Active headcuts on the current stream channels would be identified and action taken to prevent their migration upstream. No other efforts would be made to mitigate stream incision. As with Alternatives 1 and 2, a hydrologic monitoring program would be established to collect baseline data and identify changes in the site's hydrology.

2.3.4. Public Access/Recreation Management

The overriding goal of management at Willow Creek is to provide habitats for native wildlife and plants. Under Alternative 3, only pedestrians would be permitted to enter the site; no horses, bicycles, or motorized vehicles would be allowed. Existing trails and paths would be kept open, as long as public use does not cause harm or damage to wildlife or habitats. Under this alternative, no new trails would be constructed.

2.3.5. Cultural Resources Management

Management of cultural resources would be the same as under Alternative 1.

2.3.6. Operations and Maintenance

Operations and maintenance methods that would be used under Alternative 3 would generally be the same as under Alternative 1. However, the extent to which different maintenance methods are utilized would generally be less under this alternative than for the other alternatives under consideration.

2.4 Alternative 4: No Active Management

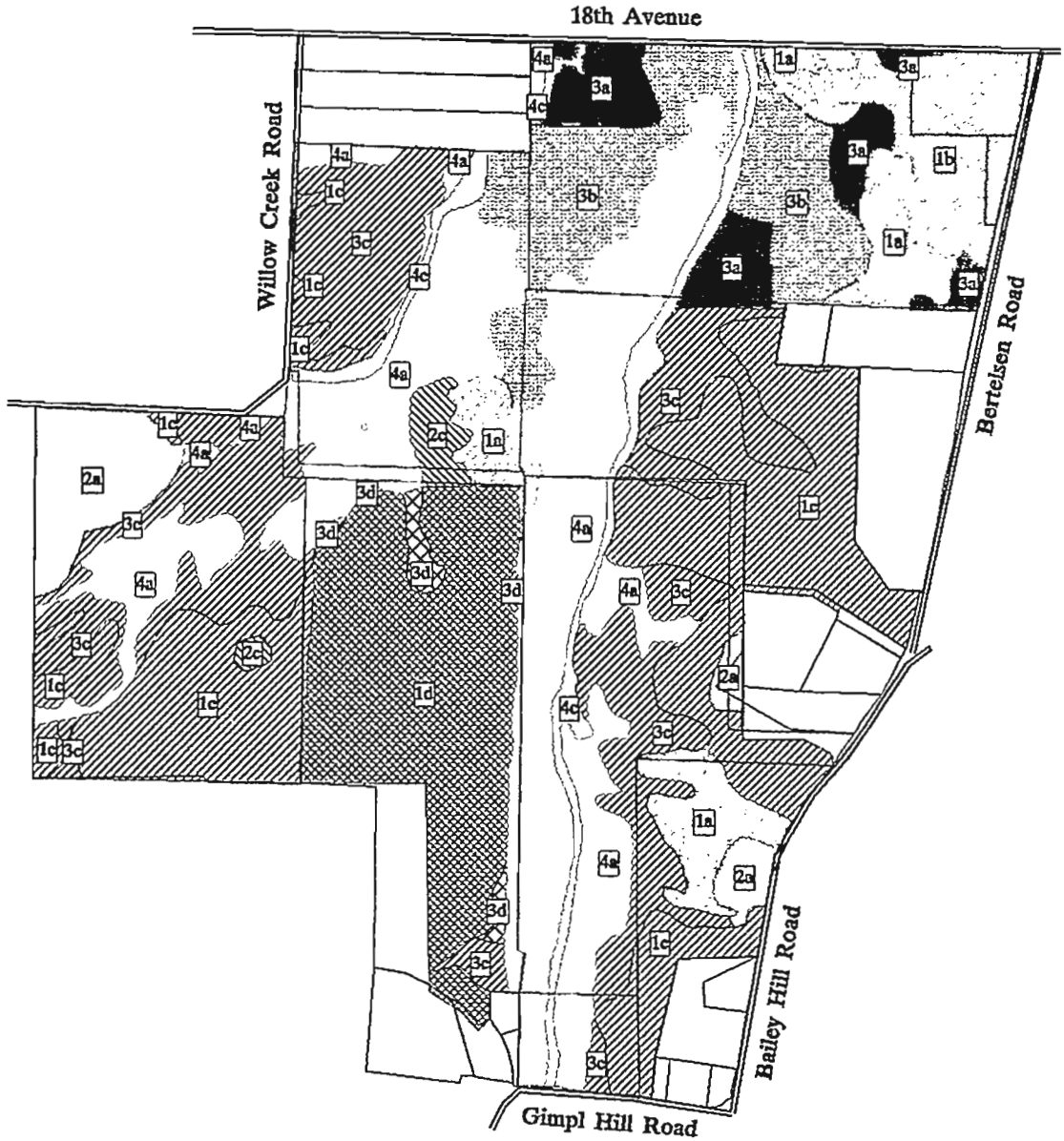
Under the No Active Management Alternative, BPA would purchase property at Willow Creek but would not undertake any maintenance, enhancement, or restoration of wildlife habitat. As a result, forest conditions would establish over virtually the entire site, as woody plant invasion continues along its existing course. The extent of each habitat type that would occur under this alternative is summarized in Table 2. As a result, the number of target species' habitat units provided by the site for habitat mitigation would decline. This is a reflection of the fact that under a regime of no active management, a diversity of native plant and animal species would not be maintained over the long term. This alternative does not meet the purpose and need as described in Section 1.2.

2.5 Alternative 5: No Action

Under the No-Action alternative, BPA would not purchase property or easements at Willow Creek. The No-Action Alternative would mean loss of this opportunity at the Willow Creek Natural Area to provide mitigation for wildlife losses due to the development of Federal hydroelectric projects in the Willamette River drainage. The No-Action Alternative would not contribute toward meeting BPA's goal to mitigate under the Council's program.

2.5.1 Wildlife Habitat Management

Open Wet Prairie; Wet Prairie; Wet Old Field;
Under this alternative the alteration of Invaded Wet Prairie and Wet Old Field to Open Wet Prairie habitat would not occur. At least 15 ha (6.1 ac) of existing wet prairie would be lost.



7 ha	Upland prairie (1a)	5 ha	Open wet prairie (3a)
6 ha	Upland fill (1b)	12 ha	Invaded wet prairie (3b)
26 ha	Upland pasture (1c)	21 ha	Wet pasture (3c)
17 ha	Upland old field (1d)	1 ha	Wet old field (3d)
5 ha	Oak forest (2a)	31 ha	Forested wetland: ash (4a)
1 ha	Conifer forest (2c)	4 ha	Riparian forest: cottonwood-ash-willow (4c)

Meters
0 200 400
Oregon, South Zone
1:10000

Figure 5.

Alternative 3: Maintain Existing Conditions

WILLOW CREEK

WILDLIFE HABITAT MANAGEMENT

Upland Prairie; Upland Pasture; Upland Old Field; Upland Fill;
Under this alternative the alteration of Upland Pasture, Upland Old Field and Upland Fill to Upland Prairie would not occur. At least 19 ha (7.7 ac) of existing upland prairie would be lost, some of it, possibly to urban development or conifer forest.

Oak Forest; Oak Savanna;
Under this alternative the alteration of Oak Forest to Oak Savanna would not occur. It is anticipated that the extent of existing oak forest would increase.

2.5.1.1 Management of Invasive or Non native Vegetation

No management or control of invasive species would occur. Areas that support Scot's broom, Himalaya blackberry and other habitat altering vegetation would continue to increase.

2.5.1.2 Management of Rare, Threatened and Endangered Plant Species

The adopted Recovery Plan for Bradshaw's lomatium would be compromised by the lack of management of invasive vegetation in the surrounding area..

2.5.2. Wildlife Management; Management of Native Wildlife Species; Fisheries Management; Management of Rare, Threatened and Endangered Animal Species; Management of Non-native Animal Species

The current abundance and diversity of native species would be compromised by habitat fragmentation and invasive plants. Damage to native species and uncontrolled predation from domestic animals associated with urbaned areas would be expected.

2.5.3 Hydrologic Resources Management

It is expected that without some hydrologic management existing stream channels would continue to become deeply incised eroding stream banks. This would increase sedimentation downstream and damage stream and riparian habitats. Active erosion would compromise existing beaver populations. Increased efficiency of drainage due to channel incision would reduce the extent of wetland habitat.

2.5.4 Public Access/Recreation Management

No restriction on public access would undertaken. Human use and use by associated domestic animals would not restricted. Existing low impact trails may be developed by being paved and widened and with increased activity would compromise existing habitats.

2.5.5 Cultural Resources Management

Active management of cultural resources would not occur. Protection of cultural resources would be limited to that provided by existing laws on private lands.

2.5.6 Operations and Maintenance

No maintenance of existing habitat or operations to improve existing habitat would occur. Both upland and wetland forest and scrub-shrub conditions would establish over virtually the entire site, as wood plant invasion continues along its existing course.

Baseline and Future Habitat Conditions at Willow Creek under Differing Management Scenarios (From Beilke, 1995)

Baseline Conditions			ALTERNATIVE 1 Proposed Action			ALTERNATIVE 2 Presettlement Conditions			ALTERNATIVE 3 Maintain Status Quo			ALTERNATIVE 4 No Active Management		
	ha	(ac)		ha	(ac)		ha	(ac)		ha	(ac)		ha	(ac)
Forested Wetland	84	(34)	Forested Wetland	91	(37.1)				Forested Wetland	84	(37.1)	Forested Wetland	183	(74.1)
Ash Savanna			Ash Savanna	12	(4.9)	Ash Savanna	29	(11.8)						
Riparian Forest	9	(3.6)	Riparian Forest	9	(4.1)				Riparian Forest	9	(4.1)	Riparian Forest	9	(3.6)
Open Water	2	(0.8)	Open Water	2					Open Water	2	(0.8)	Open Water	2	(0.8)
Oak Forest	13	(5.3)	Oak Forest	2	(0.8)				Oak Forest	13	(5.3)			
Oak Savanna			Oak Savanna	21	(8.5)	Oak Savanna	13	(5.3)						
Conifer Forest	3	(1.2)	Conifer Forest	3	(1.3)				Conifer Forest	3	(1.2)	Conifer Forest	155	(1.2)
Open Wet Prairie	15	(6.1)	Open Wet Prairie	87	(34.5)	Open Wet Prairie	174	(71)	Open Wet Prairie	15	(6.1)			
Invaded Wet Prairie	29	(11.7)							Invaded Wet Prairie	29	(11.8)			
Wet Pasture	53	(21.4)							Wet Pasture	53	(21.6)			
Wet Old Field	2	(0.8)							Wet Old Field	2	(0.8)			
Upland Prairie	19	(7.7)	Upland Prairie	122		Upland Prairie	133	(54.7)	Upland Prairie	19	(7.8)			
Upland Pasture	65	(26.3)							Upland Pasture	65	(26.5)			
Upland Old Field	40	(16.2)							Upland Old Field	40	(16.3)			
Upland Fill	15	(6.1)							Upland Fill	15	(6.1)			
Total Hectares	349	(141.2)	Total Hectares	349	(141.2)	Total Hectares	349	(141.2)	Total Hectares	349	(141.2)	Total Hectares	349	(141.2)

Alternative 5 - Extent of habitat altered is difficult to predict. It would be expected that both upland and wetland forest and scrub conditions would establish over virtually the entire site, as woody plant invasion continues along its existing course.

Table 2

CHAPTER 3: THE AFFECTED ENVIRONMENT

3.0 Introduction

Portions of the site are located within the city limits of Eugene; the entire site is within the Urban Growth Boundary. The project site consists of land that was formerly used for agricultural operations of varying intensity; historically dairy farming was apparently the primary activity. One field of about 18 hectares (45 acres) was cultivated for grass seed production until about 1990. However, most of the site has not been part of any agricultural operation since the 1960's. There are presently no dwellings or buildings located within the site boundary, and there is no evidence from historical air photos that any buildings have existed on site since 1936. Adjacent lands to the southeast, south, west, and north presently support agricultural or rural residential land uses. Lands to the east and northeast are developed at urban densities. Most of this adjacent urban development is actually located outside the Willow Creek watershed.

3.1 Site Description

Elevations of the Willow Creek site range from about 119 meters (390 ft.) to 150 meters (500 ft.) above sea level. Half of the site is nearly level, sloping down very gradually to the north at a gradient of less than 1%. The remainder of the site could be characterized as "rolling", and consists of the transition zone between the valley floor and the adjacent foothills.

Soils at Willow Creek include loams, silt loams, silty clay loams, and clay loams. Seven soil series are mapped for the site in the Lane County Soil Survey (Patching, 1987). The most extensive soil type is Natroy silty clay loam, which is the predominant soil of the wet prairie habitats. Natroy is listed as a hydric soil, and is saturated to the surface or slightly inundated during the rainy season. A second hydric soil series present at Willow Creek is Panther silty clay loam, which occurs primarily along swales and drainageways that emerge from the adjacent hills. The hydric condition is largely a function of the clay subsoil, which expands when wet and forms a nearly impermeable layer which prevents water from percolating downward. Most of the wetlands present at Willow Creek are seasonal wetlands produced by these heavy clay soils. Pengra silt loam and Willakenzie clay loam are the most extensive soils of upland habitats. Dupee silt loam, Hazelair silty clay loam, and Steiwer loam are the other upland soil types that are more limited in distribution at Willow Creek.

The landscape conditions and vegetation patterns of Willow Creek and the vicinity at the time of settlement were documented between 1852 and 1854 by surveyors employed by the General Land Office. The survey notes from the surveys of the section lines and Donation Land Claim boundaries provide site specific documentation of these conditions (see Appendix C). Most of the lands within the Willow Creek site boundary were described in these surveys as prairie, with oak openings occurring on the adjacent hills. The notes and maps of the surveyors note a generally abrupt boundary between prairie and oak openings. Typically this transition occurred at about the 150 meter (500 foot) elevation. Oak openings were documented only along the south and east margins of the Willow Creek site (they may have been present elsewhere in the interiors of sections but not documented).

The earliest air photos of Willow Creek were taken in 1936 (see Figure 2). Although this was nearly a century after the arrival of the first settlers, the 1936 photos show the Willow Creek landscape as being much more open than it is today. Since 1936, woody plants have greatly increased their abundance and extent, especially in the area of hydric soils between the west and east forks of Willow Creek.

3.2 Affected Environment

3.2.1 Fish and Wildlife Habitat Resources

Existing wildlife habitats at Willow Creek include both relatively natural habitats that remain from presettlement times or have developed since then, and habitats that have developed as a result of past agricultural use of the land. The location and extent of the habitats present at Willow Creek are shown on Figure 5. This vegetation classification was used for the analysis of wildlife habitat units contained within the Willow Creek Habitat Evaluation (Beilke, 1995). The habitat types used in the vegetation classification are as follows:

Invaded Wet Prairie - 11.7 hectares (29 acres). Wet prairie occurs on hydric soils in the north part of the site, where past grazing and agricultural practices have had only a minor impact on the species composition of the vegetation, and native species predominate. Much of the wet prairie at Willow Creek has been invaded by young trees, mostly Oregon ash and pear trees. At present, these sites have an open canopy with 20-30' tall trees, with an understory of tufted hairgrass and a large number of other native prairie grasses, sedges, rushes, and forbs.

Several rare plant species, including Bradshaw's lomatium, Willamette daisy, white-topped aster (*Aster curtus*), and shaggy horkelia (*Horkelia congesta* ssp. *congesta*) occur in the invaded wet prairie though their populations are generally not as healthy as in the open wet prairie (Bradshaw's lomatium is federally listed as endangered; the remainder are candidates for listing as threatened or endangered species). In some places invasive species such as Himalaya blackberry are found, as well as patches of native shrubs such as Douglas' spiraea. Over the past eight years, The Nature Conservancy has conducted three prescribed burns designed to diminish the woody plant cover and enhance the growth of native prairie plant species.

Open Wet Prairie - 6.1 hectares (15 acres). Similar to the invaded wet prairie, the open wet prairie is defined as the area where either trees have not invaded, or the invading trees have been removed, and the structure of the vegetation structure fairly closely resembles its original (presettlement) condition.

There are two main patches of open wet prairie, one just south of W 18th on the east side of the West Fork of Willow Creek, and the other just east of the East Fork of Willow Creek, along with several smaller scattered patches to the east where tree colonization has not occurred naturally. These areas generally support the healthiest populations of native grasses such as tufted hairgrass, along with a wide variety of prairie forbs.

Healthy populations of listed and candidate rare plant species occur in much of this unit. Historical evidence indicates that this habitat type was the predominant habitat at Willow Creek in the low bottomlands with hydric soils.

Wet Pasture - 21.4 hectares (53 acres). The wet pasture category is another type of open, grass and forb dominated habitat that occurs in bottomlands on hydric soils. Because of past agricultural disturbances, wet pasture vegetation is generally dominated by non-native, rather than native grasses and forbs. Where native grasses and forbs are present, species diversity is low.

Analysis of historical evidence indicates that the wet pastures were formerly wet prairies that were utilized as hay meadows and for grazing. Many areas may have been tilled and planted to non-native pasture species. While remnant populations of some native species, such as tufted hairgrass, still survive in some of the wet pasture areas, non-native species predominate.

Typical dominant species are bentgrass (*Agrostis tenuis*), sweet vernal grass (*Anthoxanthum odoratum*), tall fescue (*Festuca arundinacea*), and birdsfoot trefoil (*Lotus corniculatus*). Because of grazing and mowing in the past, these areas have not been invaded by trees to the same extent as the wet prairie.

Wet Old Field - 0.8 hectares (2 acres). This category represents a few small low spots in the former grass-seed field (upland old field) on the Spady parcel. Because of the long history of agricultural disturbance, typical native wet prairie vegetation is absent. Some native wetland species have managed to establish in the wet areas, such as one-sided sedge (*Carex unilateralis*), and spikerush (*Eleocharis acicularis*). This unit is still mowed or cut for hay once a year.

Upland Old Field - 16.2 hectares (40 acres). This category represents the former grass seed land on the Spady parcel. This tract has not been farmed for at least 3 years, but it has been cut for hay on an annual basis. The vegetation is also dominated by bentgrass.

Upland Prairie - 7.7 hectares (19 acres). The upland prairies are dominated by native grasses and forbs. This type occurs on higher ground on non-hydric soils. In presettlement times, these uplands were open prairie, with few or no trees or shrubs. Upland prairies are also prone to woody plant invasion, primarily Douglas-fir, Scot's broom, and Himalaya blackberry.

The upland prairie supports a rare plant species, Kincaid's lupine, and a rare butterfly, the Fender's blue (*Icaricia icarioides fenderi*), whose larvae feed on the Kincaid's lupine. Both species are federal candidate Category 2 species for listing under the Endangered Species Act.

Associated native grasses and forbs include red fescue (*Festuca rubra*), California oatgrass (*Danthonia californica*), rose checkermallow (*Sidalcea campestris*), wooly sunflower (*Eriophyllum lanatum*), and cluster brodiaea (*Brodiaea congesta*). A number of non-native grasses and forbs are also present in the upland prairie. The best of the upland prairie seems to have been more heavily impacted by grazing and agriculture than the best of the wet prairie.

Upland Pasture - 26.3 hectares (65 acres). Upland pasture occupies sites similar to the upland prairie, but supports vegetation primarily of non-native grasses and forbs, due to past disturbances from grazing and agriculture. Upland pasture in general is less threatened by invasion of woody plants, although ultimately a conversion to woody plants will occur.

Upland Fill - 6.1 hectares (15 acres). On the eastern portion of the Dealy tract, much fill was dumped and spread over a time span of at least 15 years prior to 1990. This filled area was formerly a mixture of open wet prairie and upland prairie. Now, the vegetation growing on top of the fill is primarily aggressive, non-native species as scot's broom, Himalaya blackberry, and reed canary grass. In parts the topography is very uneven because the piles of fill were not spread out. The upland fill area was not analyzed for wildlife habitat value.

Forested Wetland (ash) - 34.0 hectares (84 acres). Forested wetland occurs on hydric soils adjacent to (but not directly along) both forks of Willow Creek and several smaller tributaries on the site. This habitat is characterized by a closed canopy of Oregon ash, with trees 50 to 70 ft. tall, and 10-20" dbh. Most of these trees appear to be about 100 years old. The understory supports a sparse to dense layer of tall shrubs, such as serviceberry (*Amelanchier alnifolia*), black hawthorn (*Crataegus douglasii*), and Oregon crab apple (*Pyrus fusca*), and a variety of shade tolerant wetland herbs, such as Dewey sedge (*Carex deweyana*), slough sedge (*Carex obnupta*), spreading rush (*Juncus patens*), camas (*Camassia leichtlinii*), Willamette Valley bittercress (*Cardamine penduliflora*), bigleaf avens (*Geum macrophyllum*), and buttercup (*Ranunculus uncinatus*).

The most problematic non-native species in this habitat is Himalaya blackberry, which forms dense stands in some places. Historical evidence and analysis of existing stand structure, indicates that closed canopy ash forest did not occur at Willow Creek in presettlement times.

Instead, these sites were open prairie or a savanna with few widely scattered trees, and the open conditions were maintained by fires that were set by Native Americans. Following the arrival of settlers in the Willamette Valley, fires were suppressed, and relatively dense stands of trees became established where they had not previously occurred. The area occupied by ash forest is continuing to expand, as new stands of young trees become established in formerly open areas.

Riparian Forest - 3.6 hectares (9 acres). Riparian forest is limited to the immediate vicinity of the West and East Forks of Willow Creek, forming a narrow band less than 100 feet wide. The tree canopy is dominated by black cottonwood Oregon ash, and Piper willow, in varying proportions. In addition, much of the surface area mapped as this type consists of open water created by beaver ponds.

Open Water - 0.8 hectare (2 acres). Open water habitat includes both the West and East Forks, and several smaller tributaries of Willow Creek, and numerous ponds scattered along the Creek, created by beaver activity. Though variable, most of the ponds do not support dense emergent vegetation. As the creek dries up in the late summer, the water level in the ponds drops, and they eventually become dry for a short time in late summer before the autumn rains return.

Oak Forest - 5.3 hectares (13 acres). Several oak groves of different sizes occur over the site. Both Oregon white oak and California black oak are present. A few tall Douglas-firs are also present. Most of the trees have trunks less than 20" dbh, and the many multi-stemmed trees indicate that they are stump sprouts that originated following logging. The density of understory shrubs is variable, as is the composition of the herbaceous layer. For the most part the oak stands have a fairly open understory with mostly non-native grasses and forbs. Historical conditions in the area suggest that the oak stands

at Willow Creek in presettlement times were open savannas, rather than the dense forests that exist today. Remnant savanna-like stands still exist on several sites near Willow Creek.

Conifer Forest - 1.2 hectares (3 acres). Several small groves of conifers have become established at Willow Creek. They are dominated by Douglas-fir, but ponderosa pine (*Pinus ponderosa*) is also present. Most of the trees at Willow Creek appear to be less than 50 years old, and there are no old stumps, indicating that these groves are of relatively recent origin. There is no historical evidence that Douglas-fir occurred within the site boundaries in presettlement times, but it was present in the adjacent hills, and the existing groves either established by natural seed dispersal or by trees that were planted by early residents. The understories of the conifer groves are densely shaded and thus support very little understory vegetation.

The flora of Willow Creek has been fairly well inventoried. The most recent species list (see Appendix D) includes a total of 302 plant species in 64 families; however, 101 species (33%) are non-native. This list includes six rare, threatened, or endangered plant species (see Appendix A), as well as a number of other native species that are not commonly seen in the Willamette Valley.

3.2.2 Fish and Wildlife Resources

Wildlife diversity at Willow Creek is high and includes a representative array of songbirds, raptors, mammals, reptiles, and amphibians typically found in the Willamette Valley. However, species inventories at present and additional surveys will be needed to fully inventory this diversity. Species listed as threatened, endangered, or sensitive by the U.S. Fish and Wildlife Service and/or the Oregon Department of Fish and Wildlife that may occur at Willow Creek are listed in Appendix B.

The mosaic of prairies, woodlands, and riparian areas at Willow Creek provide habitat for resident mammals (see Appendix E). A diverse array of bird species (more than 80 species) has been documented at Willow Creek to date, including resident and migratory songbirds, raptors, waterfowl, shorebirds, and wading birds. It also appears that a variety of reptiles and amphibians are present at Willow Creek, including a variety of snakes, frogs, and possibly the western pond turtle.

Invertebrates are the least well known group of animals at Willow Creek. A number of butterfly species have been observed at Willow Creek (Appendix F), including a number of native species that have become very rare in the Willamette Valley.

Based upon observations of similar streams in the Willamette Valley, it is possible that a variety of fish may be present at Willow Creek on a seasonal basis. These species could include cutthroat trout, bluegill, bass, crappie, carp, and red-sided shiner. Small minnows, possibly the red-sided shiner, have been observed in beaver ponds. It is also possible that the Oregon chub, a listed endangered species, occurs in Willow Creek. However, the existing habitat at Willow Creek seems marginal for this species. No systematic inventory or survey has been done.

A number of non-native wildlife species are present at Willow Creek, such as the Virginia opossum, nutria, and the bullfrog. Bullfrogs, in particular, are very abundant in aquatic habitats at Willow Creek.

Bullfrogs are believed to be a major factor in the decline of a number of aquatic animals in the Pacific Northwest, such as the western pond turtle, red-legged frog, and Oregon chub.

3.2.3 Hydrologic Resources

The existing hydrologic conditions at Willow Creek are a product of local climate, topography, soils, past management of water resources, and present-day land use. As noted above, evidence from General Land Office survey notes and maps suggest that the site's surface hydrology prior to European settlement was significantly different than it is today. Stream channels were present in the upper part of the basin, but were much narrower and presumably shallower than the existing stream channels. In the lower part of the basin, stream channels were not well defined and water moved overland through a network of shallow swales. Neither open water ponds or arboreal riparian vegetation were recorded during the 1850's land surveys.

Since the 1850's, well defined stream channels have become established, even in areas not directly channelized, probably through bank erosion in response to lowering the elevation of the stream bed at some point downstream from the site. Evidence from aerial photographs shows that some portions of Willow Creek were also straightened and ditched, such as the 1/3 mile of the East Fork downstream from Gimpl Hill Road, and along the West Fork about 1/3 of a mile along the 90 degree bend of Willow Creek road and downstream from that point. While most portions of Willow Creek through the site are occupying incised stream channels, beaver ponds are distributed throughout nearly the entire lengths of both forks, and are particularly important for species such as the western pond turtle.

In addition, there are three small ponds (all <0.01 acres in size) located away from the streams, that were probably originally created as water sources for livestock. One is located on the Spady parcel, and two are located on Bailey Hill parcels. These ponds are also ephemeral, usually drying by mid-summer, though one of the Bailey Hill ponds appears to be fed by a small stream that has a spring as a source, so water lasts longer there.

At present, the stream channels seem fairly stable except for a few locations along the West Fork of Willow Creek where additional channel incision is occurring. The most visible location is just upstream from the West 18th Avenue bridge, where a change in the elevation of the stream bed of about two feet is resulting in channel incision and headward erosion. Efforts have already been made to stabilize this erosion by planting willow cuttings, but further efforts may be necessary.

At the same time that stream morphology has changed, the riparian vegetation has also changed. Air photos from 1936 show very little woody vegetation present along most of the length of the stream reaches. Since then, the riparian zones have been colonized by black cottonwood, Piper willow, and Oregon ash to form a distinctive riparian forest community. This woody vegetation has provided forage and building materials for the beaver population, which most likely would not have been present at Willow Creek in presettlement times. Now, many of the trees are dying or dead due to water level changes or girdling of trees by beaver. Furthermore, the beaver ponds are accumulating sediments and will presumable eventually fill in, eliminating the open water habitat but providing seasonal emergent wetland/stream habitat perhaps not all that different from the shallow swales that originally occupied

the site. Although changes may be inevitable in a dynamic system such as this, it is unlikely that any substantial changes to stream hydrology are likely to occur within a 20 year planning time frame.

Hydrologic inputs over most of the wetland acreage at Willow Creek (and particularly the wet prairies and forested (ash) wetland) is probably a combination of precipitation, overland flow, and to a limited extent, the stream itself. The importance of groundwater to the maintenance of wet prairie and ash forest hydrology is uncertain. Surface soil saturation is primarily a result of a dense clay layer that swells when wet and is only slowly permeable to percolation of water. Soils at Willow Creek are saturated during the rainy season from late fall until sometime in spring, conditions that are critical to maintenance of the native wet prairie habitat. The effects of development on nearby uplands are uncertain at the present time. However, the design for the Willow Creek site includes protection of considerable acreage of upland buffers that may be important to maintaining this hydrologic input.

3.2.4 Air Quality

Air quality in the Willow Creek area is generally good, except under certain specific weather or seasonal conditions, such as during temperature inversions in the winter which trap pollutants near the valley floor, and at times during the late summer when north winds blow smoke from field burning operations further north in the valley toward Eugene. The Lane County Regional Air Pollution Authority (LRAPA) manages air quality in the Eugene area.

3.2.5 Cultural Resources

The Oregon State Historic Preservation Office (SHPO) has identified cultural resources sites in the vicinity of the Willow Creek site.

3.3 Social and Economic Environment

Willow Creek is located on the edge of the city of Eugene and is largely surrounded by a rural agricultural landscape. As the City of Eugene expands develops in the future, planners have anticipated that lands around Willow Creek will change from rural to urban in character. Over the past 10-15 years, City plans and policies have developed the expectation that the site would be protected as a natural area within the urban landscape. Future development in the Willow Creek basin is guided by the Willow Creek Special Area Study (City of Eugene, 1982), which calls for protection of wetlands and other sensitive habitats at Willow Creek as a natural area. (see map E of the Willow Creek Special Area Study). The West Eugene Wetlands Plan (City of Eugene, 1992) also recommends protection of wetland habitats at Willow Creek. One of the goals of this plan is to establish a system of protected wetlands in West Eugene that will increase the quality and desirability of nearby properties that are developed. This indicates that the community places a high value on maintaining natural areas in and near the urban landscape.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 Acquisition of Land/Conservation Easement

The acquisition of land or conservation easement that would be common to four of the alternatives under consideration would not, of itself have an impact on the physical environment. It would have a beneficial impact on the protection of wildlife habitat at Willow Creek Natural Area, by preventing the land from being used for agriculture or urban development. The Willow Creek Natural Area is important site that would contribute to the overall viability of the many natural wetlands that are protected by the West Eugene Wetlands Plan.

4.1 Environmental Impacts

Impacts to the Willow Creek environment, either short term or long term, could occur under any of the alternatives under consideration as a result of implementation of wildlife habitat management at Willow Creek. Short term impacts would primarily be those related to conducting management activities, such as localized disturbance of wildlife, minor or localized trampling of vegetation by workers, noise produced by operation of mechanical equipment, or smoke produced by prescribed burns. Under alternatives that include active management (alternatives 1, 2, and 3), efforts would be made to minimize these impacts. This may be done by timing management activity to seasons when wildlife species are not breeding or nesting, when vegetation is dormant and not likely to be damaged, or during the dry season when the ground is dry and hard, and not likely to be disturbed. It is anticipated that, even taken cumulatively, these short term effects would have little or no impact on the Willow Creek environment.

Long term impacts are those that result from changes in the extent and spatial distribution of wildlife habitats through restoration and enhancement of wildlife habitats. Changes in habitat structure or species composition may result in beneficial impacts for many species, but at the same time may also result in negative impacts to species that benefit most from the pre-existing habitat conditions. The net result of such changes can be quantified in several ways. The analysis of Average Annual Habitat Units (AAHU's) provided by the Willow Creek Habitat Evaluation (Beilke 1995) measures the effects on the target wildlife species (Table 3). A second measure is the change in acreage of individual habitat types under different management alternatives (see Table 2). For cases where the acreage of a natural or high quality habitat type increases, the impact would be beneficial, while a decrease in the acreage of a high quality habitat type would have some negative impact to some native wildlife species. If each alternative is taken as a whole, over the entire site, the following criteria may be applied to determine whether the overall impact would be considered beneficial:

1. If the proposed management actions would maintain or increase native wildlife species diversity.

2. If the proposed management actions increase the size or long-term viability of populations of the target species identified for this project and analyzed in the Habitat Evaluation.

3. If the diversity and extent of natural or high quality habitats increases.

4. If the proposed management actions increase the number of species that are afforded sufficient habitat area and quality to maintain viable populations over the long term.

The following existing or proposed habitat types are considered to be natural or high quality habitat types: forested wetland (ash), ash savanna, riparian forest, conifer forest, oak woodland, oak savanna, open wet prairie, upland prairie, and open water. The other habitat types present at Willow Creek are considered to be lower quality or degraded types due to past agricultural disturbance, livestock grazing, or fire suppression.

These conditions and criteria are common to the following analysis of the alternatives.

4.2 Potential Environmental Impacts of Alternative 1

4.2.1 Impacts On Fish and Wildlife Habitat

Under this alternative, most natural or high quality habitat types would increase in acreage (see Table 2). Forested wetland (ash) would increase by 7 acres and ash savanna would increase by 12 acres; open wet prairie would increase by 76 acres, and upland prairie would increase by 102 acres. Most of the existing oak woodland would be oak savanna, and the area of oak habitat would increase by 10 acres. Extent of riparian forest, conifer forest, and open water would not change. For the most part, increases in these high natural or quality habitat types would occur as a result of enhancement or restoration of invaded wet prairie (30 acres), wet pasture (54 acres), upland old field (40 acres), and upland pasture (66 acres).

All major structural habitat types (prairie, deciduous forest and woodland, and conifer forest) would continue to occur on the site, and proposed habitat changes would generally result in increased habitat quality for wildlife. This conclusion is supported by the Habitat Evaluation, which calculated an increase from 575 habitat units to 815 habitat units for the seven target species analyzed, a net increase of 42% from the existing conditions (Table 3). With the restoration of native plant communities in areas such as the upland pasture, beneficial impacts would include an improvement in the quality of the nesting habitat for the western pond turtle, and higher quality hunting and feeding areas for species such as the red-tailed hawk and valley quail.

A more detailed quantitative analysis of the effects of this alternative on habitat conditions at Willow Creek is contained in the HEP (Beilke, 1995). As wildlife habitats are enhanced and the number of Habitat Units provided by the site increases, it may be necessary to revise the HEP to document the improvements.

4.2.2 Impacts On Fish and Wildlife Resources

Because the extent and/or quality of all of the high quality or natural habitats at Willow Creek would increase under this alternative, the long term impacts to most native fish and wildlife species would be beneficial. Results of the HEP showed an increase in habitat units for five of the seven target species

analyzed, due to increase of both the quality and quantity of habitat. Species that utilize prairie habitat (e.g. red-tailed hawk, western meadowlark, and western pond turtle) would benefit the most under this alternative (Table 3). In addition, habitat enhancement would increase the viability of certain wildlife populations.

Additional benefits would be provided by providing key enhancements, such as nesting structures (such as cavities or boxes) or basking or sheltering structures for key wildlife species. Control of non-native wildlife, such as bullfrogs, would also be beneficial to certain fish and wildlife species by reducing competition with native species for resources, or reducing non-natural predation of native species.

All of the short term impacts described in Section 4.1 could occur under this alternative. It is anticipated that the magnitude of these impacts would, in general, be less than with Alternative 2, but more than with Alternative 3. In all cases, efforts would be made to minimize these impacts and it is anticipated that these activities would have little or no negative impact on native wildlife.

To minimize potential adverse effects on native fish and wildlife resources, public access and recreation would be controlled to eliminate inappropriate uses, and limited to less sensitive areas, and levels of use that prevent unacceptable impacts to wildlife from occurring. Seasonal restrictions for recreation and public access would be implemented if it was determined that these restrictions would be necessary for native fish and wildlife protection. Little or no long term impact to the environment is anticipated as a consequence of visitor use.

4.2.3 Impacts On Hydrologic Resources

For the most part, existing hydrologic patterns would not be affected by the management actions proposed under this alternative. Existing hydrologic features would be maintained by controlling erosion at the several nick points that have been identified along the West Fork of Willow Creek. Some enhancement of hydrologic conditions is proposed through the filling of the ditch on the Spady parcel. This ditch is about 180 meters (600 ft.) long and is located just south of Willow Creek Road and flows into Willow Creek at the 90 degree bend in the road. This would increase water retention time, and restore natural water levels to adjacent lands.

Hydrologic systems are often dynamic and subject to change as a result of natural forces. Future changes to the hydrologic conditions that occur at Willow Creek would likely be a result of such natural dynamics, or human activities that occur offsite elsewhere within the watershed.

4.2.4 Impacts On Air Quality

Maintenance of native prairie habitats may include prescribed burning, which would result in short term increases in carbon monoxide and smoke particulates. Prescribed burns would only be done under conditions that minimize the impacts of smoke on the adjacent community. These conditions include north or northeast winds, burning only under atmospheric conditions that provide proper elevation and mixing of smoke, timing burns so that fuel moisture is sufficiently low that combustion occurs rapidly, pre-burn treatments to remove 10 and 100 hour fuels to reduce particulates and burn time, and limiting burn unit size. Burning would be coordinated with the Lane Regional Air Pollution Authority and the

Eugene Fire Department to ensure that impacts to air quality are minimized. Detrimental impacts to air quality would be short term, and would have little or no cumulative impact to the environment.

4.2.5 Impacts On Cultural Resources

No adverse impacts to cultural resources would occur as a result of soil disturbance associated with wetland restoration and re-establishment of native vegetation. The State Historic Preservation Officer has been notified and a cultural resources survey has been completed for the sites within the Natural Area that may be disturbed by plowing, regarding for firebreak, revegetating and thinning procedures, fencing, parking, and wetland restoration. Because there are cultural sites outside the Natural Area, the recommendation from the survey is to monitor the plowing and regrading of the firebreak by having an archeologist present during these activities. If necessary, measures would be developed to mitigate for any impacts.

Adverse impacts to cultural resources could also occur due to public access to Willow Creek, possibly resulting in compaction, collection, or erosion of sites (deliberate or unintended). Adverse impacts would be prevented or reduced by: (1) keeping public access away from identified cultural resource sites; (2) educating visitors about the significance and need for protection of any known sites; and/or (3) having a guide accompany groups of visitors. A potential for disturbance due to illegal human access could occur. This would be minimized by having periodic monitoring of the area by authorized personnel, or by having an on-site custodian.

4.2.6 Impacts On Wetlands and Floodplains

The Willow Creek site is not located within a designated Federal Emergency Management Agency (FEMA) floodplain area.

Some minor impacts to wetlands could occur as a result of habitat improvements proposed under this alternative. Approximately 2 acres of wet pasture habitat may be plowed as site preparation for revegetating the site with native wetland species. As noted in section 4.2.3, the ditch on the Spady parcel that is proposed to be filled in occurs in a wetland area.

4.3 Potential Environmental Impacts of Alternative 2

4.3.1 Impacts On Fish and Wildlife Habitat

With restoration to presettlement conditions, some types of high quality natural habitats would increase, while others would decrease (Table 2). Open wet prairie would increase by 162 acres, and upland prairie would increase by 115 acres. Acreages of forested types would decrease. Ash forest would be converted to ash savanna, and the acreage would decrease by 55 acres to 29 acres, with the balance converted to open wet prairie. The 9 acres of riparian forest and 3 acres of conifer forest would be converted to wet prairie and upland prairie, respectively. Oak woodland would be converted to oak savanna and be maintained at 13 acres.

All major structural habitat types except for conifer forest and riparian forest would continue to occur on the site; however, there would be a decrease in the extent of tree-dominated habitats. Wildlife habitat units for the target species analyzed in the HEP would increase from 575 habitat units to 801 habitat units for the seven species analyzed, a net increase of 39% from the existing conditions. Habitat conditions would improve (an increase in both the quantity and quality) for those species that utilize open wet prairie or upland habitats for some or all of their life requisites (red-tailed hawk, valley quail, and western meadowlark) (Table 3). Restoring the site to presettlement conditions would result in a decrease in forested and open water habitats, with a resulting decrease in habitat units for the beaver, black-capped chickadee, yellow warbler, and western pond turtle.

Unpublished information on the Fender's blue butterfly indicates that this alternative would be more beneficial to this species than the other alternatives. Because this species uses Kincaid's lupine, an upland prairie plant, and camassia, a wet prairie plant, an increase of these prairie types would correspondingly increase foraging and dispersal opportunities for the butterfly.

4.3.2 Impacts On Fish and Wildlife Resources

Impacts on fish and wildlife resources under Alternative 2 would be the same as those listed under Alternative 1 (see 4.2.2 under Alternative 1), except for the following differences:
As analyzed under the HEP, species that use the open wet prairie or upland prairie habitats, such as red-tailed hawk, valley quail, and western meadowlark, would benefit to an even greater extent under this alternative than Alternative 1, due to the increase in amount of available habitat (Table 3). Species that prefer forested habitats (e.g. black-capped chickadee) would have a decrease in the amount of available habitat, and a resulting decrease in habitat units. For species such as the beaver and western pond turtle that require open water habitat, a decrease in habitat units would result. Overall wildlife species diversity might decrease slightly, but the long term viability of wildlife species that use primarily open prairie habitats would be increased.

No artificial nesting structures (such as cavities or boxes) or basking or sheltering structures would be constructed for key wildlife species. Relying on natural factors and forces to provide key features of habitat structure may limit population numbers or slow the growth of populations of these wildlife species.

Because of the greater magnitude of the habitat restoration under this alternative, short term impacts resulting from the work activity would be greater than with the other two alternatives under consideration. However, because these activities would occur over a greater area and occur over a longer time frame, the overall impacts to any one area of habitat or point in time would probably not be greater than for the other alternatives.

Because public recreational access would be restricted to the outer margins of the site, there would be even less likelihood of this use having a detrimental impact on fish and wildlife resources than the other alternatives. Adverse impacts may occur due to unauthorized human presence, but this could be minimized by having authorized personnel monitor the area, or by having an on-site custodian.

4.3.3 Impacts On Hydrologic Resources

This alternative would result in substantial change to hydrologic conditions of the riparian habitat. Restoring the topography and stream channel elevations to presettlement conditions would eliminate the beaver ponds and most of the open water habitat, and replace it with a wet prairie or emergent wetland type of habitat (see section 4.3.6). Restoration would require extensive excavation and recontouring of existing creeks. This would cause long-term alteration of hydrologic function.

4.3.4 Impacts On Air Quality

Impacts on air quality under Alternative 2 would be the same as those listed under Alternative 1, because the area of habitat where prescribed burning would be utilized would be the same. (see 4.2.4 under Alternative 1).

4.3.5 Impacts On Cultural Resources

Impacts on cultural resources under Alternative 2 would be the same as those listed under Alternative 1 (see 4.2.5 under Alternative 1). However, the potential that cultural resources could be affected is greater under this alternative because of the more extensive soil disturbance that would occur with riparian habitat restoration.

4.3.6 Impacts On Wetlands and Floodplains

Under Alternative 2, short term impacts on wetlands would be greater than under the other alternatives because of the extent of physical modification of the stream channels that would occur. Changing the stream channels to broad, shallow swales would have some short term impact to adjacent wetlands due to grading and moving of soil. These impacts would be temporary until establishment of vegetation, however, stream/wetland conditions would stabilize and improve. Other impacts to wetlands could include an increase in the extent and duration of wetland hydrology that could occur with increased overbank flows, and increased retention time of water on the site. In many cases these impacts would be considered to be positive, and any potential negative effects would be considered and mitigated during the design and construction phases.

4.4 Potential Environmental Impacts of Alternative 3

4.4.1 Impacts On Fish and Wildlife Habitat

By maintaining existing conditions, the extent and quality of each habitat type would not be altered over the long term, and there would be no net change in the amount or distribution of fish and wildlife habitats (Table 2). Since no enhancement activities would occur, opportunities for improving fish and wildlife habitat would be lost, as would the opportunity for BPA to gain additional wildlife mitigation credits at Willow Creek. As analyzed in the HEP, habitat conditions for all of the target species would be the same as the existing conditions, with no change in the habitat units (Table 3).

4.4.2 Impacts On Fish and Wildlife Resources

It is anticipated that most of the existing fish and wildlife abundance and species diversity would be maintained under this alternative. However, some species that are currently present at Willow Creek but are not present in numbers sufficient to be viable over the long term may eventually be extirpated from the site. For example, without control of non-native species such as the bullfrog, species such as the western pond turtle may be lost from the site even though suitable habitat conditions are still present.

Habitat units for those species analyzed under the HEP would be the same for this alternative as under the existing conditions (Table 3). Since habitat conditions would not be improved under this alternative, opportunities to increase species abundance and diversity would be lost. Additional benefits to wildlife that could be provided by providing key enhancements, such as nesting structures (such as cavities or boxes) or basking or sheltering structures for key wildlife species, would not be achieved under this alternative. However, some of these structural features may be provided naturally as trees age and cavities or snags develop.

Short term impacts to fish and wildlife resources described in Section 4.1 could occur because of implementing habitat management, such as mechanical removal of non-native plant species, or prescribed burning. It is anticipated that the magnitude of these impacts would, in general, be less than both Alternative 1 and Alternative 2. In all cases, efforts would be made to minimize these impacts and it is anticipated that these activities would have little or no impact on native wildlife.

Maintaining public access and recreational use at existing levels would result in little or no long term impact to the environment as a consequence of visitor use.

4.4.3 Impacts On Hydrologic Resources

There would be no direct impacts to hydrologic resources as a result of implementation of this alternative. Degradation of hydrologic resources may occur because problems such as headward erosion would not be prevented.

4.4.4 Impacts On Air Quality

The impacts on air quality would be similar to those under the other alternatives under consideration. The acreage burned may be somewhat reduced under this alternative, but 10 hour and 100 hour fuels would not be removed from the site, so smoke production might be somewhat greater.

4.4.5 Impacts On Cultural Resources

The impacts on cultural resources would be the same as in Alternative 1, except that no soil or ground disturbance would occur as a result of preparing land for planting of native species, or filling in old ditches.

4.4.6 Impacts On Wetlands and Floodplains

There would be no impacts to wetlands and floodplains under this alternative.

4.5 Potential Environmental Impacts of Alternative 4

With no active management, existing trends in vegetation change would continue. Because there would be no active management existing open prairie habitats would gradually change in response to natural succession and probably become closed forest. Non-native grasses, shrubs, and trees would probably increase in abundance, and most native prairie species would eventually be extirpated.

There would be no impact to other resources.

4.6 Potential Environmental Impacts of Alternative 5

The No-Action Alternative would mean loss of this opportunity at Willow Creek to provide mitigation for wildlife losses due to the development of hydroelectric projects in the Willamette River drainage. Under the No-Action Alternative, BPA would release its option on property at the Willow Creek Natural Area. Because the Natural Area is within the Urban Growth Boundary, this would leave the 51 hectares (126 acres) Bailey Hill property within the natural area unprotected. Development of the Bailey Hill property would fragment existing natural habitat and remove habitat used by the target species. This alternative would not protect or maintain existing habitat. It would allow ongoing alteration and invasion of other species. The majority of the wetland habitats would remain undeveloped but may be available for bike and pedestrian paths or other uses that would compromise the habitat suitability for many of the targeted species. The No-Action alternative would not contribute toward meeting BPA's goal to mitigate under the council's program.

Table 3
Comparison of Management Alternatives and Average Annual Habitat Units (AAHU)
(from the Willow Creek Habitat Evaluation, Beilke 1995)

		ALTERNATIVES				
		Baseline Conditions	Proposed Action	Pre-Settlement	Maintain Existing	No Active Management
	SPECIES					
1.	Yellow Warbler	25.08	19.35	13.18	25.08	9.76
2.	Valley Quail	144.42	159.82	199.36	144.42	20.94
3.	Beaver	6.05	6.05	1.33	6.05	6.05
4.	Western Pond Turtle	106.82	155.18	69.02	106.82	22.55
5.	Black-Capped Chickadee	82.84	103.52	38.40	82.84	239.59
6.	Western Meadowlark	110.58	157.99	232.03	110.58	18.27
7.	Red-Tailed Hawk	99.60	212.80	247.74	99.60	97.11
	TOTAL AAHU's	**575.39**	**814.71**	**801.06**	**575.39**	**414.27**

CHAPTER 5: MONITORING AND EVALUATION

5.0 Objectives

Long-term monitoring and evaluation of management activities would be designed: (1) to determine if the objectives of the Proposed Action are met, and (2) to evaluate the success of the Management Plan. Monitoring and evaluation would include:

- The use of a quantifiable method to analyze change in Habitat Units (as determined by the HEP conducted in 1993 and 1994) in response to habitat maintenance and enhancement activities.

- The design of a wildlife survey to document species presence and occurrence before, during and after project implementation in response to habitat maintenance and enhancement activities.

5.1 Adaptive Management

An adaptive management approach, within the guidelines and limits of this EA/Management Plan for Willow Creek would give BPA the opportunity to alter management activities over time, in response to the effectiveness of past management actions. The information obtained from monitoring and evaluation (as stated under 5.1) would be used to develop and analyze management activities including:

1. Effectiveness of habitat maintenance and restoration activities.

2. Species occurrence and response to management actions.

CHAPTER 6: COMPLIANCE WITH ENVIRONMENTAL PROTECTION LAWS

6.0 Background

The National Environmental Policy Act (42 U.S.C. 4321-4347) requires federal agencies to give consideration to environmental amenities and values in decisionmaking along with economic and technical considerations. The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Pub. L. No 96-501), which provides direction to BPA to protect, mitigate and enhance fish and wildlife to the extent affected by development of federal dams and reservoirs in the Willamette River basin, is also used to review BPA projects.

Federal laws including the Clean Water Act, primarily Sections 401, (33 U.S.C 1341), Section 404(33 U.S.C. 1344); the Preservation of Historical and Archeological Data Act of 1974 (16 U.S.C.469 et seq.); the Endangered Species Act (16 U.S.C. 1531 et seq.); are some of the federal regulations that apply to this Management Plan.

The mitigation plan would also be subject to regulations established by the State of Oregon, Division of State Lands (Removal-Fill Law ORS 196.800 - 196.990), the Department of Environmental Quality and the Lane County Regional Air Pollution Authority.

6.1 Federal Requirements Applicable to this Project

Effects on Waters of the U.S.: Permits for Discharge of Fill in Waters of the U.S.
Section 404 of the Clean Water Act requires a permit for the discharge of fill into a wetland or other Water of the U.S. The Portland District U.S. Army Corps of Engineers and the Environmental Protection Agency have given joint approval for the West Eugene Wetlands Plan and will review wetland restoration under an expedited Letter of Permission. (A Letter of Permission is type of permit issued through an abbreviated process.)

Effects on Cultural Resources
The State Historic Preservation Officer has been notified and a cultural resources survey has been completed for the sites within the Natural Area that may be disturbed by plowing, regrading for firebreak, revegetating and thinning procedures, fencing, parking, wetland restoration. Because there are cultural sites outside the Natural Area the recommendation from the survey is to monitor the plowing and regrading of the firebreak by having an archeologist present during these activities..

Effects of Endangered Species
The ESA of 1973, as amended, requires federal agencies to ensure that their actions do not jeopardize endangered or threatened species or their critical habitat. BPA will submit this Willow Creek Wildlife Management Plan as the Biological Assessment and would be in compliance with Section 7 consultation.

6.2 Local Requirements Applicable to the Project

Effects on Waters of the State: Permits for Oregon's Removal Fill Law
Eugene is the first city in the nation to receive federal approval of streamlined wetland permitting process based upon local wetland planning. The West Eugene Wetlands Plan is one element in the Eugene Comprehensive Stormwater Management Plan adopted in 1993. The plan conforms to federal and state stormwater mandates, meets local goals and policies, and takes a multiple-objective approach to flood control, water quality, and natural resource protection. The Willow Creek Natural Area is one of the inventoried wetland sites. Wetland restoration on the Natural Area has been approved by the Order of the Director approving the West Eugene Wetlands Conservation Plan on Sept. 1994.

Effects of Air Quality: Permits
The Lane County Regional Air Pollution Authority manages air quality in the Eugene Area regulates field burning for the Natural Area.

CHAPTER 7: CONSULTATION AND COORDINATION

The following groups, public agencies, and individual participants provided input on management issues at the August 1994 public meeting for Willow Creek:

Bonneville Power Administration
Charlie Craig
Nancy Weintraub
Carlene Stenehjem
Chris Thoms
Cheryl Schultz

The Nature Conservancy
Ed Alverson
Cathy McDonald

City of Eugene
John Etter
Deborah Evans

U.S. Fish and Wildlife Service
Pat Wright
Ron Garst
Kathy Larson

Oregon Department of Fish and Wildlife
Sue Beilke
Bill Castillo
Dan Carleson
Steve Mamoyac

The Siletz Tribe

The Grande Ronde Tribe

The following agencies were consulted about the planning and writing of the Willow Creek Wildlife Mitigation Project:

Bureau of Land Management

Oregon Department of Fish and Wildlife

City of Eugene

Lane Council of Governments

Native Plant Society of Oregon

CHAPTER 8: REFERENCES and BIBLIOGRAPHY

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CHAPTER 9: SCHEDULING OF IMPLEMENTATION

The implementation of the Management Plan for Willow Creek would begin upon conclusion of the environmental review pursuant to the National Environmental Policy Act of 1969, and subject to budget availability.

APPENDIX A

RARE, THREATENED, ENDANGERED, OR SENSITIVE PLANTS OF THE WILLOW CREEK NATURAL AREA

Common Name	Scientific Name	Federal Status	State Status	ONHP List
White topped aster	*Aster curtus*	C2	C	1
Timwort	*Cicendia quadrangularis*	-	-	2
Willamette daisy	*Erigeron decumbens ssp. decumbens*	C1	LE	1
Shaggy horkelia	*Horkelia congesta ssp. congesta*	C2	C	1
Bradshaw's lomatium	*Lomatium bradshawii*	LE	LE	1
Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	C2	C	1

Status Codes:

Federal Status
LE - Species is listed as endangered
C1 - Candidate for listing; sufficient information available to support a listing proposal
C2 - Candidate for listing; additional information needed to support a listing proposal

State Status
LE - Species is listed as endangered
C - Candidate for listing as endangered or threatened

Oregon Natural Heritage Program
ONHP List 1 - Species is endangered or threatened throughout range
ONHP List 2 - Species is endangered or threatened in Oregon, more common elsewhere

Based upon "*Rare, Threatened, and Endangered Plants and Animals of Oregon*", Oregon Natural Heritage Program, August 1993.

APPENDIX B

RARE, THREATENED, ENDANGERED, OR SENSITIVE ANIMAL SPECIES KNOWN OR SUSPECTED TO OCCUR AT THE WILLOW CREEK NATURAL AREA

Common Name	Scientific Name	Federal Status	State Status	ONHP List
Fish:				
Oregon Chub	*Oregonichthys crameri*	LE	SC	1
Amphibians:				
Red-legged Frog	*Rana aurora aurora*	C2	SU	3
Reptiles:				
Western Pond Turtle	*Clemmys marmorata marmorata*	C2	SC	2
Sharptail Snake	*Contina tenuis*	-	SV	4
Birds:				
Acorn Woodpecker	*Melanerpes formicivorus*	-	SU	3
Pileated Woodpecker	*Dryocopus pileatus*	-	SV	4
Grasshopper Sparrow	*Ammodramus savannarum*	-	SU	3
Streaked Horned Lark	*Eremophila alpestris strigata*	-	SU	3
Western Bluebird	*Sialia mexicana*	-	SV	4
Mammals:				
Fringed Myotis	*Myotis thysanodes*	-	SV	1
Pallid Bat	*Antrozous pallidus pacificus*	-	SV	3
Invertebrates:				
Fender's Blue Butterfly	*Icaricia icarioides fenderi*	C2	-	1

Status Codes:

Federal Status
LE - Species is listed as endangered
C2 - Candidate for listing; additional information needed to support a listing proposal

State Status
SC - Sensitive and critical; listing is pending, or may be appropriate if not pending
SV - Sensitive species for which listing is not imminent if adequate protective measures are taken
SU - Sensitive species for which the status is unclear; further study is needed

Oregon Natural Heritage Program
ONHP List 1 - Species is endangered or threatened throughout range
ONHP List 2 - Species is endangered or threatened in Oregon, more common elsewhere
ONHP List 3 - Species may be endangered or threatened, more information needed
ONHP List 4 - Species of concern, not currently considered threatened or endangered

Based upon "*Rare, Threatened, and Endangered Plants and Animals of Oregon*", Oregon Natural Heritage Program, August 1993.

APPENDIX C

INTERPRETATION OF GENERAL LAND OFFICE SURVEY NOTES FOR THE WILLOW CREEK NATURAL AREA

Willow Creek was described in the 1850's as mostly level prairie, with only a few widely scattered trees, except on the slopes of the adjacent foothills, where oak savanna was documented. Witness trees included Oregon ash, Oregon white oak, and California black oak. Tree species representative of more densely forested or mesic habitats, such as Douglas-fir, Western redcedar, and bigleaf maple were not recorded within the boundaries of the Willow Creek Natural Area.

Methods

Section lines crossing within or near the Willow Creek Natural Area in Township 18 South, Range 4 West were surveyed under contract with the U.S. General Land Office (GLO) in October 1852 and January 1853. Donation Land Claims (DLC's) previously established by Jackson Wright and Ezekiel Bailey were also surveyed in a similar manner in August 1854. Distances were measured in chains and links (100 links to a chain; 1 chain = 20 meters or 66 feet). Surveyors were required to locate and describe changes in topography, vegetation, and soils along the lines they surveyed, and to summarize these features at the end of each section line or DLC. Boundaries between prairies and wooded habitats were located and described. When section and quarter section corners were established, witness trees were marked if trees were located nearby. Witness trees were identified, usually to species, their diameter was estimated, and the compass bearing and distance from corner to witness tree was measured and recorded. At the end of the survey of each township, the topography, vegetation, soils, and potential for settlement was described, and a plat map of the township was prepared at a scale of 1:31,680 (1" = 1/2 mile). The township description, survey line data, and plat map are shown at the end of this appendix.

These data, in effect, constitute the earliest ecological inventory of the landscape. Because the surveys were conducted as Euroamerican settlement was just beginning to establish, vegetation at the time of the surveys had not significantly changed from presettlement conditions. Thus, these surveys are our best information regarding the character of the presettlement landscape and distribution of major habitat types.

Vegetation of the Willow Creek Area in the 1850's

Most of the land within the boundaries of the Willow Creek Natural Area were mapped and described in the 1850's as level prairie. For example, the east 1/3 of Donation Land Claim (DLC) #40 was described as "gently inclining prairie", while the NW 1/4 of DLC #41 was described as "level, soil first rate, prairie". Apparently these prairies did contain a few, scattered trees, which were used as bearing trees for DLC corners, section corners, and quarter section corners. Seven such trees were recorded

within the prairie boundaries in and adjacent to the Willow Creek site. Of these, five were Oregon ash and two were Oregon white oaks. The sparse distribution of the trees is confirmed by the distance from these bearing trees to the corner posts - the average was 208 meters (683 feet), with a range of 131 meters (429 feet) to 315 meters (1034 feet). These trees were generally small, as well, as the average diameter of the ash trees was 27 cm (10.6 inches).

Once the ground rose into the nearby foothills, a transition occurred to white and black oak openings or savanna. Nearly all of the area known as the "south hills" was oak savanna, with only occasional patches of conifers such as Douglas-fir or ponderosa pine. For example, the line between sections 3 and 4, T18S R4W, was described as "nearly level first rate prairie...oak openings a short distance east of the line". All of the trees recorded in the oak openings on or adjacent to the Willow Creek site were oaks, with 57% of the bearing trees Oregon white oak and 43% California black oak. Average distance from corner to bearing tree was about 17 meters (56 feet), and the trees were larger than the trees in the prairie, with an average diameter of 50 cm (20 inches).

Streams and Wetlands in the 1850's

Streams and wetlands in the Willow Creek area were not particularly well documented by these surveys, and some inferences must be made to develop a picture from these data. For example, while the notes do not mention wetland conditions on the valley floor, the presence of a few Oregon ash trees (such as at the corner of sections 33 and 34 of T17S R4W and sections 3 and 4 of T18S R4W) suggests that wetland conditions were present.

Some clues are provided about stream channel morphology. The only place where an actual stream is mapped is along the East Fork of Willow Creek adjacent to the line between sections 4 and 9, T18S R4W. Here the creek was described in January 1853 as "a stream 3 links wide...dry in summer" (3 links is about 66 cm or 24 inches). The West Fork of Willow Creek, which was crossed several times while surveying the boundaries of the DLC's, was described only as a "swail" (or swale), with no measure of its width. These clues suggest that the stream channels were rather broad swales, with a small low flow channel or none at all. They were dry in the summer. In the winter, water probably spread out from the low flow channels and spread widely over the valley floor in the form of sheet or surface flow. The furthest downstream portion of Willow Creek that was crossed by these surveyors was along the line between sections 33 and 34 of T17S R4W and sections 3 and 4 of T18S R4W. This line was surveyed in October 1852; no mention of any stream crossing was made. This implies that there was no single defined stream channel present at this location, even though water inevitably must have flowed through there on a seasonal basis.

Lastly, there is no mention of beaver ponds as being present in the Willow Creek area at that time, and with the sparseness of woody vegetation, and lack of incised stream channels, conditions would probably have not been suitable for beaver habitation.

General Description for T18S, Range 4W

"This township has a very unequal surface being mostly rounded irregular hills some broken in the south and SE parts. Some 1st rate level and gently rolling prairie land and gently rolling prairie land and well adapted to agricultural purposes, is found along the north boundary and in a valley in the middle and southern portion of the township. Good grazing for stock is found in the hills except in the summer months when they become parched and dry. The streams usually dry up in the summer, but a sufficient number of good springs are found to supply stock etc. with water. One salt spring was noted in the south part of section 16. The timber is generally low bushy topped black and white oak openings, some scattering yellow pine, and considerable fir in the south part of the township; usually thick brush in the ravines and on steep declivities. Basaltic rocks are exposed at the surface in most part of the hills. A yellowish coarse grained sandstone was noted in several places, which is suitable for building purposes; loose fragments of petrified wood, quartz, agate, etc. were noticed in many places strewn over the ground. The variation of the needle is generally very irregular. About one third of the township is claimed, mostly by new settlers, and but few improvements have yet been made. There are a few good claims yet vacant".

Transcriptions of General Land Office Survey Notes for Willow Creek

On the North Boundary of Township 18S, Range 4 West, surveyed in October 13-14 1852:

West between sections 3 and 34
40.00 Deposit charred stake and raise mound with trench as per instructions
80.00 Set post corner of sections 3, 4, 33, and 34 from which:
A white ash 10 inches in diameter bears N75W, 650 links.
A white ash 11 inches in diameter bears S78W, 861 links.
Make trench as per instructions
Land level prairie, soil second rate

West between sections 4 and 33
35.00 Leave prairie and enter oak openings
40.00 Set post corner of sections 3, 4, 33, and 34 from which:
A white oak 24 inches in diameter bears S55E, 22 links.
A white oak 38 inches in diameter bears N20W, 62 links.

80.00 Set post corner of sections 4, 5, 32, and 33 from which:
A white oak 12 inches in diameter bears N42 1/2 E, 47 links.
A white oak 20 inches in diameter bears N47 1/2 W, 174 links.
Make trench as per instructions
Land rolling, soil second rate. Timber oak.

Interior Sections of Township 18S, Range 4 West, surveyed January 19-21 1853:

South between sections 3 and 4
42.50 Set quarter section post from which:
A white ash 14 inches in diameter bears N59 1/2W, 1110 links.
A black oak 28 inches in diameter bears S4 1/2E, 1566 links.
78.00 Leave prairie course NE & SW
82.50 To corner of sections 3, 4, 9 & 10
Land nearly level first rate prairie; good for farming. Oak openings short distance east of line.

South between sections 4 and 5
7.34 To the north boundary of Ezekiel Bailey's claim, west 10 chains to the NW corner and east 46.56 chains to the NE corner as pointed out.
37.50 Leave prairie & enter oak openings course S70E
43.90 Set quarter section post from which:
A black oak 16 inches in diameter bears S10W, 1621 links.
A black oak 28 inches in diameter bears N49E, 85 links.
52.00 To a farm and enter field course E & W
52.80 Exit fields course E & W
63.90 To the south boundary of Ezekiel Bailey's claim, west 10 chains to the SW corner and East 46.56 chains to the SE corner as pointed out.
83.90 To corner of sections 4, 5, 8, & 9.
Land north part gently rolling prairie and residue gently rolling and hilly oak openings. Soil good second and first rate clay loam.

West between sections 4 and 9
6.00 Enter prairie course NE & SW
23.40 To a stream 3 links wide course north, dry in summer
34.00 Leave prairie course S60E & NE
40.16 Set quarter section post from which:
A black oak 14 inches in diameter bears N44W, 10 links.
A white oak 24 inches in diameter bears S49W, 27 links.
50.00 Top of north part of hill
60.00 A valley course north
80.32 To section corner
Land east half gently rolling prairie, residue hilly black and white oak openings.

North between sections 9 and 10 (N from quarter section post)
44.00 Enter prairie, course E & W
57.50 Leave prairie, course E & W

80.00 Set post corner of sections 3, 4, 9 & 10 from which:
A white oak 28 inches in diameter bears S68W, 66 links.
A black oak 24 inches in diameter bears S12E, 44 links.
A black oak 12 inches in diameter bears N12E, 481 links.
A black oak 24 inches in diameter bears N70W, 106 links.
Land rolling and hilly, soil good second rate clay loam. Timber black and white oak openings.

Survey of the boundaries of Ezekiel Bailey's Claim (#40), August 13th, 1854

Beginning at the NW corner from which:
A black oak 12 inches in diameter bears S10E, 782 links.
A black oak 24 inches in diameter bears S17W, 758 links.
A white oak 24 inches in diameter bears N17 1/2 W, 432 links; thence

East on the north boundary of Claim #40 in section 5 & 4, 276 chains from post
Intersect sect. line between sections 4 & 5 - 13.88 links south of corner
Set post for NE corner of Claim #40 and NW corner of Claim #41 in section 4 from which:
An ash 8 inches in diameter bears S11W, 785 links.
An ash 10 inches in diameter bears S35 1/2 E, 1155 links.
A white oak 12 inches in diameter bears N33 1/2 W, 1117 links.

South on the east boundary of Claim #40 and west boundary of Claim # 41 in section 4
20.50 Swail (swale)
56.57 Set post for SE corner of Claim #40 on west boundary of Claim #41 in section 4 from which:
A white oak 15 inches in diameter bears N89 3/4 E. 375 links.
A white oak 20 inches in diameter bears S14 1/2 E, 234 links; thence
An ash 15 inches in diameter bears N55 1/2 W, 1373 links

West on the south boundary of Claim #40 in sections 4 & 5
23.00 Cross a ravine
26.00 Ascend from ravine and enter timber
34.00 Summit of bluff
46.36 Intersect section line between sections 4 & 5, 13.05 chains north of corner of sections 4, 5, 8, & 9
56.57 Set post for SW corner of Claim #40 in section 5 from which
A black oak 36 inches in diameter bears N21E, 4 links
A white oak 18 inches in diameter bears N73W, 110 links
A white oak 24 inches in diameter bears S71E, 57 links

North on true line on west boundary of Claim #40 in section 5:

1.00 Ascend bluff
4.50 Summit of same
5.10 Begin to descend
16.00 Foot of descent and swale
17.40 Begin ascent
24.50 Summit of oak bluff
45.00 Cross a hollow
50.00 Begin to ascend
57.02 To post, NW corner of Claim #40

East 1/3 gently inclining prairie, west 2/3 rolling. Soil second rate. Timber oak, some fir and ash, third rate.

Survey of the boundaries of Jackson Wright's Claim (#41), August 12th, 1854

Beginning at the NE corner of Claim #41 and on west boundary of Claim #42 in section 3
Deposited charred stake and raised mound with trench as per instructions

West on the north boundary of Claim #42 in section 3 & 4

25.53 Intersect sect. line between sections 4 & 5 - 13.80 chains south of corner
59.00 To post NW corner of Claim #41 and NE corner of Claim #40 in section 4, from which:
An ash 8 inches in diameter bears S24W, 883 links.
An ash 10 inches in diameter bears S50 1/2 E, 1000 links.
A white oak 12 inches in diameter bears N40 1/2 W, 1217 links.

South on the west boundary of Claim #41 and east boundary of Claim # 40 in sections 4 & 9

20.50 Swail (swale) 10 links wide course E & W
56.57 To post for SE corner of Claim #40 and begin to ascend hill
59.00 Leave prairie and enter timber
68.70 Intersect section line 664 chains east of quarter section post on line between sections 4 & 9
108.65 Set post for SW corner of Claim #41 in section 9 from which:
A white oak 12 inches in diameter bears N6W, 56 links
A white oak 15 inches in diameter bears N34E, 220 links
A white oak 15 inches in diameter bears S14E, 90 links

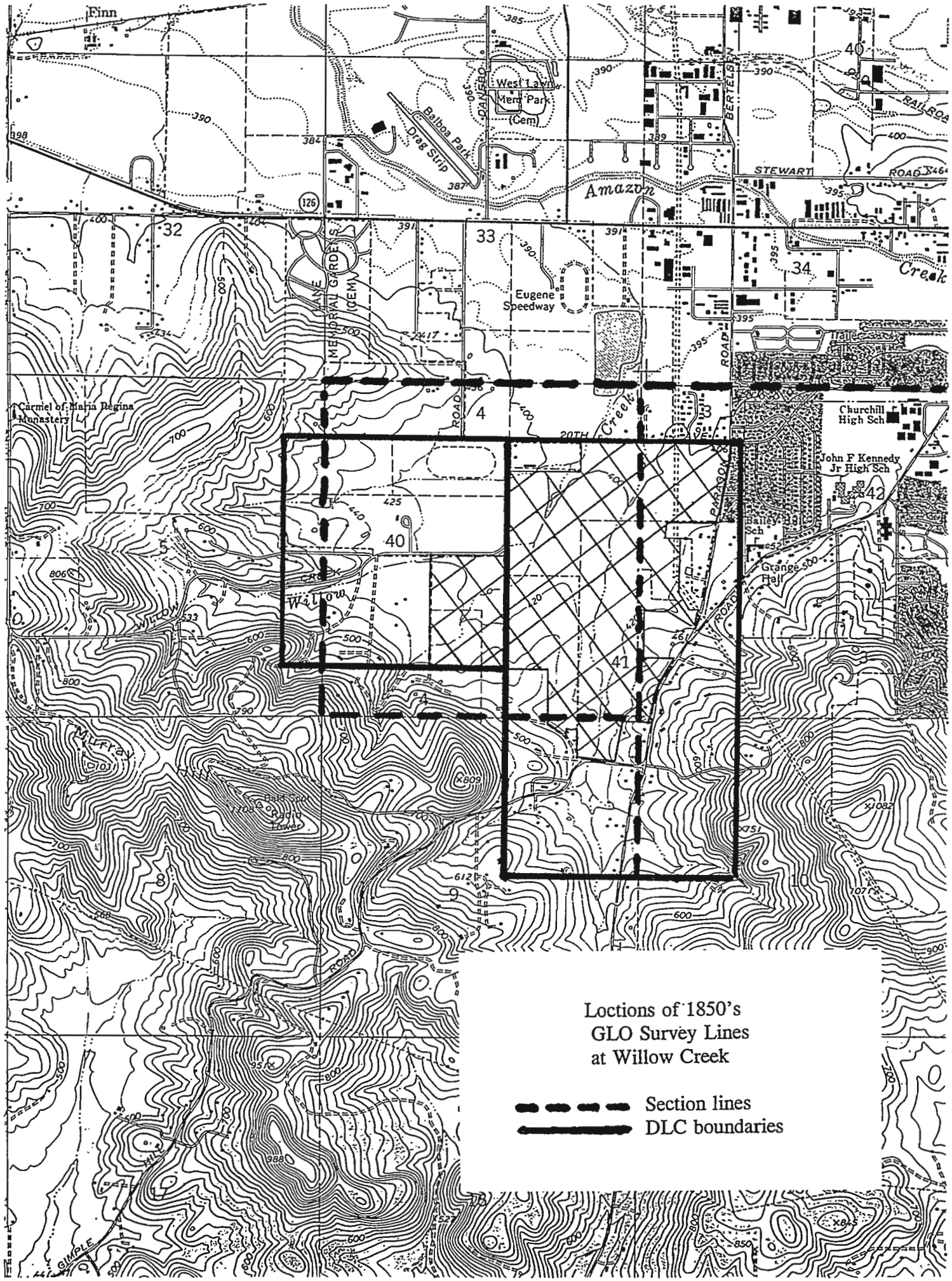
East on the south boundary of Claim #41 in sections 9 & 10

20.00 Foot of descent
33.52 Intersect section line at quarter section post between sections 9 & 10
57.00 Begin to descend
59.00 Set post for SE corner of Claim #41 in ravine and in section 10 from which:
A black haw 8 inches in diameter bears S30W, 21 links
A maple 12 inches in diameter bears N35E, 33 links

A vine maple 4 inches in diameter bears N14W, 10 links

North on the east boundary of Claim #41 in sections 10 & 3
0.50 Begin to ascend hill
2.50 Summit of rise and begin to descend
5.00 Foot of hill and begin to ascend
15.00 Summit of hill and begin to descend
20.50 Foot of hill and begin to ascend
30.00 Summit of hill and begin to descend
40.00 Intersect section line 14.66 chains west of quarter section post on line between sections 3 and 10
53.50 Foot of descent and begin to ascend
60.22 To post of SW corner of Claim #42 in section 3
69.12 Leave timber enter prairie
108.70 To NE corner of Claim #41 on west boundary of Claim #42 in section 3

Land on NW quarter level, soil first rate prairie, on SE 1/2 broken, soil second rate. Timber chiefly white and black oak, third rate.



Loctions of 1850's
GLO Survey Lines
at Willow Creek

Section lines
DLC boundaries

1853 GLO Plat Map
for T18S R4W

(scale 1:42,240)

APPENDIX D

VASCULAR PLANTS OF THE WILLOW CREEK NATURAL AREA

ISOETACEAE	
Isoetes nuttallii	Nuttall's quillwort
OPHIOGLOSSACEAE	
Botrychium multifidum	leathery grape-fern
POLYPODIACEAE	
Cystopteris fragilis	fragile fern
Polypodium glycyrrhiza	licorice fern
Polystichum munitum	common sword fern
Pteridium aquilinum var. pubescens	bracken
SALVINIACEAE	
Azolla mexicana	water fern
PINACEAE	
Pinus ponderosa	Ponderosa pine
Pseudotsuga menziesii	Douglas-fir
CUPRESSACEAE	
Juniperus virginiana (I)	eastern redcedar
SALICACEAE	
Populus trichocarpa	black cottonwood
Salix lasiandra	Pacific willow
Salix piperi	Piper's willow
BETULACEAE	
Corylus avellana (I)	filbert
FAGACEAE	
Quercus garryana	Oregon white oak
Quercus kelloggii	California black oak
LORANTHACEAE	
Phoradendron flavescens var. villosum	American mistletoe

SANTALACEAE	
Commandra umbellata	bastard toadflax
POLYGONACEAE	
Polygonum bistortoides	American bistort
Rumex acetosella (I)	sheep sorrel
Rumex crispus (I)	curly dock
Rumex salicifolius	willow-leaved dock
PORTULACACEAE	
Claytonia perfoliata (Montia p.)	miner's lettuce
Claytonia sibirica (Montia s.)	candyflower
Montia linearis	narrow-leaved montia
Montia fontana	water chickweed
CARYOPHYLLACEAE	
Cerastium viscosum (I)	sticky chickweed
Dianthus armeria (I)	Deptford pink
Moenchia erecta (I)	moenchia
Stellaria calycantha var.	northern starwort
Stellaria media (I)	chickweed
RANUNCULACEAE	
Aquilegia formosa	western columbine
Delphinium menziesii var. pyramidale	Menzie's larkspur
Ranunculus occidentalis	western buttercup
Ranunculus orthorhynchus	straight-beak buttercup
Ranunculus repens (I)	creeping buttercup
Ranunculus uncinatus	small-flowered buttercup
BERBERIDACEAE	
Berberis aquifolium	tall Oregon-grape
PAPAVERACEAE	
Eschscholzia californica (I)	California poppy
BRASSICACEAE	
Cardamine oligosperma	little western bittercress
Cardamine penduliflora [1]	Willamette-Valley bittercress
Cardamine pulcherrima var. tenella	slender toothwort
Rorippia curvisiliqua var.	western yellowcress

SAXIFRAGACEAE	
Lithophragma parviflora	smallflowered prairiestar
Saxifraga oregana	Oregon saxifrage
Saxifraga integrifolia	prairie saxifrage
Tellima grandiflora	fringecup
ROSACEAE	
Amalanchier alnifolia var. semiintegrifolia	western serviceberry
Cottoneaster franchettii (I)	cottoneaster
Cottoneaster horizontalis (I)	cottoneaster
Crataegus douglasii var.	black hawthorn
Crataegus monogyna (I)	singleseed hawthorn
Fragaria vesca var.	woods strawberry
Fragaria virginiana var. platypetala	broadpetal strawberry
Geum macrophyllum	large-leaved avens
Horkelia congesta ssp. congesta [1]	shaggy horkelia
Holodiscus discolor	ocean-spray
Oemleria cerasiformis	indian plum
Physocarpus capitatus	Pacific ninebark
Potentilla gracilis var. gracilis	slender cinquefoil
Prunus avium (I)	bird cherry
Prunus domestica (I)	plum
Prunus emarginata	bitter cherry
Pyracantha sp. (I)	pyracantha
Pyrus communis (I)	pear
Pyrus malus (I)	apple
Pyrus fusca	western crab-apple
Rosa eglanteria (I)	sweetbrier
Rosa multiflora (I)	multiflora rosa
Rosa nutkana	Nootka rose
Rosa pisocarpa	clustered wild rose
Rubus discolor (I)	Himalayan blackberry
Rubus laciniatus (I)	evergreen blackberry
Rubus ursinus	Pacific blackberry
Sanguisorba minor ssp. muricata (I)	garden burnet
Sanguisorba occidentalis	annual burnet
Sorbus aucuparia (I)	European mountain-ash
Spiraea douglasii var.	Douglas' spiraea

FABACEAE	
Cytisus scoparius (I)	Scot's broom
Lathyrus aphaca (I)	yellow vetchling
Lathyrus hirsutus (I)	hairy vetchling
Lathyrus latifolius (I)	perennial sweet-pea
Lathyrus nevadensis	Sierran pea-vine
Lathyrus sphaericus (I)	grass peavine
Lotus corniculatus (I)	birdsfoot-trefoil
Lotus formosissimus	seaside lotus
Lotus pinnatus	meadow deervetch
Lotus purshianus	spanish-clover
Lupinus latifolius	broadleaf lupine
Lupinus micranthus	small-flowered lupine
Lupinus polyphyllus var.	bigleaf lupine
Lupinus sulphureus ssp. kincaidii [1]	Kincaid's lupine
Psoralea physodes	California-tea
Trifolium dubium (I)	least hop clover
Trifolium oliganthum	few-flowered clover
Trifolium pratense (I)	red clover
Trifolium repens (I)	white clover
Trifolium subterraneum (I)	subterranean clover
Vicia hirsuta (I)	hairy vetch
Vicia tetrasperma (I)	slender vetch
Vicia sativa var. (I)	common vetch
GERANIACEAE	
Geranium columbinum (I)	long-stalked geranium
Geranium dissectum (I)	cut-leaved geranium
Geranium oreganum	western geranium
LINACEAE	
Linum angustifolium (I)	pale flax
CALLITRICHACEAE	
Callitriche stagnalis (I)	pond water-starwort
Callitriche heterophylla var.	water-starwort
ANACARDIACEAE	
Rhus diversiloba	poison-oak
ACERACEAE	
Acer macrophyllum	bigleaf maple

RHAMNACEAE	
Rhamnus purshiana	cascara
MALVACEAE	
Sidalcea cusickii	Cusick's checkermallow
Sidalcea virgata	rosy checkermallow
HYPERICACEAE	
Hypericum anagalloides	bog St. John's-wort
Hypericum formosum var. scouleri	Western St. John's wort
Hypericum perforatum (I)	common St. John's-wort
LYTHRACEAE	
Lythrum hyssopifolia (I)	hyssop loosestrife
Peplis portula (I)	water-purslane
ONAGRACEAE	
Boisduvalia densiflora var.	dense spike-primrose
Epilobium angustifolium	fireweed
Epilobium glandulosum	common willow-herb
Epilobium paniculatum	autumn willow-herb
Epilobium watsonii	Watson's willow-herb
Ludwigia palustris var. pacifica	water-purslane
ARALIACEAE	
Hedera helix (I)	English ivy
APIACEAE	
Anthriscus scandicina (I)	bur chervil
Conium maculatum (I)	poison-hemlock
Daucus carota (I)	queen anne's lace
Eryngium petiolatum [1]	Oregon coyote-thistle
Heracleum lanatum	cow-parsnip
Lomatium bradshawii [1]	Bradshaw's lomatium
Lomatium nudicaule	barestem lomatium
Oenanthe sarmentosa	water parsely
Osmorhiza chilensis	sweet-cicely
Perideridia gairdneri	Gairdner's yampah
Perideridia oregana	Oregon yampah
Sanicula crassicaulis var. crassicaulis	western sanicle
ERICACEAE	
Arbutus menziesii	Pacific madrone

PRIMULACEAE	
Anagalis arvensis (I)	scarlet pimpernel
Centunculus minimus	chaffweed
Dodecatheon hendersonii	Henderson's shooting star
Dodecatheon pulchellum [2]	few-flowered shooting star
Trientalis latifolia	western starflower
AQUIFOLIACEAE	
Ilex aquifolium (I)	holly
OLEACEAE	
Fraxinus latifolia	Oregon ash
GENTIANACEAE	
Centaurium umbellatum (I)	common centaury
Centaurium muhlenbergii	Muhlenberg's centaury
Gentiana sceptrum [2]	staff gentian
Cicendia quadrangularis (Microcala q) [2]	timwort
APOCYNACEAE	
Apocynum cannibinum var. glaberrimum	common dogbane
CONVOLVULACEAE	
Convolvulus nyctagineus	night-blooming morning-glory
POLEMONIACEAE	
Microsteris gracilis var.	pink microsteris
Navarretia intertexta	needle-leaved navarretia
HYDROPHYLLACEAE	
Nemophila parvilfora	small-flowered nemophila
BORAGINACEAE	
Myosotis discolor (I)	yellow & blue forget-me-not
Myosotis laxa	small-flowered forget-me-not
Plagiobothrys figuratus	fragrant popcorn-flower

LAMIACEAE	
Lamium purpureum (I)	red henbit
Melissa officinalis (I)	lemon balm
Mentha piperita	peppermint
Mentha pulegium (I)	pennyroyal
Prunella vulgaris var. lanceolata	self-heal
Satureja douglasii	yerba buena
Stachys rigida	rigid hedge-nettle
SOLANACEAE	
Solanum dulcamara (I)	bittersweet
SCROPHULARIACEAE	
Gratiola ebracteata	bractless hedge-hyssop
Lindernia anagallidea	false pimpernel
Orthocarpus bracteosus	rosy owl-clover
Orthocarpus hispidus	hairy owl-clover
Parentucellia viscosa (I)	yellow parentucellia
Veronica americana	American speedwell
Veronica serpyllifolia var. (I)	thyme-leaved speedwell
Veronica scutellata	marsh speedwell
PLANTAGINACEAE	
Plantago lanceolata (I)	English plantain
Planatgo major (I)	common plantain
RUBIACEAE	
Galium aparine var. echinospermum	cleavers
Galium parisense var. leiocarpum (I)	wall bedstraw
Galium trifidum var. pacificum	small bedstraw
Galium triflorum	fragrant bedstraw
Sherardia arvensis (I)	blue field-madder
CAPRIFOLIACEAE	
Lonicera ciliosa	orange honeysuckle
Lonicera hispidula	hairy honeysuckle
Symphoricarpos albus var. laevigatus	common snowberry
Viburnum ellipticum	Oregon viburnum
VALERIANACEAE	
Plectritis congesta	rosy plectritis
Valerianella locusta (I)	European corn-salad

DIPSACACEAE	
Dipsacus sylvestris (I)	teasel
CUCURBITACEAE	
Marah oreganus	Oregon bigroot
CAMPANULACEAE	
Downingia elegans	common downingia
Heterocodon rariflorum	heterocodon
ASTERACEAE	
Achillea millefolium	common yarrow
Agoseris grandiflora	large-flowered agoseris
Anaphalis margaritacea	pearly everlasting
Aster hallii [1]	Hall's aster
Aster curtus	white-topped aster
Bellis perennis (I)	english daisy
Bidens frondosa	leafy beggar's-tick
Chrysanthemum leucanthemum (I)	oxeye daisy
Cirsium arvense (I)	Canada thistle
Cirsium vulgare (I)	bull thistle
Erigeron decumbens var. decumbens [1]	Willamette Daisy
Eriophyllum lanatum	woolly sunflower
Gnaphalium palustre	lowland cudweed
Grindelia integrifolia var. integrifolia	Willamette valley gumweed
Haplopappus racemosus var. racemosus [2]	racemed goldenweed
Hypochaeris radicata (I)	cat's-ear
Lasthenia glaberrima	smooth lasthenia
Leontodon nudicaulis (I)	hairy hawkbit
Madia elegans var.	showy tarweed
Madia glomerata	cluster tarweed
Madia sativa var. sativa	coast tarweed
Microseris laciniata	cut-leaved microseris
Senecio jacobaea (I)	tansy ragwort
Solidago canadensis var.	meadow goldenrod
Sonchus asper (I)	prickly sow-thistle
Taraxacum officinale (I)	dandelion
Wyethia angustifolia	narrow-leaf wyethia
ALISMATACEAE	
Alisma plantago-aquatica var. americana	broad-leaf water-plantain

POTAMOGETONACEAE	
Potamogeton crispus (I)	pondweed
JUNCACEAE	
Juncus acuminatus	tapered rush
Juncus bolanderi	Bolander's rush
Juncus bufonius	toad rush
Juncus effusus var. pacificus	soft rush
Juncus marginatus (I)	grass-leaved rush
Juncus "nevadensis"	Sierra rush
Juncus oxymeris	pointed rush
Juncus patens	spreading rush
Juncus tenuis var. tenuis	slender rush
Luzula campestris var. multiflora	field woodrush
CYPERACEAE	
Carex aurea [2]	golden fruit sedge
Carex densa	dense sedge
Carex deweyana	Dewey's sedge
Carex feta	green-sheath sedge
Carex lanuginosa	woolly sedge
Carex leporina	hare sedge
Carex obnupta	slough sedge
Carex tumulicola	foothill sedge
Carex unilateralis	one-sided sedge
Eleocharis acicularis	needle spikerush
Eleocharis ovata	ovoid spike-rush
Eleocharis palustris	creeping spikerush
POACEAE	
Agrostis exarata	spike bentgrass
Agrostis hallii	Hall's bentgrass
Agrostis tenuis (I)	colonial bentgrass
Aira caryophyllea (I)	silver hairgrass
Aira elegans (I)	elegant hairgrass
Alopecurus geniculatus	water foxtail
Alopecurus pratensis (I)	meadow foxtail
Anthoxanthum odoratum (I)	sweet vernalgrass
Arrhenatherum elatius (I)	tall oatgrass
Avena fatua (I)	wild oats
Briza minor (I)	little quaking-grass
Beckmannia syzigachne	slough grass
Bromus commutatus (I)	meadow brome

POACEAE (con't)	
Bromus rigidus (I)	ripgut brome
Cynosurus echinatus (I)	hedgehog dogtail
Cynosurus cristatus (I)	crested dogtail
Dactylis glomerata (I)	orchard-grass
Danthonia californica	California oatgrass
Deschampsia danthonioides	annual hairgrass
Deschampsia elongata	slender hairgrass
Deschampsia cespitosa	tufted hairgrass
Elymus glaucus	blue wildrye
Festuca arundinacea (I)	tall fescue
Festuca bromoides (I)	six-weeks fescue
Festuca pratensis (I)	meadow fescue
Festuca rubra	red fescue
Glyceria occidentalis	western mannagrass
Holcus lanatus (I)	velvet-grass
Holcus mollis (I)	creeping velvet-grass
Hordeum brachyantherum	meadow barley
Koeleria cristata	junegrass
Lolium perenne (I)	perennial ryegrass
Panicum capillare	common witchgrass
Panicum occidentale	western witchgrass
Phalaris aquatica (I)	Harding grass
Phalaris arundinacea (I)	reed canarygrass
Phleum pratense (I)	common timothy
Poa annua (I)	annual bluegrass
Poa compressa (I)	Canada bluegrass
Poa scabrella	pine bluegrass
Poa pratensis (I)	Kentucky bluegrass
Poa trivialis (I)	roughstalk bluegrass
SPARGANIACEAE	
Sparganium emersum var.	simple-stem bur-reed
TYPHACEAE	
Typha latifolia	common cat-tail
LILIACEAE	
Allium amplectens	slimleaf onion
Brodiaea congesta	cluster brodiaea
Brodiaea coronaria	harvest brodiaea
Brodiaea hyacinthina	hyacinth brodiaea
Calochortus tolmiei	Tolmie's mariposa lily

LILIACEAE (con't)	
Calochortus uniflorus [2]	Monterey mariposa lily
Camassia leichtlinii ssp. suksdorfii	tall camas
Camassia quamash ssp. maxima	common camas
Erythronium oregonum	Oregon fawn lily
Fritilaria lanceolata	chocolate lily
Trillium albidum	sessile trillium
Veratrum californicum var. caudatum	tailed false-hellebore
Zigadenus venenosus var. venenosus	death camas
IRIDACEAE	
Iris tenax	Oregon iris
Sisyrinchium hitchcockii	Hitchcock's blue-eyed grass
Sisyrinchium idahoense	Idaho blue-eged grass
ORCHIDACEAE	
Habenaria elegans	rein-orchid
Spiranthes romanzoffiana var.	ladies' tresses

The flora includes a total of 302 species in 64 families, of which 101 species (33%) are introduced.

NOTES:
(I) - Introduced, non-native species
1 - endemic or near-endemic to the Willamette Valley
2 - rare in the Willamette Valley, though more common elsewhere

APPENDIX E

VERTEBRATE SPECIES KNOWN OR SUSPECTED TO OCCUR AT WILLOW CREEK

Introduction

The following species list for Willow Creek was derived primarily from a draft publication titled Vegetation And Wildlife species By Habitat Type, April 1990, prepared by the Lane Council of Governments; the habitat/vegetative types from this publication are defined on the following pages, and only those which most closely met the conditions of the existing wildlife habitats at Willow Creek (described in this Draft EA/Management Plan under 3.2 AFFECTED ENVIRONMENT, 3.2.1 Fish and Wildlife Habitat Resources) were used.

Other sources of information for the species list include wildlife observations recorded during the Habitat Evaluation field analysis, and bird lists compiled by local birders familiar with the site. This list is meant to be tentative, and as information on species occurrence, season of use, etc. is obtained from future fish and wildlife surveys, it will need to be modified.

HABITAT TYPES

	HABITAT TYPE	VEGETATIVE TYPE(S)	CODE(S)
I.	Open Water*	Lakes and Reservoirs	24
II.	Wet Meadows/*	Wet Meadows*	33
	Wetland Shrub*	Wetland Shrub*	99
III.	Freshwater	Inland Marsh	21
IV.	Riparian Vegetation*	Riparian*	37
V.	Deciduous Woodland*	Oak*	72
		Deciduous Hardwood	73
VI.	Mixed Coniferous/	Douglas Fir-Hardwood	66a
	Deciduous Woodlands	Douglas Fir-Pine-Hardwood	66b
		Ponderosa Pine-Hardwood	67
VII.	Coniferous Forest*	Douglas Fir*	62
		Douglas Fir-Pine	66
		Incense Cedar	72
VIII.	Fields*	Grasslands*	40
IX.	Dryland Shrub	Dryland Shrub	98
X.	Barren	Barren (Rocky)	80
XI.	Developed/Cultural*	Agricultural*	97
		Cultural Association	100
		Urban (Developed)	101

*Habitat/vegetative types used for the Willow Creek species list.

DEFINITIONS OF VEGETATION HABITAT TYPES

21. **Inland Marsh**
This type is defined as a shallow water area around. Usually the marsh is shallow enough to be vegetated throughout or has patches of open water. Tules and cat-tails are common indicator plants of this type. Areas- near Fern Ridge Reservoir are good example ' s of the inland marsh type. This type contains some of the most important waterfowl and water bird nesting and wintering habitats within the metropolitan area. This is a critical environment because of the limited acreage of this type in Oregon.

24. **Lakes and Reservoirs**
All open, fresh water areas are included in this type. For purposes of the Eugene-Springfield inventory, this type was defined to include ponds, rivers, canals, sloughs, and any other body of water one acre or larger in area. The borders of this type are sometimes vegetated with water tolerant forbs, shrubs, and trees. The value to wildlife of these areas varies with the kind and location of the body of water. Most waterbodies offer resting and limited feeding for waterfowl and water birds. This type provides valuable habitat for fish, amphibians, some mammals, and some reptiles.

33. **Wet Meadows**
This type contains small damp areas, generally with many small springs or bisected by slow-moving streams. Common indicator plants are sedges, monkey flower, skunk cabbage, and similar species. This type contains valuable late summer and fall forage for big game mammals. Wet meadows are usually important watering areas for those same big game mammals. Various species of birds, reptiles, and amphibians also utilize this vegetative type.

37. **Riparian Vegetation**
This type occurs most frequently along streams, rivers, and slough banks. Vegetation usually occurs in a dense narrow band near the shoreline. Species of plants identifying this type are those dependent upon the water, such as willow, cottonwood, and alder. This is an important wildlife habitat type. The riparian vegetation is a concentration point for a great variety of game and non-game species, providing food, cover, and resting opportunities. This vegetation renders the more open grassland, forested, and agricultural areas suitable as wildlife feeding areas by providing necessary cover.

40. **Annual and Perennial Grasslands**
In Western Oregon, this type occurs in small units. Many species of native and domestic plants may be found in this type. In the Cascades and Coast Range, this type occurs on shallow ponds. Bracken fern is a common plant in these areas. This type is an important type for foraging mammals. Many birds and small mammals also rely on this habitat type.

62. **Douglas Fir - Old Growth** (100 years or older)
This type consists of forests of predominately Douglas Fir. Other associated species occurring in lesser quantities are Grand Fir, Oregon Big-leaf Maple, and Oregon White Oak. The forest will have large, tall trees in a solid stand.

62a. **Douglas Fir - Mid Age Stand** (30-100 years old)
Second growth forest of predominately Douglas fir. Other species of trees may exist but in small quantities. The forest will have medium-size trees in a solid but sparser looking stand than old growth.

62b. **Douglas Fir - Young Age Stand** (5-30 years old)
Second growth forest of predominately Douglas fir. Other species of trees may exist but in small quantities. The forest will have small-size trees in sparse but continuous stands.

62c. **Douglas Fir - Reforested Stand** (0-5 years old)
This type is either a recently cut-over or reforested stand. May have brush species existing but on-site investigation will show recently planted trees with the brush.

66. **Douglas Fir - Ponderosa Pine**
Drier sites of Douglas Fir with a scattering of ponderosa pine. The pine should be 25 percent or greater in the stand to be classified as this vegetation type.

66a. **Douglas Fir - Oak**
A mix of Douglas Fir and Oregon White Oak where neither is occurring less than 25 percent within the stand.

72. **Oak**
A pure stand of Oregon White Oak with no other associated species occurring greater than 25 percent.

73. **Deciduous Hardwood**
The hardwood forest type consists of such plants as maple, cottonwood, ash, and some oak. This type may contain scattered clumps of Douglas fir or pine. This vegetation type supports a broad range of mammal, bird, and reptile species.

80. **Barren**
This type consists of bare rocky areas (cliffs and talus rock areas). For this inventory, this type was defined to include natural gravel deposits.

97. **Agricultural Lands**
This type consists of irrigated and non-irrigated forage and croplands. This type does not include rangelands. This type is important habitat for upland gamebirds, waterfowl, and smaller non-game species of birds and mammals.

98. **Dryland Shrub**
This type is often found as understory. This type can however, tolerate full sun exposure and does exist as a unit classification in areas of minimum soil depth with no tree capability. Usually found on the fringe areas of meadows and woods, this type is present in the first stages of succession after-logging or clearing Activities. This type consists of snowberry, poison oak, Oregon grape, Douglas Hawthorn, Indian Plum and blackberry.

99. **Wetland Shrub**
This type is found mostly on north and east facing slopes. The types species, vine maple, and western swordfern, are dependent upon the presence of moisture, cooling, and partial shade.

100. **Cultural Association**
Here human influence has altered the natural landscape. Introduced vegetation-is dominant. Lawns, ornamental trees, fruit trees, flowers, and gardens are present.

101. **Urban**
In this environment, little vegetation exists. Pavement, concrete, and buildings dominate.

KEY

The key below explains the symbols used in the vegetation and wildlife species lists:

Use Season
Sp = Spring (March, April, May)
S = Summer (June, July, August)
F = Fall (September, October, November)
W = Winter (December, January, February)

Population Level

C = Common	Very numerous; species which are certain to be observed by an experienced wildlife expert
U = Uncommon	Species present but not certain to be observed
0 = Occasional	Observed only a few times during a season or may be irregular in its occurrence
R = Rare	Not present or observed every year
X = Accidental	Out of normal range; may have been recorded in the area one or few times
Status*	
E = Endangered Species	Those species in danger of becoming extinct within the foreseeable future throughout all or a significant portion of their range.
T = Threatened Species	Those species which are likely to become endangered
C2 = USFWS Candidates	Those species which require additional information to be proposed as threatened or endangered.
SS =	Those species on the state of Oregon sensitive species list but not having any other legal status.
U =	Those species endangered or threatened in Oregon but more common or stable elsewhere.
W = Watch List	Those species which are currently stable but which may become threatened in the foreseeable future. These species currently do not need active management attention. However, they may need some type of continued monitoring.

Other Symbols

( ) = Scientific name of species

* = Source of species status, Oregon Natural Heritage Database, 1989

I. OPEN WATER
(lakes, reservoirs, rivers, streams, and ponds)

FISH

Status	Name	Population Level
	Pacific brook lamprey (Lampetra pacifica)	C
	Pacific lamprey (Lampetra tridentata)	C
	White sturgeon (Acipenser transmontanus)1	U
	American shad (Alosa sapidissima)1	O
	Coho salmon (Oncorhynchus kisutch)	U
	Spring chinook salmon (Oncorhynchus tshawytscha)1	C
	Fall chinook salmon (Oncorhynchus tshawytscha)1,2	U to C
	Cutthroat trout (Salmo clarki)1	C
	Rainbow trout (Salmo gairdneri)1	C
	Summer steelhead (Salmo gairdneri)1	C
	Winter steelhead (Salmo gairdneri)1	C
	Dolly varden (Salvelinus malma)1	O
	Chiselmouth (Acrocheilus alutaceus)	C
	Carp (Cyprinus carpio)2	C
C2	Oregon chub (Hybopsis crameri)	O
	Peamouth (Mylocheilus caurinus)	U
	Northern squawfish (Ptychocheilus oregonensis)	C
	Redside shiner (Richardsonius balteatus)	C
	Largescale sucker (Catostomus macrocheilus)	C
	Mountain sucker (Pantosteus platyrhynchus)	U
	Brown bullhead (Ictalurus nebulosus)1,2	U
	Channel catfish (Ictalurus punctatus)1	O
	Mosquitofish (Gambusia affinis)	O to U
	Sand roller (Percopsis transmontana)	O
	Warmouth (Lepomis gulosus)1,2	U
	Blackside dace (Rhinichthys osculus)	C
	Longnose dace (Rhinichthys cataractae)	C
	Leopard dace (Rhinichthys falcatus)	C
	Pumpkinseed (Lepomis gibbosus)	U
	Stickleback (Gasterosteus aculeatus)	U
	Mountain whitefish (Prosopium williamsoni)	C
	Bluegill (Lepomis macrochirus)1,2	C
	Smallmouth bass (Micropterus dopmieui)1	U
	Largemouth bass (Micropterus salmoides)1	C
	White crappie (Pomoxis annularis)1	C
	Black crappie (Pomoxis nigromaculatus)1	C
	Yellow perch (Perca flavescens)1	C
	Reticulate sculpin (Cottus perplexus)	C
	Prickly sculpin (Cottus asper)	C
	Piute sculpin (Cottus beldingi)	C

1. Species defined as "game fish" in Oregon Game Code

MAMMALS

Status	Name	Population Level	Use Season
	Nutria (Myocastor coypus)	O	Sp,S,F,W
	Mink (Mustela vison)	O	Sp,S,F,W
	Vagrant Shrew (Sorex vagrans)	O	
	Racoon (Procyon lotor)	O	Sp,S,F,W
	River Otter (Lutra canadensis)	O	Sp,S,F,W
	Beaver (Castor canadensis)	O	Sp,S,F,W
	Muskrat (Ondatra zibethica)	O	Sp,S,F,W
	Little Brown Myotis (Myotis lucifugus)	O	
	California Myotis (Myotis californicus)	O	

BIRDS

	Red-throated Loon (Gavia stellata)	R	W
	Pacific Loon (Gavia pacifica)	R	W
	Common Loon (Gavia immer)	O	Sp,F,W
	Pied-billed Grebe (Podilymbus podiceps)	C	Sp,S,F,W
	Horned Grebe (Podiceps auritus)	R	Sp,F,W
	Eared Grebe (Podiceps nigricollis)	R	Sp,F,W
	Western Grebe (Aechmophorus occidentalis)	R	Sp,S,F,W
	Leach's Storm-Petrel (Oceanodroma leucorhoa)	X	F
	American American White Pelican (Pelecanus erythororhynchos)	R	Sp,F
	Double-crested Cormorant (Phalacrocorax auritus)	R	Sp,F,W
	Great Blue Heron (Ardea herodias)	C	Sp,F,W
	Great Egret (Casmerodius albus)	O	Sp,F,W
	Snowy Egret (Egretta thula)		
	Tundra Swan (Cygnus columbianus)	U	Sp,F,W
	Green-backed Heron (Butorides striatus)	U	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Trumpeter Swan (Cygnus buccinator)	R	Sp,W
	Greater White-fronted Goose (Anser albifrons)	U	Sp,F,W
	Snow Goose (Chen caerulescens)	R	Sp,F,W
	Canada Goose (Branta canadensis)	C	Sp,S,F,W
	Wood Duck (Aix sponsa)	U	Sp,S,F,W
	Green-winged Teal (Anas crecca)	C	Sp,F,W
	Mallard (Anas platyrhynchos)	C	Sp,S,F,W
	Northern Pintail (Anas acuta)	C	Sp,F,W
	Blue-winged Teal (Anas discors)	U	Sp,S
	Cinnamon Teal (Anas cyanoptera)	C	Sp,S,F,W
	Northern Shoveler (Anas clypeata)	C	Sp,F,W
	Gadwall (Anas strepera)	O	Sp,F,W
	Eurasian Wigeon (Anas penelope)	O	F,W
	American Wigeon (Anas americana)	C	Sp,F,W
	Canvasback (Aythya valisineria)	U	Sp,F,W
	Redhead (Aythya americana)	U	Sp,F,W
	Ring-necked Duck (Aythya collaris)	O	Sp,F,W
	Greater Scaup (Aythya marila)	O	F,W
	Lesser Scaup (Aythya affinis)	U	Sp,F,W
	Common Goldeneye (Bucephala clangula)	O	W
	Surf Scoter (Melanitta perspicillata)		
	Bufflehead (Bucephala albeola)	U	Sp,F,W
	Hooded Merganser (Lophodytes cucullatus)	U	Sp,F,W
	Common Merganser (Mergus merganser)	U	Sp,S,F,W
	Ruddy Duck (Oxyura jamaicensis)	U	Sp,F,W
	Osprey (Pandion haliaetus)	U	Sp,S
	Bald Eagle (Haliaeetus leucocephalus)	O	W
	American Coot (Fulica americana)	C	Sp,S,F,W
	Wilson's Phalarope (Steganopus tricolor)	O	Sp,S,F
	Red-necked Phalarope (Phalaropus lobatus)		
	Red Phalarope (Phalaropus fulicarius)		
	Parasitic Jaeger (Stercoraius parasiticus)	X	F
	Long-Tailed Jaeger (Stercorarius longicandus)	X	F
	Glaucous-Winged Gull (Larus glaucescens)	C	F,W
	Bonaparte's Gull (Larus philadelphia)	U	F,W
	Mew Gull (Larus canus)	O	W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Ring-Billed Gull (Larus delawarensis)	C	Sp,S,F,W
	California Gull (Larus californicus)	U	F,W
	Herring Gull (Larus argentatus)	U	F,W
	Thayer's Gull (Larus thayeri)	U	W
	Western Gull (Larus occidentalis)	O	W
	Sabine's Gull (Xema sabini)	X	
	Caspian Tern (Sterna caspia)	O	
	Common Tern (Sterna hirundo)	U	F
	Forster's Tern (Sterna forsteri)	U	S,F
	Black Tern (Childonias niger)	U	S
	Common Nighthawk (Chordeiles minor)	U	Sp,S,F
	Vaux's Swift (Chaetura vauxi)	U	SP,S,F
	Belted Kingfisher (Ceryle alcyon)	U	Sp,S,F,W
	Tree Swallow (Iridoprocne bicolor)	C	Sp,S,F
	Violet-green Swallow (Tachycineta thalassina)	C	Sp,S,F
	Northern Rough-winged Swallow (Stelgidopteryx ruticollis)	O	Sp,S,F
	Bank Swallow (Riparian riparia)	O	Sp,S,F
	Cliff Swallow (Petrochelidon pyrrhonota)	C	Sp,S,F
	Barn Swallow (Hirundo rustica)	C	Sp,S,F
	Purple Martin (Progne subis)	O	Sp,S,F
	American Dipper (Cinclus mexicanus)	O	F,W
	AMPHIBIANS AND REPTILES		
	Common Garter Snake (Thamnophis sirtalis)	O	Sp,S,F
	Gopher Snake (Pituophis melanoleucus)	U	Sp,S,F
	Bullfrog (Rana catesbeiana)	C	Sp,S,F,W
SS	Oregon Red-Legged Frog (Rana aurora)	U	Sp,S,F,W
	California Yellow-Legged Frog (Rana boylei)	O	Sp,S,F,W
	Pacific Tree Frog (Hyla regilla)	C	Sp
	Tailed Frog (Ascaphus truei)	U	Sp,S,F,W
	Rough-Skinned Newt (Taricha granulosa)	C	Sp,S,F,W
	Northwestern Salamander (Ambystoma gracile)	C	Sp,S,F,W
	Long-Toed Salamander (Ambystoma macrodactylum)	U	SP,S,F,W

AMPHIBIANS AND REPTILES (Cont'd)

Status	Name	Population Level	Use Season
	*Pacific Giant Salamander (Dicamptodon ensatus)	U	SP,S
	Northwestern Pond Turtle (Clemmys marmorata marmorata)	O	Sp,S,F,W

*McKenzie River Only

II. WET MEADOWS AND WETLAND SHRUB

MAMMALS

Status	Name	Population Level	Use Season
	Blacktailed Deer (*Odocoileus hemionus columbianus*)	C	Sp,S,F,W
	Beaver (*Castor canadensis*)	C	Sp,S,F,W
	Coyote (*Canis latrans*)	U	Sp,S,F,W
	Black Bear (*Ursus americanus*)	U	Sp,S,F
	Bobcat (*Lynx rufus*)	U	Sp,S,F,W
	Townsend Chipmunk (*Eutamias townsendi*)	O	Sp,S,F,W
	Chickaree (Red squirrel) (*Tamiasciurus douglasi*)		
	Dusky-Footed Woodrat (*Neotoma fuscipes*)	O	
	Roosevelt Elk (*Cervus canadensis*)	U	Sp,S,F,W
	Racoon (*Procyon lotor*)	C	Sp,S,F
	Mink (*Mustela vison*)	O	Sp,S,F,W
	Muskrat (*Ondatra zibethica*)	O	
	Nutria (*Myocastro copyus*)	O	
	Mountain Lion (*Felis concolor*)	O	Sp,S,F
	Red Fox (*Vulpes fulva*)	U	Sp,S,F,W
	Short-Tailed Weasel (*Mustela erminea*)	O	Sp,S,F,W
	Long-Tailed Weasel (*Mustela frenata*)	U	Sp,S,F,W
	Vagrant Shrew (*Sorex vagrans*)	O	
	Dusky Shrew (*Sorex obscurus*)	O	
	Pacific Shrew (*Sorex pacificus*)	O	
	Pacific Water Shrew (*Sorex bendirei*)	O	
	Townsend Mole (*Scapanus townsendii*)	O	
	Little Brown Myotis (*Myotis lucifugus*)	O	
	California Myotis (*Myotis californicus*)	O	
	California Ground Squirrel (*Spermophilus beechei*)	U	
	Giant Pocket Gopher (*Thomomys bulbivorous*)	O	
	Mazama Pocket Gopher (*Thomomys mazama*)	O	
	Western Redback Vole (*Clethrionomys occidentalis*)	O	
	Townsend Vole (*Microtus townsendi*)	O	
	Gray-Tailed Vole (*Microtus canicaudus*)	O	
	Oregon Vole (*Microtus oregoni*)	O	
	Longtailed Vole (*Microtus longicandus*)	O	

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Sandhill Crane (Grus canadensis)	O	Sp,F,W
	Black-bellied Plover (Squatarola squatarola)	U	Sp,F,W
	American Coot (Fulica americana)	C	Sp,S,F,W
	Lesser Golden Plover (Pluvialis dominica)	O	F
	Semipalmated Plover (Charadrius semipalmatus)	O	Sp,F,W
	Killdeer (Charadrius vociferus)	C	Sp,S,F,W
	American Avocet (Recurvirostra americana)	R	Sp,F
	Greater Yellowlegs (Totanus melanoleucus)	U	Sp,F,W
	Lesser Yellowlegs (Totanus flavipes)	O	SP,F
	Spotted Sandpiper (Actitis macularia)	C	Sp,S,F,W
	Semipalmated Sandpiper (Ereunetes pusillus)	O	F
	Western Sandpiper (Erennetes mauri)	U	Sp,F,W
	Least Sandpiper (Erolia minutilla)	C	Sp,F,W
	Baird's Sandpiper (Erolia bairdii)	O	F
	Pectoral Sandpiper (Erolia melanotos)	O	F
	Dunlin (Erolia alpina)	C	SP,F,W
	Stilt Sandpiper (Micropalama himantopus)	O	F
	Sanderling (Crocethia alba)	O	Sp,F
	Short-Billed Dowitcher (Limnodromus griseus)	O	F
	Long-Billed Dowitcher (Limnodromus scolopaceus)	C	Sp,F,W
	Common Snipe (Copelli gallinago)	C	Sp,S,F,W
	Parasitic Jaeger (Stercocarius parasiticus)	X	F
	Long-Tailed Jaeger (Stercorarius longicaudus)	X	F
	Bonaparte's Gull (Larus philadelphia)	U	F,W
	Mew Gull (Larus canus)	O	W
	Ring-Billed Gull (Larus delawarensis)	C	Sp,S,F,W
	California Gull (Larus californicus)	U	F,W
	Herring Gull (Larus argentatus)	U	F,W
	Thayer's Gull (Larus thayeri)	U	W
	Western Gull (Larus occidentalis)	O	W

MAMMALS (Cont'd)

Status	Name	Population Level	Use Season
	Pacific Jumping Mouse (Zapus trinotatus)	O	
	Common Opossum (Didelphis marsupialis)	O	
	Striped Skunk (Mephitis mephitis)	O	
	Brush Rabbit (Sylvilagus bachmani)	O	
	Eastern Cottontail Rabbit (Sylvilagus floridanus)		
	Spotted Skunk (Spilogale putorius)	O	
	Gray Fox (Urocyon cinereo argenteus)	O	
	Blacktailed Jackrabbit (Lepus californicus)		
	Northern Flying Squirrel (Glaucomys sabrinus)	C	
	BIRDS		
	Pied-Billed Grebe (Podilymbus podiceps)		
	American White Pelican (Pelecanus erythrorhynchos)	R	Sp,F
	Double-Crested Cormorant (Phalacrocorax auritus)	R	Sp,F,W
	Snowy Egret (Egretta thula)		
	Great Egret (Casmerodius albus)	O	Sp,F,W
	Great Blue Heron (Ardea herodias)	C	Sp,S,F,W
	Green-backed Heron (Butorides virescens)	U	Sp,S,F,W
	Tundra Swan (Cygnus columbianus)	U	Sp,F,W
	Greater White-fronted Goose (Anser albifrons)	U	Sp,F,W
	Snow Goose (Chen caerulescens)	R	Sp,F,W
	Canada Goose (Branta canadensis)	C	Sp,S,F,W
	Green-Winged Teal (Anas crecca)	C	Sp,,F,W
	Mallard (Anas platyrhynchos)	C	Sp,S,F,W
	Northern Pintail (Anas acuta)	C	Sp,F,W
	Blue-Winged Teal (Anas discors)	U	Sp,S
	Cinnamon Teal (Anas cyanoptera)	U	Sp,S,F,W
	Gadwall (Anas strepera)	O	Sp,F,W
	Northern Shoveler (Anas clypeata)	C	Sp,F,W
	Eurasian Wigeon (Aras penelope)	O	F,W
	American Wigeon (Aras americana)	C	Sp,F,W
T	Bald Eagle (Haliaeetus leucocephalus)	O	W
	Ring-Necked Pheasant (Phasianus Colchicus)	C	Sp,S,F,W
	Northern Harrier (Circus Cyaneus)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Glaucous-winged Gull (Larus glaucescens)	C	F,W
	Sabine's Gull (Xema sabini)	X	F
	Caspian Tern (Sterna caspia)	O	S
	Common Tern (Sterna hirundo)	U	F
	Forster's Tern (Sterna forsteri)	U	S,F
	Black Tern (Chlidonias niger)	U	S
	Common Nighthawk (Chordeiles minor)	U	Sp,S,F
	Vaux's Swift (Chaetura vauxi)	U	Sp,S,F
	Tree Swallow (Iridoprocne bicolor)	C	Sp,S,F
	Violet-Green Swallow (Lachycineta thalassina)	C	Sp,S,F
	Northern Rough-winged Swallow (Stelgidopteryx riticollis)	U	Sp,S,F
	Bank Swallow (Riparia riparia)	O	Sp,F
	Cliff Swallow (Petrochelidon pyrrhonota)	C	Sp,S,F
	Barn Swallow (Hirundo rustica)	C	Sp,S,F
	Purple Martin (Progne subis)	O	Sp,S,F
	American Crow (Corvus brachyrhynchos)	C	Sp,S,F,W
	American Dipper (Cincus mexicanus)	O	F,W
	Water Pipit (Anthus spinoletta)	U	Sp,F,W
	European Starling (Sturnus vulgaris)	C	Sp,S,F,W
	Brewer's Blackbird (Euphagus cyanocephalus)	C	Sp,S,F,W
	AMPHIBIANS AND REPTILES		
	Common Garter Snake (Thamnophis sirtalis)	C	Sp,S,F
	Northwest Garter Snake (Thamnophis ordinoides)	C	Sp,S,F
	Northern Alligator Lizard (Gerrhonotus coeruleus)	O	Sp,S F,R
	Rough-Skinned Newt (Taricha granulosa)	C	Sp,S,F,W
	Long-Toed Salamander (Ambystoma macrodactylum)	U	Sp,S,F,W
	West Red-Backed Salamander (Plethodon vehiculum)	O	Sp,S,F,W
	Northwest Salamander (Ambystoma gracile)	C	Sp,S,F,W
	Bullfrog (Rana catesbeiana)	C	Sp,S,F,W
	Pacific Tree Frog (Hyla regilla)	C	Sp,S
	Pacific Pond Turtle (Clemmys marmorata)	U	Sp,S,F,W

MAMMALS

Status	Name	Population Level	Use Season
	Beaver (Castor canadensis)	C	Sp,S,F,W
	Mountain Beaver (Aplodontia rufa)	O	Sp,S,F,W
	Racoon (Procyon lotor)	U	Sp,S,F,W
	Eastern Cottontail (Sylvilagus floridanus)	O	Sp,S,F,W
	Nutria (Myocastro copyus)	U	Sp,S,F,W
	Black-Tailed Deer (Odocoileus hemionus columbianus)	C	Sp,S,F,W
	California Ground Squirrel (Spermophilus beechei)	O	Sp,S,F,W
	Muskrat (Ondatra zibethica)	O	Sp,S,F,W
	River Otter (Lutra canadensis)	O	Sp,S,F,W
	Coyote (Canis latrans)	O	Sp,S,F,W
	Red Fox (Vulpes fulva)	U	Sp,S,F,W
	Spotted Skunk (Spilogale putorius)	O	Sp,S,F,W
	Common Opossum (Didelphis marsupialis)	O	Sp,S,F,W
	Trowbridge Shrew (Sorex trowbridgei)	O	
	Vagrant Shrew (Sorex vagrans)	O	
	Dusky Shrew (Sorex obscurus)	O	
	Pacific Water Shrew (Sorex bendirei)	O	
	Shrew Mole (Neurotrichus gibbsi)	U	
	Townsend Mole (Scapanus townsendii)	U	
	Bushytail Woodrat (Neotoma cinerea)	O	
	Longtail Weasel (Mustela frenata)	U	Sp,S,F,W
	Shorttail Weasel (Mustela erminea)	O	Sp,S,F,W
	Mink (Mustela vison)	O	Sp,S,F,W
	Striped Skunk (Mephitis mephitis)	U	Sp,S,F,W
	Gray Fox (Urocyon cinereo argenteus)	O	Sp,S,F,W
	Mountain Lion (Felis concolor)	O	Sp,W
	Bobcat (Lynx rufus)	U	Sp,S,F,W
	Black Bear (Ursus americanus)	O	Sp,S,F
	Pacific Jumping Mouse (Zapus trinotatus)	O	
	Porcupine (Erethizon dorsatum)	O	Sp,S,F,W
	Snowshoe Hare (Lepus americanus)	O	Sp,W
	Brush Rabbit (Sylvilagus bachmani)	C	Sp,S,F,W
	Roosevelt Elk (Cervus canadensis)	O	Sp,F,W
	Little Brown Myotis (Myotis lucifugus)	O	
	Long-Eared Myotis (Myotis evotis)	O	
	California Myotis (Myotis californicus)	O	
	Big Brown Bat (Eptesicus fuscus)	O	

MAMMALS (Cont'd)

Status	Name	Population Level	Use Season
	Hoary Bat (Lasiurus cinereus))	O	
	Dusky-Footed Woodrat (Neotoma fuscipes)	O	Sp,S,F,W
	Western Redback Vole (Clethrionomys occidentalis)	O	
	Oregon Vole (Mirotus oregoni)	O	
	Long-Tailed Vole (Microtus longicaudus)	O	
	Black-Tailed Jackrabbit (Lepus californicus)	O	Sp,S,F,W
	Western Gray Squirrel (Sciurus griseus)	O	Sp,S,F,W
	Townsend Chipmunk (Eutamias townsendi)	O	Sp,S,F,W
	Northern Flying Squirrel (Glaucomys sabrinus)	O	Sp,S,F,W
	BIRDS		
	Great Blue Heron (Ardea herodias)	C	Sp,S,F,W
	Green-backed Heron (Butorides virescens)	U	Sp,S,F,W
	Wood Duck (Aix sponsa)	U	Sp,S,F,W
	Turkey Vulture (Cathartes aura)	C	Sp,S,F,W
T	Bald Eagle (Haliaeetus leucocephalus)	O	W
	Sharp-Skinned Hawk (Accipiter striatus)	U	Sp,S,F,W
	Cooper's Hawk (Accipiter cooperii)	U	Sp,S,F,W
	Northern Goshawk (Accipiter gentilis)	R	W
	Red-Shouldered Hawk (Buteo lineatus)	X	Sp
	Swainson's Hawk (Buteo swainsoni)	R	W
	Red-Tailed Hawk (Buteo Jamaicensis)	C	Sp,S,F,W
	Ferruginous Hawk (Buteo regalis)	O	W
	Rough-Legged Hawk (Buteo lagopus)	U	F,W
	American Kestrel (Falco sparverius)	C	SP,S,F,W
	Merlin (Falco columbarius)	R	Sp,F,W
	Ring-Necked Pheasant (Phasiannus colchicus)	C	Sp,S,F,W
	Ruffed Grouse (Bonasa umbellus)	U	Sp,S,F,W
	California Quail (Lophortyx californicus)	C	Sp,S,F,W
	Mourning Dove (Zenaidura macroura)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Western Screech Owl (Otus kennicottii)	U	Sp,S,F,W
	Great Horned Owl (Bubo virginianus)	U	Sp,S,F,W
	Northern Pygmy Owl (Glaucidium gnoma)	U	Sp,S,F,W
	Long-Eared Owl (Asio otus)	R	Sp
	Common Nighthawk (Chordeiles minor)	U	Sp,S,F
	Vaux's Swift (Chaetura vauxi)	U	Sp,S,F,W
	Belted Kingfisher (Ceryle alcyon)	U	Sp,S,F,W
	Red-naped Sapsucker (Sphyrapicus nuchalis)	U	Sp,S,F,W
	Red-breasted Sapsucker (Sphyrapicus ruber)	U	Sp,S,F,W
	Downy Woodpecker (Dendrocopos pubescens)	U	Sp,S,F,W
	Hairy Woodpecker (Dendrocopos villosus)	U	Sp,S,F,W
	Northern Flicker (Colaptes auratus)	C	Sp,S,F,W
	Pileated Woodpecker (Dryocopus pileatus)	U	Sp,S,F,W
	Willow Flycatcher (Empidonax traillii)	U	Sp,S
	Hammond's Flycatcher (Empidonax hammondii)	O	Sp,S
	Dusky Flycatcher (Empidonax oberholseri)	O	Sp,S
	Western Flycatcher (Empidonax difficilis)	U	Sp,S
	Ash Throated Flycatcher (Myiarchus cinerascens)	C	Sp,S,F
	Western Wood Pewee (Contopus sordidulus)	C	Sp,S,F
	Purple Martin (Progne subis)	O	Sp,S,F,W
	Tree Swallow (Iridoprocne bicolor)	C	Sp,S,F
	Violet-Green Swallow (Tachycineta thalassina)	C	Sp,S,F
	Northern Rough-winged Swallow (Stelgidopteryx riticollis)	U	Sp,S,F
	Cliff Swallow (Petrochelidon pyrrhonota)	C	Sp,S,F
	Barn Swallow (Hirundo rustica)	C	Sp,S,F
	Scrub Jay (Aphelocoma coerulescens)	C	Sp,S,F,W
	Black-Billed Magpie (Pica pica)	O	W
	American Crow (Corvus brachyrhynchos)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Common Raven (Corvus corax)		
	Black-Capped Chickadee (Parus atricapillus)	C	Sp,S,F,W
	Chestnut-Backed Chickadee (Parus rufescens)	C	Sp,S,F,W
	Bushtit (Psaltriparus minimus)	C	Sp,S,F,W
	White-Breasted Nuthatch (Sitta carolinensis)	C	Sp,S,F,W
	Brown Creeper (Certhia familiaris)	C	Sp,S,F,W
	American Dipper (Cinclus mexicanus)	O	F,W
	Bewick's Wren (Thryomanes bewickii)	C	Sp,S,F,W
	House Wren (Troglodytes aedon)	C	Sp,S,F
	Winter Wren (Troglodytes troglodytes)	C	Sp,S,F,W
	Golden-Crowned Kinglet (Regulus satrapa)	C	Sp,S,F,W
	Ruby-Crowned Kinglet (Regulus calendula)	C	Sp,F,W
	Western Bluebird (Sialia mexicana)	U	Sp,S,F,W
	Townsend's Solitaire (Myadestes townsendi)	O	Sp,W
	Swainson's Thrush (Hylocichla ustulata)	U	Sp,S,F
	Hermit Thrush (Hylocichla guttata)	U	Sp,S,F,W
	American Robin (Turdus migratorius)	C	Sp,S,F,W
	Varied Thrush (Ixoreus naevius)	C	Sp,F,W
	Bohemian Waxwing (Bombycilla garrulus)	O	W
	Cedar Waxwing (Bombycilla cedrorum)	C	Sp,S,F,W
	Northern Shrike (Lanius excubitor)	U	Sp,F,W
	European Starling (Sturnus vulgaris)	C	Sp,S,F,W
	Solitary Vireo (Vireo solitarius)	U	Sp,S,F
	Hutton's Vireo (Vireo huttoni)	U	Sp,S,F,W
	Warbling Vireo (Vireo gilvus)	U	Sp,S,F
	Red-Eyed Vireo (Vireo olivaceus)	O	Sp,S
	Orange-Crowned Warbler (Vermivora celata)	U	Sp,S,F,W
	Nashville Warbler (Vermivora ruticapilla)	U	Sp,S,F
	Yellow Warbler (Dendroica petechia)	U	Sp,S,F
	Yellow-Rumped Warbler (Dendrocia coronata)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Black-Throated Gray Warbler (Dendrocia nigrescens)	U	Sp,S,F
	Townsend's Warbler (Dendroica townsendi)	U	Sp,S,F,W
	Hermit Warbler (Dendroica occidentalis)	U	Sp,S,F
	MacGillivray's Warbler (Oporornis tolmiei)	U	Sp,S,F,W
	Common Yellow Throat (Geothlypis trichas)	U	Sp,S,F,W
	Wilson's Warbler (Wilsonia pusilla)	C	Sp,S,F
	Yellow-Breasted Chat (Icteria virens)	U	Sp,S,F
	Western Tanager (Piranga ludoviciana)	U	Sp,S,F
	Black-headed Grosbeak (Pheucticus melanocephalus)	U	Sp,S,F
	Lazuli Bunting (Passerina amoena)	U	Sp,S,F
	Rufous-Sided Towhee (Pipilo erythrophthalmus)	C	Sp,S,F,W
	Chipping Sparrow (Spizella passerina)	U	Sp,S,F,W
	Fox Sparrow (Passerella iliaca)	U	Sp,F,W
	Song Sparrow (Melospiza melodia)	C	Sp,S,F,W
	Lincoln's Sparrow (Melospiza lincolnii)	U	Sp,F,W
	White-Throated Sparrow (Zonotrichia albicollis)	O	W
	Golden-Crowned Sparrow (Zonotrichia atricapilla)	C	Sp,F,W
	White-Crowned Sparrow (Zonotrichia leucophrys)	C	Sp,F,W
	Harris' Sparrow (Zonotrichia querula)	O	W
	Dark-eyed Junco (Junco hyemalis)	C	Sp,S,F,W
	Red-Winged Blackbird (Agelaius phoeniceus)	C	Sp,S,F,W
	Yellow-Headed Blackbird (Xantho-(cephalus xanthocephalus)	U	Sp,S
	Brewer's Blackbird (Euphagus cyanocephalus)	C	Sp,S,F,W
	Brown-Headed Cowbird (Molothrus ater)	C	Sp,S,F,W
	Northern Oriole (Icterus galbula)	U	Sp,S,F
	Purple Finch (Carpodacus purpureus)	C	Sp,S,F,W
	House Finch (Carpodacus mexicanus)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Pine Siskin (Carduelis pinus)	U	Sp,S,F,W
	Lesser Goldfinch (Spinus psaltria)	U	Sp,S,F,W
	American Goldfinch (Carduelis tristis)	C	Sp,S,F,W
	Evening Grosbeak (Hesperiphona vespertina)	U	Sp,S,F,W

AMPHIBIANS AND REPTILES

Status	Name	Population Level	Use Season
	Common Garter Snake (Thamnophis sirtalis)	C	Sp,S,F
	Rubber Boa Snake (Charina bottae)	U	Sp,S,F
	Racer Snake (Coluber constrictor)	U	Sp,S,F
	Western Rattlesnake (Crotalus viridis)	R	Sp,S,F
SS	Common King Snake (Lampropeltis getulus)	U	Sp,S,F
	Northwestern Garter Snake (Thamnophis ordinoides)	C	Sp,S,F
	Northwestern Salamander (Ambystoma gracile)	C	Sp,S,F,W
	Long-Toed Salamander (Ambystoma macrodactylum)	U	Sp,S,F,W
	*Pacific Giant Salamander (Dicamptodon ensatus)	U	Sp,S
	Olympic Salamander (Rhyacotriton olymicus)	O	Sp,S,F,W
	Oregon Red Salamander (Ensatina eschscholtzi oregonensis)	U	SP,S,F,W
	Gopher Snake (Pituophis melanoleucus)	U	Sp,S,F
	Rough-Skinned Newt (Taricha granulosa)	C	Sp,S,F,W
	Bullfrog (Rana catesbeiana)	C	Sp,S,F,W
SS	Oregon Red-Legged Frog (Rana aurora)	U	Sp,S,F,W
	California Yellow-Legged Frog (Rana boylei)	O	Sp,S,F,W
	Tailed Frog (Ascaphus truei)	U	Sp,S,F,W
	Pacific Tree Frog (Ascaphus truei)	C	Sp,S
	Northwestern Pond Turtle (Clemmys marmorata marmorata)	U	Sp,S,F,W

* McKenzie River Only

V. DECIDUOUS WOODLAND

MAMMALS

Status	Name	Population Level	Use Season
	Black-tailed Deer (*Odocoileus hemionus columbianus*)	C	Sp,S,F,W
	Racoon (*Procyon lotor*)	U	Sp,S,F,W
	Red Fox (*Vulpes fulva*)	U	Sp,S,F,W
	Striped Skunk (*Mephitis mephitis*)	U	Sp,S,F,W
	Spotted Skunk (*Spilogale putorius*)	U	Sp,S,F,W
	Mountain Lion (*Felis concolor*)	O	Sp,S,F,W
	Gray Fox (*Urocyon cinereo argenteus*)	U	Sp,S,F,W
	Black Bear (*Ursus americanus*)	O	Sp,S,F,W
	Roosevelt Elk (*Cervus canadensis*)	O	Sp,F,W
	Coyote (*Canis latrans*)	U	Sp,S,F,W

MAMMALS (Cont'd)

Status	Name	Population Level	Use Season
	Beaver (Castor canadensis)	C	Sp,S,F,W
	Bobcat (Lynx rufus)	U	Sp,S,F,W
	Mink (Mustela vison)	O	Sp,S,F,W
	Nutria (Myocastro copyus)	O	Sp,S,F,W
	Short-Tailed Weasel (Mustela erminea)	U	Sp,S,F,W
	Long-Tailed Weasel (Mustela frenata)	O	Sp,S,F,W
	Common Opossum (Didelphis marsupialis)	O	Sp,S,F,W
	Porcupine (Erethizon dorsatum)	U	Sp,S,F,W
	Dusky-Footed Woodrat (Neotoma fuscipes)	O	Sp,S,F,W
	Western Gray Squirrel (Sciurus griseus)	O	Sp,S,F,W
	Shrew Spp. (Sorex spp.)	U	Sp,S,F,W
	California Ground Squirrel (Spermophilus beechei)	C	Sp,S,F,W
	Deer Mouse (Peromyscus maniculatus)	C	Sp,S,F,W
	Brush Rabbit (Sylvilagus bachmani)	C	Sp,S,F,W
	Northern Flying Squirrel (Glaucomys sabrinus)	U	Sp,S,F,W
	Black-Tailed Jackrabbit (Lepus californicus)	U	Sp,S,F,W
	Townsend Chipmunk (Eutamias townsendi)	U	Sp,S,F,W
	Feral Dog (Canis familiaris)	C	Sp,S,F,W
	Feral Cat (Felis domestica)	C	Sp,S,F,W
	BIRDS		
	Great Blue Heron (Andea herodias)	C	Sp,S,F,W
	Great Egret (Casmerodius albus)	O	Sp,F,W
	Wood Duck (Aix sponsa)	U	Sp,S,F,W
	Turkey Vulture (Cathartes aura)	C	Sp,S,F,W
	Sharp-Shinned Hawk (Accipiter striatus)	U	Sp,S,F,W
	Cooper's Hawk (Accipiter cooperii)	U	Sp,S,F,W
	Northern Goshawk (Accipiter gentilis)	R	W
	Red-Shouldered Hawk (Buteo lineatus)	X	Sp
	Swainson's Hawk (Buteo swainsoni)	R	W
	Red-Tailed Hawk (Buteo Jamaicensis)	C	Sp,S,F,W
	Ferruginous Hawk (Buteo regalis)	R	W
	Rough-Legged Hawk (Buteo lagopus)	U	F,W
	American Kestrel (Falco sparverius)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Ruffed Grouse (Bonasa umbellus)	U	Sp,S,F,W
	California Quail (Lophortyx californicus)	C	Sp,S,F,W
	Mountain Quail (Oreortyx pictus)	U	Sp,S,F,W
	Band-Tailed Pigeon (Columba fasciata)	U	Sp,S,F,W
	Mourning Dove (Zenaidura macroura)	C	Sp,S,F,W
	Western Screech Owl (Otus kennicottii)	U	Sp,S,F,W
	Great Horned Owl (Bubo virginianus)	U	Sp,S,F,W
	Northern Pygmy Owl (Glaucidium gnoma)	U	Sp,S,F,W
	Long-Eared Owl (Asio otus)	R	Sp
	Northern Saw-Whet Owl (Aegolius acadicus)	U	Sp,S,F,W
	Common Nighthawk (Chordeiles minor)	U	Sp,S,F
	Vaux's Swift (Chaetura vauxi)	U	Sp,S,F
	Anna's Hummingbird (Calypte anna)	O	F,W
	Calliope Hummingbird (Stellula calliope)	O	Sp
	Rufous Hummingbird (Selasphorus rufus)	C	Sp,S,F
	Lewis' Woodpecker (Asyndesmus lewis)	U	Sp,S,F,W
	Acorn Woodpecker (Melanerpes formicivorus)	C	Sp,S,F,W
	Red-naped Sapsucker (Sphyrapicus nuchalis)	U	Sp,S,F,W
	Red-breasted Sapsucker (Sphyrapicus ruber)	U	Sp,S,F,W
	Downy Woodpecker (Dendrocopos pubescens)	U	Sp,S,F,W
	Hairy Woodpecker (Dendrocopos villosus)	U	Sp,S,F,W
	Northern Flicker (Colaptes auratus)	C	Sp,S,
	Western Wood Pewee (Contopus sordidulus)	C	Sp,S,FF,W
	Willow Flycatcher (Empidonax traillii)	U	Sp,S
	Hammond's Flycatcher (Empidonax hammondii)	O	Sp,S
	Dusky Flycatcher (Empidonax oberholsen)	O	Sp,S
	Western Flycatcher (Empidonax difficilis)	U	Sp,S
	Ash-Throated Flycatcher (Myiarchus cinerascens)	O	Sp,F

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Tree Swallow (Iridoprocne bicolor)	C	Sp,S,F
	Scrub Jay (Aphelocoma coerulescens)	C	Sp,S,F,W
	Black-Billed Magpie (Pica pica)	O	W
	American Crow (Corvus brachyrhynchos)	C	Sp,S,F,W
	Black-Capped Chickadee (Parus atricapillus)	C	Sp,S,F,W
	Chestnut-Backed Chickadee (Parus rufescens)	C	Sp,S,F,W
	Bushtit (Psaltriparus minimus)	C	Sp,S,F,W
	White-Breasted Nuthatch (Sitta carolinensis)	C	Sp,S,F,W
	Brown Creeper (Certhia familiaris)	C	Sp,S,F,W
	Bewick's Wren (Thryomanes bewicikii)	C	Sp,S,F,W
	House Wren (Troglodytes aedon)	C	Sp,S,F
	Winter Wren (Troglodytes troglodytes)	C	Sp,S,F,W
	Golden-Crowned Kinglet (Regulus satrapa)	C	Sp,S,F,W
	Ruby-Crowned Kinglet (Regulus calendula)	C	Sp,F,W
	Western Bluebird (Sialia mexicana)		
	Mountain Bluebird (Sialia currucoides)	O	Sp,S,F,W
	Townsend's Solitaire (Myadestes townsendi)	O	Sp,W
	Swainson's Thrush (Hylocichla ustulata)	U	Sp,S,F
	Hermit Thrush (Hylocichla guttata)	U	Sp,S,F,W
	American Robin (Turdus migratorius)	C	Sp,S,F,W
	Varied Thrush (Ixoreus naevius)	C	Sp,F,W
	Wrentit (Chamaea fasciata)	U	Sp,S,F,W
	Bohemian Waxwing (Bombycilla garrulus)	O	W
	Cedar Waxwing (Bombycilla cedrorum)	C	Sp,S,F,W
	Northern Shrike (Lanius excubitor)	U	Sp,F,W
	European Starling (Sturmus vulgaris)	C	Sp,S,F,W
	Solitary Vireo (Vireo solitarius)	U	Sp,S,F
	Hutton's Vireo (Vireo huttoni)	U	Sp,S,F,W
	Warbling Vireo (Vireo gilvus)	U	Sp,S,F
	Red-Eyed Vireo (Vireo olivaceus)	O	Sp,S
	Orange-Crowned Warbler (Vermivora celata)	U	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Nashville Warbler (Vermivora ruticapilla)	U	Sp,S,F
	Yellow Warbler (Dendroica petechia)	U	Sp,S,F
	Yellow-Rumped Warbler (Dendroica coronata)	C	Sp,S,F,W
	Black-Throated Gray Warbler (Dendroica nigrescens)	U	Sp,S,F
	Townsend's Warbler (Dendroica townsendi)	U	Sp,S,F,W
	Hermit Warbler (Dendroica occidentalis)	U	Sp,S,F
	MacGillivray's Warbler (Oporornis tolmiei)	U	Sp,S,F,W
	Wilson's Warbler (Wilsonia pusilla)	C	Sp,S,F
	Western Tanager (Piranga ludoviciana)	U	Sp,S,F
	Black-Headed Grosbeak (Pheucticus melanocepalus)	C	Sp,S,F
	Lazuli Bunting (Passerina amoena)	U	SP,S,F
	Rufous-Sided Towhee (Pipilo erythrophthalmus)	C	Sp,S,F,W
	Chipping Sparrow (Spizella passerina)	U	Sp,S,F,W
	Fox Sparrow (Passerella iliaca)	U	Sp,F,W
	Song Sparrow (Melospiza melodia)	C	Sp,S,F,W
	Lincoln's Sparrow (Melospiza lincolnii)	U	Sp,F,W
	White-Throated Sparrow (Zonotrichia albicollis)	C	W
	White-Crowned Sparrow (Zonotrichia leucophrys)	C	Sp,F,W
	Golden-Crowned Sparrow (Zonotrichia atricapilla)	C	Sp,F,W
	Harris Sparrow (Zonotrichia querula)	O	W
	Dark-eyed Junco (Junco hyemalis)	C	Sp,S,F,W
	Northern Oriole (Icterus galbula)	U	Sp,S,F
	Purple Finch (Carpodacus purpureus)	C	Sp,S,F,W
	House Finch (Carpodacus mexicanus)	C	Sp,S,F,W
	Pine Siskin (Carduelis pinus)	U	Sp,S,F,W
	Lesser Goldfinch (Spinus psaltria)	U	Sp,S,F,W
	American Goldfinch (Carduelis tristis)	C	Sp,S,F,W
	Evening Grosbeak (Hesperiphona vespertina)	U	Sp,S,F,W

AMPHIBIANS AND REPTILES

Status	Name	Population Level	Use Season
	Common Garter Snake (Thamnophis sirtalis)	C	Sp,S,F,W
	Northwestern Garter Snake (Thamnophis ordinoides)	C	Sp,S,F,W
	Rubber Boa Snake (Charina bottae)	U	Sp,S,F,W
	Ring-Necked Snake (Diadophis punctatus)	O	Sp,S,F,W
SS	Western Rattlesnake (Crotalus viridis)	R	Sp,S,F,W
	Racer Snake (Coluber constrictor)	O	Sp,S,F,W
	Gopher Snake (Pituophis melanoleucus)	U	Sp,S,F,W
SS	Sharp-Tailed Snake (Contia tenuis)	R	Sp,S,F,W
SS	Common King Snake (Lampropeltis getulus)	U	Sp,S,F,W
	Western Skink (Eumeces skiltonianus)	O	Sp,S,F,W
	Northern Alligator Lizard (Gerrhonotus coeruleus)	U	Sp,S,F,W
	Rough-Skinned Newt (Taricha granulosa)	U	Sp,S,F,W
	Western Fence Lizard (Sceloporus occidentalis)	C	Sp,S,F,W
	*Pacific Giant Salamander (Dicamptodon ensatus)	U	Sp,S,F,W
	Northwestern Salamander (Ambystoma gracile)	U	Sp,S,F,W
	Long-Toed Salamander (Ambystoma macrodactylum)	O	S,F
	Oregon Red Salamander (Ensatina eschscholtzi)	O	Sp,S,F,W
	Clouded Salamander (Aneides ferreus oregonesis)	O	Sp,S,F,W
SS	California Red-Legged Frog (Rana boylei)	O	Sp,S,F,W
	Oregon Red-Legged Frog (Rana aurora)	U	Sp,S,F,W
	Pacific Tree Frog (Hyla regilla)	U	Sp,S,F,W

* McKenzie River Only

VII. CONIFEROUS FORESTS

MAMMALS

Status	Name	Population Level	Use Season
	Black-Tailed Deer (*Odocoileus hemionus columbianus*)	C	Sp,S,F,W
	Coyote (*Canis latrans*)	U	Sp,S,F,W
	Racoon (*Procyon lotor*)	U	Sp,S,F,W
	Roosevelt Elk (*Cervus canadensis*)	O	Sp,S,F,W
	Black Bear (*Ursus americanus*)	O	Sp,S,F,W

MAMMALS (Cont'd)

Status	Name	Population Level	Use Season
	Bobcat (Lynx rufus)	U	Sp,S,F,W
	Red Fox (Vulpes fulva)	O	Sp,S,F,W
	Gray Fox (Urocyon cinereo argenteus)	O	Sp,S,F,W
	Mountain Lion (Felis concolor)	O	Sp,S,F,W
	Mink (Mustela vison)	O	Sp,S,F,W
	Common Opossum (Didelphis marsupialis)	U	Sp,S,F,W
	Striped Skunk (Mephitis mephitis)	O	Sp,S,F,W
	Spotted Skunk (Spilogale putorius)	O	Sp,S,F,W
	Showshoe Hare (Lepus americanus)	O	Sp,S,F,W
	Brush Rabbit (Sylvilagus bachmani)	U	Sp,S,F,W
	California Ground Squirrel (Spermophilus beechei)	U	Sp,S,F,W
	Townsend Chipmunk (Entamias townsendi)	U	Sp,S,F,W
	Chickaree (Tamiasciurus douglasi)	U	Sp,S,F,W
	Mountain Beaver (Aplodontia rufa)	O	Sp,S,F,W
	Bushy-Tailed Woodrat (Neotoma cinerea)	O	Sp,S,F,W
	Dusty-Footed Woodrat (Neotoma fuscipes)	O	Sp,S,F,W
	Trowbridge Shrew (Sorex trowbridgei)	O	Sp,S,F,W
	Vagrant Shrew (Sorex vagrans)	O	Sp,S,F,W
	Dusky Shrew (Sorex obscurus)	O	Sp,S,F,W
	Pacific Shrew (Sorex pacificus)	O	Sp,S,F,W
	Townsend Mole (Scapanus townsendii)	O	Sp,S,F,W
	Pacific (Coast) Mole (Scapanus orarius)	O	Sp,S,F,W
	Little Brown Myotis (Myotis lucifugus)	O	Sp,S,F,W
	Yuma Myotis (Myotis yumanensis)	O	Sp,S,F,W
	Long-Eared Myotis (Myotis erotis)	O	Sp,S,F,W
	Northern Flying Squirrel (Glaucomys sabrinus)	O	Sp,S,F,W
	Deer Mouse (Peromyscus maniculatus)	C	Sp,S,F,W
	Pacific Phenacomy (Phenacomys albipes)	U	Sp,S,F,W
	Red Tree Vole (Phenacomys longicaudus)	U	Sp,S,F,W
	Western Redback Vole (Clethrionomys occidentalis)	O	Sp,S,F,W
	Long-Tailed Weasel (Mustela frenata)	O	Sp,S,F,W

MAMMALS (Cont'd)

Status	Name	Population Level	Use Season
	Short-Tailed Weasel (Mustela erminea)	O	Sp,S,F,W
	Fringed Myotis (Myotis thysanodes)	O	Sp,S,F,W
	Long-Legged Myotis (Myotis volans)	O	Sp,S,F,W
	California Myotis (Myotis californicus)	O	Sp,S,F,W
	Small-Footed Myotis (Myotis subulatus)	O	Sp,S,F,W
	Silver-Haired Bat (Lasionycteris noctivagans)	O	Sp,S,F,W
	Big Brown Bat (Eptesicus fuscus)	O	Sp,S,F,W
	Hoary Bat (Lasiurus cinereus)	O	Sp,S,F,W
	Western Big-Eared Bat (Pleotus townsendi)	O	Sp,S,F,W
	Pallid Bat (Antrozous pallidus)	O	Sp,S,F,W
	Oregon Vole (Microtus oregoni)	O	Sp,S,F,W
	Pacific Jumping Mouse (Zapus trinotatus)	O	Sp,S,F,W
	Porcupine (Erethizon dorsatum)	U	Sp,S,F,W
	Shrew Mole (Neurotriclus gibbsi)		
	Western Gray Squirrel (Sciurus griseus)	O	SP,S,F,W
	Eastern Cottontail (Sylvilagus floridanus)	U	SP,S,F,W
	BIRDS		
	Turkey Vulture (Cathartes aura)	C	Sp,S,F,W
	Sharp-Shinned Hawk (Accipter striatus)	U	Sp,S,F,W
	Cooper's Hawk (Accipter cooperii)	U	SP,S,F,W
	Northern Goshawk (Accipter gentilis)	R	W
	Red-Tailed Hawk (Buteo jamaicensis)	C	Sp,S,F,W
	Blue Grouse (Dendragapus obscurus)	U	Sp,S,F,W
	Ruffed Grouse (Bonasa umbellus)	U	Sp,S,F,W
	Mountain Quail (Oreortyx pictus)	U	Sp,S,F,W
	Band-Tailed Pigeon (Columba fasciata)	U	Sp,S,F,W
	Great Horned Owl (Bubo virginianus)	U	Sp,S,F,W
	Northern Pygmy Owl (Glaucidium gnoma)	U	Sp,S,F,W
	Great Gray Owl (Strix nebulosa)	U	Sp,S
	Long-Eared Owl (Asio otus)	R	Sp
	Northern Saw-Whet Owl (Aegolius acadicus)	U	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Common Nighthawk (Chordeiles minor)	U	Sp,S,F
	Vaux s Swift (Chaetura vauxi)	U	Sp,S,F
	Anna's Hummingbird (Calypte anna)	O	F,W
	Calliope Hummingbird (Stellula calliope)	O	Sp
	Rufous Hummingbird (Seasphorus rufus)	C	Sp,S,F
	Red-naped Sapsucker (Sphyrapicus nuchalis)	U	Sp,S,F,W
	Red-breasted Sapsucker (Saphyrapicus ruber)		
	Hairy Woodpecker (Dendrocopos villosus)	U	Sp,S,F,W
	Northern Flicker (Colaptes auratus)	C	Sp,S,F,W
	Pileated Woodpeck Dryocopus pileatus)	U	Sp,S,F,W
	Olive-Sided Flycatcher (Nuttallornis borealis)	U	Sp,S,F
	Western Wood Pewee (Contopus sordidulus)	C	Sp,S,F
	Willow Flycatcher (Empidonax traillii)	U	Sp,S
	Dusky Flycatcher (Empidonax oberholseri)	O	Sp,S
	Western Flycatcher (Empidonax difficilis)	U	Sp,S
	Tree Swallow (Iridoprocne bicolor)	C	Sp,S,F
	Steller's Jay (Cyanocitta steileri)	C	Sp,S,F,W
	Scrub Jay (Aphelocoma coerulescens)	C	Sp,S,F,W
	American Crow (Corvus brachyrhynchos)	C	Sp,S,F,W
	Common Raven (Corvus corax)	U	Sp,S,F,W
	Black-Capped Chickadee (Parus atricapillus)	C	Sp,S,F,W
	Chestnut-Backed Chickadee (Parus rufescens)	C	Sp,S,F,W
	Bushtit (Psaltriparus minimus)	C	Sp,S,F,W
	Red-Breasted Nuthatch (Sitta canadensis)	C	Sp,S,F,W
	White-Breasted Nuthatch (Sitta carolinensis)	C	Sp,S,F,W
	Brown Creeper (Certhia familiaris)	C	Sp,S,F,W
	Bewick's Wren (Thryomanes bewickii)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season	
	Winter Wren (Troglodytes troglodytes)	C	Sp,S,F,W	Golden-
	Crowned Kinglet (Regulus satrapa)	C	Sp,S,F,W	
	Ruby-Crowned Kinglet (Regulus calendula)	C	Sp,F,W	
	Western Bluebird (Sialia mexicana)	U	Sp,S,F,W	
	Townsend's Solitaire (Myadestes townsendi)	O	Sp,W	
	Swainson's Thrush (Hylocichla ustulata)	U	Sp,S,F	
	Hermit Thrush (Hylocichla guttata)	U	Sp,S,F,W	
	American Robin (Turdus migratorius)	C	Sp,S,F,W	
	Varied Thrush (Ixoreus naevius)	C	Sp,F,W	
	Bohemian Waxwing (Bombycilla garrulus)	O	W	
	Cedar Waxwing (Bombycilla cedrorum)	C	Sp,S,F,W	
	European Starling (Sturnus vulgaris)	C	Sp,S,F,W	
	Solitary Vireo (Vireo solitarius)	U	Sp,S,F	
	Hutton's Vireo (Vireo huttoni)	U	Sp,S,F,W	
	Orange-Crowned Warbler (Vermivora celata)	U	Sp,S,F,W	
	Nashville Warbler (Vermivora ruticapllla)	U	Sp,S,F	
	Yellow-Rumped Warbler (Dendroica cononata)	C	Sp,S,F,W	
	Black-Throated Gray Warbler (Dendroica nigrescens)	U	Sp,S,F	
	Townsend's Warbler (Dendroica townsendi)	U	Sp,S,F,W	
	Hermit Warbler (Dendroica occidentalis)	U	Sp,S,F	
	MacGillivray's Warbler (Oporornis tolmiei)	U	Sp,S,F,W	
	Wilson's Warbler (Wilsonia pusilla)	C	Sp,S,F	
	Western Tanager (Piranga ludoviciana)	U	Sp,S,F	
	Black-Headed Grosbeak (Pheucticus melanocephalus)	U	Sp,S,F	
	Rufous-Sided Towhee (Pipilo erythrophthalmus)	C	Sp,S,F,W	
	Chipping Sparrow (Spizella passerina)	U	Sp,S,F,W	
	Fox Sparrow (Passerella iliaca)	U	Sp,F,W	
	Song Sparrow (Melospiza melodia)	C	Sp,S,F,W	
	Dark-eyed Junco (Junco hyemalis)	C	Sp,S,F,W	

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Purple Finch (Carpodacus purpureus)	C	Sp,S,F,W
	Red Crossbill (Loxia curvirostra)	O	Sp,F
	Pine Siskin (Cardwelis pirus)	U	Sp,S,F,W
	Evening Grosbeak (Hesperiphona vespertina)	U	Sp,S,F,W

AMPHIBIANS AND REPTILES

	Common Garter Snake (Thamnophis sirtalis)	U	Sp,S,F,W
	Rubber Boa Snake (Charina bottae)	O	Sp,S,F,W
	Ring-Necked Snake (Diadophis punctatus)	O	Sp,S,F,W
SS	Sharp-Tailed Snake (Contia tenuis)	R	Sp,S,F,W
SS	Western Rattlesnake (Crotalus viridis)	R	Sp,S,F,W
	Northwestern Garter Snake (Thamnophis ordinoides)	U	Sp,S,F,W
	Racer Snake (Coluber constrictor)	O	Sp,S,F,W
	Gopher Snake (Pituophis melanoleucus)	U	Sp,S,F,W
	Western Skink (Eumeces skiltonianus)	O	Sp,S,F,W
	Southern Alligator Lizard (Gerrhonotus multicarinatus)	O	Sp,S,F,W
	Western Fence Lizard (Sceloporus occidentalis)	C	Sp,S,F,W
	Northern Alligator Lizard (Gerrhonotus coeruleus)	O	Sp,S,F,W
	Rough-Skinned Newt (Taricha granulosa)	U	Sp,S,F,W
	Northwestern Salamander (Ambystoma gracile)	O	Sp,S,F,W
	Long-Toed Salamander (Ambystoma macrodactylum)	O	Sp,S,F,W
	*Pacific Giant Salamander (Dicamptodon ensatus)	O	Sp,S,F,W
	Clouded Salamander (Aneides ferreus)	O	Sp,S,F,W
	Dunn's Salamander (Plethodon dunni)	O	Sp,S,F,W
	Oregon Red Salamander (Ensatina eschscholtzi oregonensis)	O	Sp,S,F,W
	California Yellow-legged Frog (Rana boylei)	O	Sp,S,F,W
	Pacific Tree Frog (Hyla regilla)	U	Sp,S,F,W

AMPHIBIANS AND REPTILES (Cont'd)

SS	Oregon Red-Legged Frog (*Rana aurora*)	O	Sp,S,F,W
SS	Tailed Frog (*Ascaphus truei*)	R	Sp,S,F,W

VIII. FIELDS

MAMMALS

Status	Name	Population Level	Use Season
	Black-Tailed Deer (Odocoileus hemionus columbianus)	U	Sp,S,F,W
	Roosevelt Elk (Cervus canadensis)	O	Sp,S,F,W
	Mink (Mustela vison)	O	Sp,S,F,W
	Coyote (Canis latrans)	U	Sp,S,F,W
	Red Fox (Vulpes fulva)	U	Sp,S,F,W
	Gray Fox (Urocyon cinereo argenteus)	U	Sp,S,F,W
	Mountain Lion (Felis concolor)	O	Sp,W
	Bobcat (Lynx rufus)	O	Sp,S,F,W
	Black Bear (Ursus americanus)	O	Sp,S,F,W
	Racoon (Procyon lotor)	U	Sp,S,F,W
	Common Opossum (Didelphis marsupialis)	O	Sp,S,F,W
	Porcupine (Erethizon dorsatum)	O	Sp,S,F,W
	Snowshoe Hare (Lepus americanus)	O	Sp,W
	Brush Rabbit (Sylvilagus bachmani)	U	Sp,S,F,W
	Mountain Beaver (Aplodontia rufa)	O	Sp,S,F,W
	California Ground Squirrel (Spermophilus beechei)	U	Sp,S,F,W
	Western Gray Squirrel (Sciurus griseus)	O	S,F
	Eastern Fox Squirrel (Sciurus niger)	O	S,F
	Golden-Mantled Squirrel (Citellus lateralis)	O	S,F
	Short-Tailed Weasel (Mustela erminea)	O	Sp,S,F,W
	Long-Tailed Weasel (Mustela frenata)	U	Sp,S,F,W
	Spotted Skunk (Spilogale putorius)	O	Sp,S,F,W
	Striped Skunk (Mephitis mephitis)	C	Sp,S,F,W

MAMMALS (Cont'd)

Status	Name	Population Level	Use Season
	Blacktailed Jackrabbit (Lepus californicus)	U	Sp,S,F,W
	Townsend Chipmunk (Entamias townsendi)	O	Sp,S,F,W
	Giant Pocket Gopher (Thomomys bulbivorous)	U	Sp,S,F,W
	Deer Mouse (Peromyscus maniculatus)	C	Sp,S,F,W
	House Mouse (Mus musculus)	C	Sp,S,F,W
	Mazama Pocket Gopher (Thomomys mazama)	O	Sp,S,F,W
	Camas Pocket Gopher	O	Sp,S,F,W
	Shrew Mole (Neurotriculus gibbsi)	O	Sp,S,F,W
	Townsend Mole (Scapanus townsendii)	O	Sp,S,F,W
	Pacific (Coast) Mole (Scapanus orarius)	O	Sp,S,F,W
	Trowbridge Shrew (Sorex trowbridgei)	O	Sp,S,F,W
	Dusky-Footed Woodrat (Neotoma fuscipes)	O	Sp,S,F,W
	Bushytailed Woodrat (Neotoma cinerea)	O	Sp,S,F,W
	California Vole (Microtus californicus)	O	Sp,S,F,W
	Townsend Vole (Microtus townsendi)	O	Sp,S,F,W
	Longtail Vole (Microtus longicaudus)	O	Sp,S,F,W
	Mountain Vole (Microtus montanus)	O	Sp,S,F,W
	Oregon Vole (Microtus oregoni)	O	Sp,S,F,W
	Gray-Tailed Vole (Microtus canicaudus)	O	Sp,S,F,W
	Dusky Shrew (Sorex obscurus)	O	Sp,S,F,W
	Little Brown Myotis (Myotis lucifugus)	O	Sp,S,F,W
	California Myotis (Myotis californicus)	O	Sp,S,F,W
	Yuma Myotis (Myotis yumanensis)	O	Sp,S,F,W
	Western Big-Eared Bat (Pleotus townsendi)	O	Sp,S,F,W
	Pallid Bat (Antrozous pallidus)	O	Sp,S,F,W
	Pacific Jumping Mouse (Zapus trinotatus)	O	Sp,S,F,W
	Eastern Cottontail Rabbit (Sylvilagus floridanus)	O	Sp,S,F,W
	Northern Flying Squirrel (Glaucomys sabrinus)	O	Sp,S,F,W

MAMMALS (Cont'd)

Status	Name	Population Level	Use Season
	Nutria (Myocastor coupus)	U	Sp,S,F,W

BIRDS

	Great Blue Heron (Ardea herodias)	C	Sp,S,F,W
	Great Egret (Casmerodius albus)	O	Sp,F,W
	Snowy Egret (Egretta thula)		
	Tundra Swan (Cygnus columbianus)	U	Sp,F,W
	Trumpeter Swan (Cygnus buccinator)	R	Sp,W
	Greater White-Fronted Goose (Anser albifrons)	U	Sp,F,W
	Snow Goose (Chen caerulescens)	R	Sp,F,W
	Green-Winged Teal (Anas crecca)	C	Sp,F,W
	Canada Goose (Branta canadensis)	C	Sp,S,F,W
	Mallard (Anas strepera)	C	Sp,S,F,W
	Northern Pintail (Anas acuta)	C	Sp,F,W
	Blue-Winged Teal (Anas discors)	U	Sp,S
	Cinnamon Teal (Anas cyanoptera)	U	Sp,S,F,W
	Eurasian Wigeon (Anas penelope)	O	F,W
	American Wigeon (Anas americana)	C	Sp,F,W
	Turkey Vulture (Cathartes aura)	C	Sp,S,F,W
	White-Tailed Kite (Elanus leucurus)		
T	Bald Eagle (Haliaeetus leucocephalus)	O	W
	Northern Harrier (Circus cyaneus)	U	Sp,S,F,W
	Cooper's Hawk (Accipiter cooperii)	U	Sp,S,F,W
	Swainson's Hawk (Buteo swainsoni)	R	W
	Red-Tailed Hawk (Buteo jamaicensis)	C	Sp,S,F,W
	Ferruginous Hawk (Buteo regalis)	R	W
	Rough-Legged Hawk (Buteo lagopus)	U	F,W
	Golden Eagle (Aquila chrysaetos)	O	W
	American Kestrel (Falco sparverius)	C	Sp,S,F,W
	Merlin (Falco columbarius)	R	Sp,F,W
	Peregrine Falcon (Falco peregrinus)	R	W
	Prairie Falcon (Falco mexicanus)	R	W
	Ring-Necked Pheasant (Phasianus colchicus)	C	Sp,S,F,W
	California Quail (Lophortyx californicus)	C	Sp,S,F,W
	American Coot (Fulica ameircana)	C	Sp,S,F,W
	Sandhill Crane (Grus canadensis)	O	Sp,F,W
	Semipalmated Plover (Charadrius semipalmatus)	O	Sp,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Snowy Plover (Charadrius alexandrinus)	C	Sp,S,F,W
	Killdeer (Charadrius vociferus)	C	Sp,S,F,W
	American Golden Plover (Pluialis dominica)	O	F
	Black-Bellied Plover (Squatarola squatarola)	U	Sp,F,W
	Common Snipe (Copella gallinago)	C	Sp,S,F,W
	Long-Billed Curlew (Numenius americanus)	O	Sp,F
	Sanderling (Crocethia alba)	O	Sp,F
	Western Sandpiper (Ereunetes mauri)	U	Sp,F,W
	Least Sandpiper (Erolia minutilla)	C	Sp,F,W
	Dunlin (Erolia alpina)	C	Sp,F,W
	Long-Billed Dowitcher (Limnodromus scolopaceus)	C	Sp,F,W
	Bonaparte's Gull (Larus philadelphia)	U	F,W
	Mew Gull (Larus canus)	O	W
	Ring-Billed Gull (Larus delawarensis)	C	Sp,S,F,W
	California Gull (Larus californicus)	U	F,W
	Herring Gull (Larus argentatus)	U	F,W
	Thayer's Gull (Larus thayeri)	U	W
	Western Gull (Larus occidentalis)	O	W
	Glaucous-Winged Gull (Larus glaucescens)	C	F,W
	Rock Dove (Columba livia)	C	Sp,S,F,W
	Band-Tailed Pigeon (Columba fasciata)	U	Sp,S,F,W
	Mourning Dove (Zenaida macroura)	C	Sp,S,F,W
	Common Barn Owl (Tyto alba)	U	Sp,S,F,W
	Snowy Owl (Nyctea scandiaca)	O	W
	Burrowing Owl (Athene cunicularia)		
	Short-Eared Owl (Asio flammeus)	U	Sp,S,F,W
	Common Nighthawk (Chordeiles minor)	U	Sp,S,F
	Vaux's Swift (Chaetura vauxi)	U	Sp,S,F
	Northern Flicker (Colaptes auratus)	C	Sp,S,F,W
	Say's Phoebe (Sayornis saya)	O	Sp,F
	Western Kingbird (Tyrannus verticalis)	U	Sp,S
	Eastern Kingbird (Tyrannus tyrannus)	R	Sp
	Horned Lark (Eremophila alpestris)	U	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Purple Martin (Progne subis)	O	Sp,S,F
	Tree Swallow (Iridoprocne bicolor)	C	Sp,S,F
	Violet-Green Swallow (Tachycineta thalassina)	C	Sp,S,F
	Rough-Winged Swallow (Stelgidopteryx ruticollis)	U	Sp,S,F
	Bank Swallow (Riparia riparia)	O	Sp,F
	Cliff Swallow (Petrochelidon pyrrhonota)	C	Sp,S,F
	Barn Swallow (Hirundo rustica)	C	Sp,S,F
	Scrub Jay (Aphelocoma coerulescens)	C	Sp,S,F,W
	Black-Billed Magpie (Pica pica)	O	W
	American Crow (Corvus brachyrhynchos)	C	Sp,S,F,W
	Common Raven (Corvus corax)	U	Sp,S,F,W
	Western Bluebird (Sialia mexicana)	U	Sp,S,F,W
	American Robin (Turdus migratorius)	C	Sp,S,F,W
	Varied Thrush (Ixoreus naevius)	C	Sp,F,W
	Water Pipit (Anthus spinoletta)	U	Sp,F,W
	Northern Shrike (Lanius excubitor)	U	Sp,F,W
	Loggerhead Shrike (Lanius ludovicianus)	O	W
	European Starling (Sturnus vulgaris)	C	Sp,S,F,W
	Vesper Sparrow (Pooecetes gramineus)	U	Sp,S,F
	Savannah Sparrow (Passerculus sandwichensis)	C	Sp,S,F,W
	Grasshopper Sparrow (Ammodramus savannarum)	R	Sp,S
	Song Sparrow (Melospiza melodia)	C	Sp,S,F,W
	Lincoln's Sparrow (Melospiza lincolnii)	U	Sp,F,W
	Chestnut-Collared Longspur (Calcarius ornatus)	X	S
	Swamp Sparrow (Melospiza georgiana)	R	W
	White-Throated Sparrow (Zonotrichia albicollis)	O	W
	Golden-Crowned Sparrow (Zonotrichia atricapilla)	C	Sp,F,W
	White-Crowned Sparrow (Zonotrichia leucophrys)	C	Sp,F,W
	Harris' Sparrow (Zonotrichia querula)	O	W
	Dark-eyed Junco (Junco hyemalis)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Red-Winged Blackbird (Agelaius phoeniceus)	C	Sp,S,F,W
	Western Meadowlark (Sturnella neglecta)	C	Sp,S,F,W
	Brewer's Blackbird (Euphagus cyanocephalus)	C	Sp,S,F,W
	Yellow-Headed Blackbird (Xantho-(cephalus xanthocephalus)	U	Sp,S
	Brown-Headed Cowbird (Molothrus ater)	U	Sp,S,F,W
	Gray-Crowned Rosy Finch (Leucosticte tephrocotis)	O	W
	Pine Siskin (Carduelis pinus)	U	Sp,S,F,W
	American Goldfinch (Carouelis tristis)	C	Sp,S,F,W
	House Sparrow (Passer domesticus)	C	Sp,S,F,W

AMPHIBIANS AND REPTILES

	Common Garter Snake (Thamnophis sirtalis)	U	Sp,S,F,W
	Northwestern Garter Snake (Thamnophis ordinoides)	U	Sp,S,F,W
SS	Western Rattlesnake (Crotalus viridis)	R	Sp,S,F,W
	Rubber Boa Snake (Charian bottae)	U	SP,S,F,W
	Ring-Necked Snake (Diadophis punctatus)	O	Sp,S,F,W
	Racer Snake (Coluber constrictor)	O	Sp,S,F,W
SS	Sharp-Tailed Snake (Contia tenuis)	R	Sp,S,F,W
	Gopher Snake (Pituophis melanoleucus)	U	Sp,S,F,W
	Western Terrestrial Garter Snake (Thamnophis elegans)	U	Sp,S,F,W
	Western Fence Lizard (Sceloporus occidentialis)	O	Sp,S,F,W
	Southern Alligator Lizard (Gerrhonotus multicarinatus)	O	Sp,S,F,W
	Western Skink (Eumeces skiltonianus)	O	Sp,S,F,W
	Rough-Skinned Newt (Taricuha granulosa)	O	Sp,S,F,W
	Northwestern Salamander (Ambystoma gracile)	O	Sp,S,F,W
	Long-Toed Salamander (Ambystoma macrodactylum)	O	Sp,S,F,W

VIII. FIELDS

AMPHIBIANS AND REPTILES (Cont'd)

Status	Name	Population Level	Use Season
	Oregon Red Salamander (Ensatina eschscholtzi oregonensis)	O	Sp,S,F,W
	Western Red-Backed Salamander (Plethodon vehiculum)	O	Sp,S,F,W
	Oregon Red-Legged Frog (Rava aurora)	O	Sp,S,F,W
	Bullfrog (Rana catesbeiana)	O	Sp,S,F,W
	Pacific Tree Frog (Hyla regilla)	O	Sp,S,F,W
SS	Spotted Frog (Rana pretiosa)	R	Sp,S,F,W
	Northwestern Pond Turtle (Clemmys marmorata marmorata)	O	Sp,S

XI. DEVELOPED/CULTURAL

MAMMALS

Status	Name	Population Level	Use Season
	Black-Tailed Deer (Odocoileus hemionus columbianus)	U	Sp,S,F,W
	Red Fox (Vulpes fulva)	U	Sp,S,F,W
	Beaver (Castor canadensis)	U	Sp,S,F,W
	Common Opossum (Didelphis marsupialis)	O	Sp,S,F,W
	Racoon (Procyon lotor)	U	Sp,S,F,W
	Chickaree (Red squirrel) (Tamiasciurus douglasi)	U	Sp,S,F,W
	Spotted Skunk (Spilogale putorius)	U	Sp,S,F,W
	Striped Skunk (Mephitis mephitis)	U	Sp,S,F,W
	Brush Rabbit (Sylvilagus bachmani)	U	Sp,S,F,W
	Eastern Fox Squirrel (Sciurus niger)	U	Sp,S,F,W
	California Ground Squirrel (Spermophilus beechei)	U	Sp,S,F,W
	Western Gray Squirrel (Sciurus griseus)	U	Sp,S,F,W
	Moles (Scapanus spp.)	U	Sp,S,F,W
	Shrews (Sorex spp.)	U	Sp,S,F,W
	Thamomys (Thomomys spp.)	U	Sp,S,F,W
	House Mouse (Mus musculus)	C	Sp,S,F,W
	Norway Rat (Rattus norvegicus)	C	Sp,S,F,W

BIRDS

	Killdeer (Charadrius vociferus)	C	Sp,S,F,W
	Ring-Billed Gull (Larus delawarensis)	C	Sp,S,F,W
	Rock Dove (Columba livia)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Ring-Necked Pheasant (Phasianus colchicus)	C	Sp,S,F,W
	Barn Owl (Tyto alba)	U	Sp,S,F,W
	Western Screech Owl (Otus asio)	U	Sp,S,F,W
	Common Nighthawk (Chordeiles minor)	U	Sp,S,F
	Vaux's Swift (Chaetura vauxi)	U	Sp,S,F
	Anna's Hummingbird (Calypte anna)	O	F,W
	Calliope Hummingbird (Stellula calliope)	O	Sp
	Rufous Hummingbird (Selasphorus rufus)	C	Sp,S,F
	Downy Woodpecker (Dendrocopos pubescens)	U	Sp,S,F,W
	Northern Flicker (Colaptes auratus)	C	Sp,S,F,W
	Red-naped Sapsucker (Sphyrapicus nuchalis)	U	Sp,S,F,W
	Red-breasted Sapsucker (Sphyrapicus thyroideus)		
	Purple Martin (Progne subis)	O	Sp,S,F
	Tree Swallow (Iridoprocne bicolor)	C	Sp,S,F
	Violet-Green Swallow (Tachycineta thalassina)	C	Sp,S,F
	Cliff Swallow (Petrochelidon pyrrhonota)	C	Sp,S,F
	Barn Swallow (Hirundo rustica)	C	Sp,S,F
	Scrub Jay (Aphelocoma coerulescens)	C	Sp,S,F,W
	American Crow (Corvus brachyrhynchos)	C	Sp,S,F,W
	Bushtit (Psaltriparus minimus)	C	Sp,S,F,W
	House Wren (Troglodytes aedon)	C	Sp,S,F
	Ruby-Crowned Kinglet (Regulus calendula)	C	Sp,F,W
	American Robin (Turdus migratorius)	C	Sp,S,F,W
	Varied Thrush (Ixoreus naevius)	C	Sp,F,W
	Northern Mockingbird (Mimus polyglottos)	O	W
	Sage Thrasher (Oreoscoptes montanus)	O	Sp
	White Wagtail (Motacilla alba)	X	W
	Cedar Waxwing (Bombycilla cedrorum)	O	W
	European Starling (Sturnus vulgaris)	C	Sp,S,F,W

BIRDS (Cont'd)

Status	Name	Population Level	Use Season
	Orange-Crowned Warbler (Vermivora celata)	C	Sp,S,F,W
	Yellow-Rumped Warbler (Dendroica coronata)	C	Sp,S,F,W
	Black-Throated Gray Warbler (Dendroica nigrescens)	U	Sp,S,F
	Townsend's Warbler (Dendroica townsendi)	U	Sp,S,F,W
	Wilson's Warbler (Wilsonia pusilla)	C	Sp,S,F
	Rufous-Sided Towhee (Pipilo erythrophthalmus)	C	Sp,S,F,W
	Chipping Sparrow (Spizella passerina)	U	Sp,S,F,W
	Fox Sparrow (Passerella iliaca)	U	Sp,F,W
	White-Throated Sparrow (Zonotrichia albicollis)	O	W
	Golden-Crowned Sparrow (Zonotrichia atricapilla)	C	Sp,F,W
	White-Crowned Sparrow (Zonotrichia leucophrys)	C	Sp,F,W
	Harris' Sparrow (Zonotrichia querula)	O	W
	Dark-eyed Junco (Junco hyemalis)	C	Sp,S,F,W
	Brewer's Blackbird (Euphagus cyanocephalus)	C	Sp,S,F,W
	Rosy Finch (Leucosticte arctoa)	O	W
	Purple Finch (Carpodacus purpureus)	C	Sp,S,F,W
	House Finch (Carpodacus mexicanus)	C	Sp,S,F,W
	Pine Siskin (Carduelis pinus)	U	Sp,S,F,W
	Lesser Goldfinch (Spinus psaltria)	U	Sp,S,F,W
	American Goldfinch (Carduelis tristis)	C	Sp,S,F,W
	Evening Grosbeak (Hesperiphona vespertina)	U	Sp,S,F,W
	House Sparrow (Passer domesticus)	C	Sp,S,F,W

Status	Name	Population Level	Use Season
	AMPHIBIANS AND REPTILES		
	Rubber Boa Snake (Charina bottae)	O	Sp,S,F,W
	Ring-Necked Snake (Diadophis punctatus)	O	Sp,S,F,W
	Racer Snake (Coluber constrictor)	O	Sp,S,F,W
	Gopher Snake (Pituophis melanoleucus)	O	Sp,S,F,W
	Northwest Garter Snake (Thamnophis ordinoides)	O	Sp,S,F,W
SS	Sharp-Tailed Shake (Conita tenuis)	R	Sp,S,F,W
	Common Garter Snake (Thamnophis sirtalis)	O	Sp,S,F,W
	Rough-Skinned Newt (Taricha granulosa)	U	Sp,S,F,W
	Western Fence Lizard (Sceloporus occidentalis)	O	Sp,S,F,W
	Pacific Tree Frog (Hyla regilla)	O	Sp,S,F,W
	Clouded Salamander (Aneides ferreus oregonesis)	O	Sp,S,F,W
	Long-Toed Salamander (Ambystoma macrodactylum)	O	Sp,S,F,W
SS	Oregon Red-Legged Frog (Rana aurora)	O	Sp,S,F,W

APPENDIX F

BUTTERFLIES OF THE WILLOW CREEK NATURAL AREA

Papilionidae (Swallowtails)	
anise swallowtail	*Papilio zelicaon*
western tiger swallowtail	*Papilio rutulus*
Pieridae (Whites and Sulphurs)	
alfalfa butterfly	*Colias eurytheme*
cabbage white	*Pieris rapae*
Lycaenidae (Blues)	
eastern tailed blue	*Everes comyntas*
silvery blue	*Glaucopsyche lygdamus*
Acmon blue	*Icaricia acmon*
Fender's blue	*Icaricia icarioides fenderi*
purplish copper	*Lycaena helloides*
common hairstreak	*Strymon melinus*
Nymphalidae (Fritillaries)	
California sister	*Adelpha bredowii*
Lorquin's admiral	*Limenitis lorquini*
field crescent	*Phycoides campestris*
melitta crescent	*Phyciodes mylitta*
red admiral	*Vanessa atalanta*
Satyridae (Browns)	
large woodnymph	*Cercyonis pegala*
ochre ringlet	*Coenonympha tullia*
Hesperidae (Skippers)	
roadside skipper	*Amblyscirtes vialis*
field skipper	*Atalopedes campestris*
dun skipper	*Euphyes vestris*
woodland skipper	*Ochlodes sylvanoides*
Sonora skipper	*Polites sonora*
checkered skipper	*Pyrgus ruralis*
Day-flying Moths	
Ranchman's tiger moth	*Platyprepia virginalis*
cinnibar moth	*Tyria jacobaea*

In addition, the following species are vagrants that were observed during the El Niño year of 1992, but presumably are not breeding residents:

giant sulphur	*Phoebis sennae*
painted lady	*Vanessa cardui*