Habitat Evaluation Procedures (HEP) Report

Willow Creek

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WILLOW CREEK HABITAT EVALUATION

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WILLOW CREEK HABITAT EVALUATION

1 INTRODUCTION

The Willow Creek site is one of the most significant remaining areas of typical native Willamette Valley habitats, with a variety of wetlands, grasslands, and woodlands. A diverse array of native flora and fauna, with significant wildlife habitats, is present on the site. Wildlife diversity is high, and includes species of mammals, songbirds, raptors, reptiles, amphibians, and one rare invertebrate. Over 200 species of native plants have been identified (including populations of six rare, threatened, or endangered species), along with significant remnants of native plant communities.

Willow Creek is located in Lane County, Oregon, on the western edge of the City of Eugene (see Figure 1). The city limit of Eugene passes through the site, and the site is entirely within the Eugene Urban Growth Boundary (UGB). At present, only lands to the east and northeast of the site are developed to full urban densities. Low density rural residential and agricultural land uses predominate on lands to the northwest and south. A partially completed light industrial/research office park is located to the northwest.

Several informal trails lead south from West 18th at various points into the site. The area encompasses a total of approximately 349 acres under several ownerships, in sections 3 and 4 of Township 18 South, Range 4 West.

Wildlife habitat values resulting from the purchase of this site will contribute toward the goal of mitigating for habitat lost as outlined in the Bonneville Power Administration's (BPA) Mitigation and Enhancement Plan for the Willamette River Basin. Under this Plan, mitigation goals were developed as a result of the loss of wildlife habitat due to the development and operation of Federal hydro-electric facilities in the Willamette River Basin.

Results of the HEP will be used to; 1) determine the current status and habitat enhancement potential of the site consistent with wildlife mitigation goals and objectives; and 2) develop a management plan for the area. The BPA is considering exercising their option to purchase the Bailey Hill property, acquiring additional properties now owned by The Nature Conservancy, and/or funding enhancement activities for the entire site in order to receive credit under the Mitigation and Enhancement Plan for the Willamette River Basin.

Figure 1 AERIAL PHOTOGRAPH OF WILLOW CREEK

Figure 2 EXISTING AND FUTURE HABITAT CONDITIONS

WILLOW CREEK VEGETATION Presettlement Restoration Alternative

Oregon, South Zone
1:7900

Vegetation Key

132 Acres		Upland prairie (1a)
13 Acres		Oak savannah (2b)
173 Acres		Open wet prairie (3a)
29 Acres		Wooded Wetland, Ash Savannah (4b)

WILLOW CREEK VEGETATION Proposed Action

Oregon, South Zone

1:7900

Vegetation Key

119 Acres		Upland prairie (1a)
2 Acres		Oak forest (2a)
21 Acres		Oak savannah (2b)
3 Acres		Conifer forest (2c)
85 Acres		Open wet prairie (3a)
91 Acres		Forested wetland: ash (4a)
12 Acres		Wooded Wetland, Ash Savannah (4b)
10 Acres		Riparian forest: cottonwood-ash-willow (4c)

WILLOW CREEK VEGETATION No Active Management Alternative

Oregon, South Zone

1:7900

Vegetation Key

155 Acres

Conifer forest (2c)

180 Acres

Forested wetland: ash (4a)

11 Acres

Riparian forest: cottonwood-ash-willow (4c)

Figure 3

SAMPLING SITES FOR HSI MODELS

2 HISTORICAL BACKGROUND

The site was first settled in the 1850's as part of the Jackson Wright Donation Land Claim. Used primarily as part of a dairy operation for much of its past, all of the site was used as a pasture for livestock (primarily dairy cattle), and/or for the production of hay on the uplands until approximately 25-30 years ago, at which time the site was purchased by investors. Other uses of the site included grass seed production on the Upland Old Field habitat; this activity ceased several years ago.

In 1978, the Willow Creek site was identified as an important wet prairie remnant by Stan Cook, a University of Oregon professor and member of The Nature Conservancy (TNC), who located populations of a rare plant during a field trip. Follow-up visits by TNC staff and university botanists confirmed that several rare plant species occurred on the site, growing in a rare remnant of native Willamette Valley wet prairie. Efforts by TNC and local planning agencies in the early 1980's led to an agreement with the private property owners that would allow development to occur on the upland margins of the site in exchange for permanent protection for the core wetland areas.

The Nature Conservancy began intensive management efforts at Willow Creek in 1983 under management agreements with the property owners. Since that time, management and monitoring efforts on the natural area have been on-going.

In 1983, the city of Eugene purchased 5 acres at Willow Creek. In the meantime, the projected urban development did not occur. In 1990, The Nature Conservancy began to acquire lands from the private owners, including portions of the site that had been slated for development under the original agreement. To date, TNC has purchased over 200 acres at Willow Creek.

3 SITE DESCRIPTION

The Willow Creek site is situated at the southern end of the Willamette Valley section of the Western Oregon Interior Valleys physiographic province. Most of the area consists of nearly level bottomlands at the base of low hills that define the valley's southern margin. Scattered throughout the grasslands on the site are conifer forest, ash forest, oak forest, and riparian forest in varying sizes and configurations.

A total of 12 habitat types have been delineated for the Willow Creek area, totaling approximately 350 acres. Present ownership of the habitat types analyzed include the following:

- Young Tract: 42.16 acres
- Dealy Tract: 60.37 acres
- Bailey Hill Tract: 125.68 acres
- Spady Tract: 110.43 acres
- Bertelsen Tract: 6.08 acres*
- City of Eugene: 5.00 acres*

*These areas were not analyzed for wildlife habitat values since they have been used as upland fill.

Habitat types (see Figure 2) include the following:

Invaded Wet Prairie - (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 (Fraxinus latifolia), and pear (Pyrus communis). At present, these sites have an open canopy with 20-30' tall trees, with an understory of tufted hairgrass (Deschampsia cespitosa) and a large number of other native prairie grasses, sedges, rushes, and forbs.

Several rare plant species, including Bradshaw's desert-parsley (Lomatium bradshawii), Willamette daisy (Erigeron decumbens ssp. decumbens), 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 (Lomatium bradshawii 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 (Rubus discolor) are found, as well as patches of native shrubs such as Douglas' spiraea (Spiraea douglasii). 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 - (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 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 - (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 - (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. Several native wetland species have managed to establish in the wet areas, such as spikerush (Eleocharis acicularis), and one-sided sedge (Carex unilaterialis). This unit is still mowed or cut for hay once a year.

Upland Old Field - (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 - (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, (Pseudotsuga menziesii), Scot's broom (Cytisus scoparius), and Himalaya blackberry.

The upland prairie supports a rare plant species, Kincaid's lupine (Lupinus sulphureus ssp. kincaidii), 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 - (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 - (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 (Phalaris arundinacea). 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 - (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 - (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 (Populus trichocarpa), Oregon ash, and Piper willow (Salix piperi), in varying proportions. In addition, much of the surface area mapped as this type consists of open water created by beaver ponds.

Open Water - (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 - (13 acres) Several oak groves of different sizes occur over the site. Both Oregon white oak (Quercus garryana) and California black oak (Quercus kelloggii) are present. A few tall Douglas-firs (Pseudotsuga menziesii) 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 - (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 old stumps, indicating that these groves are of relatively recent origin. There is no historical evidence that Douglas-fir occurred within the natural area 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.

3.1 Bailey Hill Habitat Types

The Bailey Hill property consists of approximately 125 ac, which is located primarily in the northwest and southeast portions of the site. Eight habitat types make up the Bailey Hill property and include:

Wet Pasture	27.3
Upland Pasture	28.1
Upland Prairie	9.9
Invaded Wet Prairie	3.7
Forested Wetland	44.2
Conifer Forest	2.2
Oak Forest	3.5
Riparian Forest	6.1

Total: 125.00 acres

The BPA currently has an option to purchase the Bailey Hill property, contingent on the outcome of the habitat evaluation for the site. This paper recognizes however, that for management purposes, such as the enhancement of native vegetation, it would be more appropriate to address the entire site, not just the Bailey Hill property.

4 EVALUATION PROCEDURES

Habitat evaluation procedures (HEP) developed by the U.S. Fish and Wildlife Service (USFWS 1980), utilizes a species/habitat approach for quantifying relative habitat values. Several wildlife species are selected for a particular area. Each species has various habitat needs that are documented in a Habitat Suitability Index (HSI) model. HSI models primarily focus on the measurement of physical and chemical habitat variables which are used to calculate an index to habitat quality. The model includes information on habitat use, model structure, assumptions, application, and references.

The habitat in a study area is compared to optimum habitat (defined in HSI model) for a species to result in a HSI. The HSI is a number between 0 and 1:

0 represents no habitat suitability

1 represents optimum habitat suitability

The HSI is multiplied by the number of acres of a particular habitat in the study area to obtain Habitat Units (HU's).

$HSI \times Acres = HU's$

1 Habitat Unit = 1 acre with optimum habitat suitability

To determine the impact of a proposed action, the existing or baseline habitat condition is compared to predicted future habitat conditions at predetermined Target Years (TY). Target Year 0 (TY0) represents baseline conditions. Target Year 1 (TY1) represents the first year land and/or water use is expected to change. Other Target Years are selected up to the completion of a proposed action or the end of the economic life of the action.

Using the same HSI models, the area of available habitat and HSI's are estimated for each evaluation species and future Target Year. HU's are determined for each Target Year and annualized by summing HU's throughout the analysis period and dividing by the number of years in that period (in this case, 50 years). This results in Average Annual Habitat Units (AAHU). Annualization of HU's facilitates the comparison of various alternative actions for impact assessment (Tables 6 and 7).

For all the alternatives analyzed, the following general assumptions were made in regard to the changes in habitat conditions over the lifetime of the project (50 years):

1. HU's were calculated at Target Years 0, 1, 25, and 50.

2. For all of the alternatives, it was assumed that:
 - at Year 0 there would be no changes in habitat conditions.
 - at Year 1, 10% of the habitat changes would have occurred.
 - at Year 25, 90% of the habitat changes would have occurred.
 - at Year 50, 100% of the habitat changes would have occurred.
3. For selected species that had more than one HSI value, a weighted value was calculated which was then used to determine AAHU's. The calculation for this value was:

$$\frac{\text{Total \# of HU's}}{\text{Total \# of acres}} = \text{HSI weighted value}$$

5 SPECIES SELECTION

The HEP team selected the following species to determine the relative value of wildlife habitat at Willow Creek:

1. Yellow Warbler (Dendroica petechia)
2. Valley Quail (Callipepla californica)
3. Beaver (Castor canadensis)
4. Western Pond Turtle (Clemmys marmorata)
5. Black-capped Chickadee (Parus atricapillus)
6. Western Meadowlark (Sturnella neglecta)
7. Red-tailed Hawk (Buteo jamaicensis)

Criteria for species selection was based on 1) the priority goals developed in the Willamette River Basin Wildlife Mitigation Plan, and target species for the Willamette Basin Projects (see Table 1 below); 2) habitat use; 3) ecological role; and 4) early discussions with Cathy Macdonald and Ed Alverson (TNC), Charlie Craig (BPA), and Pat Wright and Larry Rasmussen (USFWS).

Table 1. Target Species of the Willamette Basin Projects

<u>Big Game</u>	<u>Waterfowl</u>	<u>Upland Game</u>
Black-tailed deer	Harlequin duck	Ruffed grouse
Roosevelt elk	Wood duck	California quail
Black bear	Common merganser	Ring-necked pheasant
Cougar	Greater scaup	Band-tailed pigeon
		W. gray squirrel

Table 1. cont.

<u>Furbearers</u>	<u>Nongame</u>	<u>Nongame cont.</u>
Beaver	Bald Eagle	American Dipper
River otter	Osprey	Yellow Warbler
Mink	Spotted Owl	
Red fox	Pileated Woodpecker	

Habitat use in relation to food, reproduction, cover requirements, and season of use of candidate species was particularly important in final species selection. Selected species ranged from having specific habitat preferences (eg. Western Pond Turtle) to species utilizing a majority of the habitat types at Willow Creek (eg. Red-tailed Hawk). A matrix was developed in the early stages of the HEP, which displayed the evaluations species and their use of habitat types (see Table 2).

The species selected represent guilds of species, including:

- cavity nesters (Black-capped Chickadee)
- riparian tree nesters (Black-capped Chickadee)
- upland game birds (Valley Quail)
- shrub-scrub users (Valley Quail, Beaver, Yellow Warbler)
- furbearers (Beaver)

No species were chosen to represent waterfowl, wading, or shorebirds since little habitat is present at Willow Creek to support species in these groups. Essentially all of the habitat at Willow Creek was considered suitable for big game such as deer and elk, and no models were chosen to represent this guild.

Species were also chosen to represent wetland users, (Beaver, Western Pond Turtle), and open grassland users (Red-tailed Hawk, Valley Quail, Western Meadowlark, and Western Pond Turtle). The Western Pond Turtle was also evaluated because it is a species of concern (listed as Sensitive by the Oregon Dept. of Fish and Wildlife), whose habitat is diminishing statewide. The model used for the Western Pond Turtle is a draft which is currently being revised by the U. S. Fish and Wildlife Service; it was decided by the HEP team to use this version since it was the only one available at the time.

The Red-tailed Hawk model was added to include habitat requirements for raptors that were not covered in the other models (eg. number of trees ≥ 20 " dbh per acre). Models for the Ruffed Grouse, Downy Woodpecker, and Gray Squirrel were also considered, but it was determined by the HEP team that habitat requirements for these species would be adequately covered by the Valley Quail, Black-capped Chickadee, and Red-tailed Hawk models, respectively. All of the models used for selected species were obtained from the U.S. Fish and Wildlife Service (Table 3).

Table 2. Habitat Use of the Evaluation Species at Willow Creek

SPECIES	HABITAT										
Number of Acres	Upland Prairie (19)	Open Wet Prairie (15)	Invaded Wet Prairie (29)	Upland Pasture (65)	Wet Pasture (53)	Upland Old & Wet Old Fields (42)	Forested Wetland (84)	Oak Forest (13)	Conifer Forest (3)	Riparian Forest (9)	Open Water (2)
Yellow Warbler			X							X	
Valley Quail	X		X	X	X						
Beaver										X	X
Western Pond Turtle	X		X	X	X	X					X
Black-capped Chickadee							X	X	X	X	
Western Meadowlark	X	X		X	X	X					
Red-tailed Hawk	X	X		X		X	X	X	X	X	

Complete descriptions of each habitat type are in the Site Description Section

**Table 3. HSI MODEL VARIABLES (V) FOR SELECTED WILLOW CREEK
HEP SPECIES.**

1. YELLOW WARBLER

V1 = Percent deciduous shrub crown cover.

HSI: 1.0 if between 60% and 80%.

V2 = Average height of deciduous shrub canopy.

HSI: 1.0 if ≥ 6.6 ft.

V3 = Percent of deciduous shrub canopy comprised
of hydrophytic shrubs.

HSI: 0.1 to 1.0 if 0% to 100%.

Riparian forest (4 sample sites) and invaded wet prairie
(2 sample sites) habitats were evaluated with this
model. The suitability index is based on the
reproductive life requisite.

2. VALLEY QUAIL

V1 = Percent ground vegetation cover.

HSI: 1.0 if between 50% and 75%.

V2 = Average shrub height.

HSI: 1.0 if ≥ 6 ft.

V3 = Distance to escape cover (e.g. dense growth of
shrubs or vine tangles)

HSI: 1.0 if ≤ 100 ft.

V4 = Average diameter of escape cover patches.

HSI: 1.0 if between 10-20 ft.

V5 = Distance between escape cover patches.

HSI: 1.0 if between 75-225 ft.

Upland pasture, upland prairie, invaded wet prairie,
and wet pasture habitats (2 sample sites per habitat,
except for upland prairie with 1 sample site) were
evaluated with this model. The suitability index
was based on the cover life requisite.

3. BEAVER

V1 = Percent tree canopy closure.

HSI: 1.0 if between 40% to 60%.

V2 = Percent of trees in the 1-6" dbh size class.

HSI: 0.2 to 1.0 if 0% to 100%.

- V3 = Percent shrub crown cover.
HSI: 1.0 if between 40% to 60%.
- V4 = Average height of shrub canopy.
HSI: 1.0 if $\geq$ 6.6 ft.
- V5 = Species composition of woody vegetation (trees and/or shrubs).
HSI: 1.0 if woody vegetation dominated ($\geq$ 50%) by one or more of the following species: aspen, willow, cottonwood, or alder; 0.6 if woody vegetation dominated by other deciduous species. 0.2 if woody vegetation dominated by coniferous species (e.g. fir and pine).
- V6 = Percent of lacustrine surface dominated by yellow and/or white water lily.
HSI: 0.0 to 0.4 if 0% to 100%.
- V7 = Percent stream gradient.
HSI: 1.0 if $\leq$ 6%.
- V8 = Average water fluctuation on an annual basis.
HSI: 1.0 if small fluctuations that have no effect on burrow or lodge entrances; 0.5 if moderate fluctuations that affect burrow or lodge entrances; 0.0 if extreme fluctuations or water absent during part of the year.
- V9 = Shoreline development factor.
HSI: 1.0 if $\geq$ 3.0.

The riparian forest (4 sample sites) and open water (4 sample sites) habitat types were evaluated for the beaver. The HSI was equal to the lowest life requisite value obtained for either food or water, based on the limiting factor concept.

4. WESTERN POND TURTLE

- V1 = Percent cover of emergent and submerged vegetation
HSI: 1.0 if $\geq$ 75%.
- V2 = Water velocity and depth
HSI: 1.0 if shallow or moderate deep waters (< 2m depth) without water fluctuations and slow, still (undetectable flow to the eye) waters.
- V3 = Amount of in-water woody structure and/or vegetation or other refugia.
HSI: 1.0 if there was an abundance of in-water structure for both basking and cover combined.

V4 = Nesting potential

HSI: 1.0 if high quality and abundant nesting areas within 1/4 mile of pond turtle habitat.

The upland prairie and upland old field (1 sample site each); wet pasture, upland pasture, and invaded wet prairie (2 sample sites each) habitats, each in combination with the open water habitat (4 sample sites) were evaluated with this model. The HSI determination is equal to the life requisites for foraging, cover, and reproductive values.

5. BLACK-CAPPED CHICKADEE

V1 = Percent tree canopy closure.

HSI: 1.0 if between 50% and 75%.

V2 = Average height of overstory trees.

HSI: 1.0 if ≥ 49.2 ft.

V3 = Number of snags 4-10" dbh per acre.

HSI: 1.0 if ≥ 2 .

The riparian forest, forested wetland, conifer forest, and oak forest habitats (2 sample sites each except for the conifer forest, where only 1 sample was taken due to its small size) were evaluated with this model. The HSI determination was based on the lowest of the two values obtained for the food and reproduction life requisites.

6. WESTERN MEADOWLARK

V1 = Percent herbaceous canopy cover

HSI: 1.0 if $\geq 90\%$.

V2 = Proportion of herbaceous canopy cover that is grass

HSI: 1.0 if $\geq 80\%$.

V3 = Average height of herbaceous canopy (average spring conditions).

HSI: 1.0 if between 12-35cm.

V4 = Distance to perch site (such as tall forb, shrub).

HSI: 1.0 if ≤ 30 m.

V5 = Percent shrub crown cover.

HSI: 1.0 if $\leq 5\%$.

Upland prairie, upland pasture, open wet prairie, wet pasture, upland old field, and wet old field habitats were evaluated with this model.

All of the habitats had 2 sample sites, except for the upland prairie and wet old field, which had 1 sample site each. The HSI was equal to the life requisite value for food/reproduction.

7. RED-TAILED HAWK

V1 = Percent herbaceous canopy cover.

HSI: 1.0 if $\geq 65\%$.

V2 = Percent herbaceous canopy 3-18" tall in open areas.

HSI: 1.0 if $\geq 50\%$.

V3 = Number of perch sites (trees, poles) $\geq 10"$ dbh per acre in open areas.

HSI: This variable was modified so that there would be a forage value for areas without trees. 1.0 (high) if ≥ 3 trees per acre to 0.2 (low) if ≤ 1 tree per acre.

V4 = Percent tree canopy closure.

HSI: 1.0 if 0% to 50%. This variable was dropped by the HEP team upon determining that analyzing the value for food in this cover type (deciduous forest) would not apply to this area. Only the grassland (V3) cover type was analyzed.

5 = Number of trees $\geq 20"$ dbh per acre.

HSI: 1.0 if ≥ 10 trees per acre.

V6 = Percent area in optimum food.

HSI: 1.0 if $\geq 70\%$.

V7 = Percent area in optimum reproduction.

HSI: 1.0 if $\geq 15\%$.

V8 = Distance between cover types.

HSI: 1.0 if 0.0 to 0.75 mi.

The upland old field, conifer forest, upland prairie, (each with 1 sample site), riparian forest (4 sample sites), upland pasture, oak forest, and open wet prairie (2 sample sites each) habitats were evaluated with this model. The HSI determination was equal to the lower of the two values obtained for the food and reproduction life requisites.

6 METHODOLOGY

In the fall of 1993, an interdisciplinary team was formed to develop and implement quantitative Habitat Evaluation Procedures (HEP) to document the value of various habitats in the Willow Creek Natural Area. HEP participants included; Cathy Macdonald and Ed Alverson, The Nature Conservancy (TNC); Charlie Craig, Bonneville Power Administration (BPA); Pat Wright and Kathy Larson, U. S. Fish and Wildlife Service (USFWS); and Sue Beilke, Oregon Department of Fish and Wildlife (ODFW).

6.1 Data Collection

Several meetings were held with the HEP field team (Ed Alverson, TNC; Kathy Larson, USFWS; and Sue Beilke, ODFW), to discuss the models chosen and to determine what types of sampling methods would be used. The data collected measured the present habitat conditions at Willow Creek. It was agreed upon that estimates of future habitat conditions with and without management (see 6.2) would also be done in the field. This determination would be helpful later in writing a management plan for the area.

Data for the model variables was collected on February 2 and 3, March 2, and April 13, 1994. Since field sampling occurred in the winter and early spring, the determination for such variables as height of herbaceous canopy cover and tree canopy closure proved difficult. Hence data for some of the variables was based on both information from field measurements and a HEP team member's knowledge of vegetative and hydrologic conditions in the late spring and summer; this included the following variables: % tree canopy closure, height of herbaceous canopy, % herbaceous canopy cover, % herbaceous canopy 3-18" tall, % cover of emergent vegetation, and average water fluctuation on an annual basis.

General assumptions that were made regarding present habitat conditions include the following:

1. Height of forbs in the upland and wet old fields would be under 2' tall for 10 months of the year (August - May), but $\geq 2'$ for the months of June and July.
2. Water fluctuations in Willow Creek occur at a moderate level, and are below optimal conditions for beaver. Optimal water conditions under the model include stable water levels that have no effect on burrow or lodge entrances.
3. Height and canopy cover of herbaceous components in the upland pasture, upland prairie, open wet prairie, and wet pasture habitats were estimated based on the characteristics of the native and non-native species present.

4. Amount of emergent vegetation in the open water habitat was estimated based on conditions at the time of the surveys, and the HEP team's knowledge of the habitat.

5. Upland old field and wet old field habitat types were combined and analyzed as one habitat type due to their similarities and location (the wet old field is contained within the upland old field).

Habitat data was collected using a total of 19 sampling sites for the HSI models for Willow Creek (see Figure 3). Habitat measurements were made at 25 ft intervals along a 125 ft transect. For some variables, such as herbaceous canopy closure and # of snags, the area measured extended 20 ft on either side of the transect. Sampling techniques included the use of a clinometer, stadia rod, dbh tape, ocular estimation, and field team consensus to determine habitat variables.

6.2 Future Habitat Conditions

Future habitat conditions were analyzed based on four management alternatives developed for the site. Two of the alternatives, the Proposed Action and Presettlement, would utilize various strategies and management actions to restore or enhance existing habitats toward desired habitats. The third alternative, Maintain Status Quo, would maintain the existing baseline habitat conditions. The No Active Management alternative would be a hands-off approach, allowing plant succession. Table 4 depicts the baseline and future habitat conditions for each alternative.

Proposed Action Alternative: The greatest diversity of natural habitats would be managed for under this alternative. Emphasis would be on habitat modifications that restore native plant communities. Habitat types typical of different successional states, including grasslands, savannas, riparian forests, and forested wetlands, would be managed for.

Most of the ash trees and all non-native species (apple, blackberry, pear, etc.) invading the open wet prairie and upland prairie habitats would be removed. This could affect the HSI value and/or the HUs (increase or decrease) for one or more of the selected wildlife species. The open wet prairie and upland prairie habitats would be restored to predominantly native prairie grasses. A majority of the oak woodland would be restored to oak savanna with larger trees and a more open canopy cover than what exists under the present conditions.

Presettlement Alternative: Under this alternative, most of the area would be restored to either open wet prairie or upland prairie habitats, with the forested wetland being converted to ash savanna. The ash and oak savannas would contain large, mature trees interspersed with open, grassy areas. The non-native species present such as Himalaya blackberry, pear, apple, etc. would be removed. The ash trees invading the pasture and prairie habitats would be removed. Native grasses and forbs would dominate the upland and open wet prairie habitats. There would be very little forested wetland remaining on the site, with the open water (approximately one acre) consisting of small ponds or marshy areas contained within the wet prairie habitat.

Maintain Status Quo Alternative: Under this alternative, the existing habitat conditions as established by the HEP would be maintained. No enhancement activities would occur. Control of plant succession and invasive plants such as Himalaya blackberry and reed canary grass would occur only to the extent that it maintained the existing habitat conditions.

No Active Management Alternative: Plant succession would continue unmanaged, leading to dominance by TY50 of forested wetland in the lowlands (predominantly Oregon ash with some non-natives such as pear, Himalaya blackberry, and reed canary grass), conifer forest on the uplands, where soils are better drained, and a small amount of riparian forest and open water. All of the open areas, such as the upland prairie and open wet prairie, would gradually become forested.

Table 4. Baseline and Future Habitat Conditions at Willow Creek Under Differing Management Scenarios

Baseline Conditions	Proposed Action	Presettlement	Maintain Status Quo	No Active Management
Forested Wetland	Forested Wetland		Forested Wetland	Forested Wetland
Ash Savannah	Ash Savannah	Ash Savannah	Ash Savannah	
Riparian Forest	Riparian Forest		Riparian Forest	Riparian Forest
Conifer Forest	Conifer Forest		Conifer Forest	Conifer Forest
Invaded Wet Prairie			Invaded Wet Prairie	
Oak Forest	Oak Forest		Oak Forest	
Oak Savannah	Oak Savannah	Oak Savannah	Oak Savannah	
Open Wet Prairie	Open Wet Prairie	Open Wet Prairie	Open Wet Prairie	
Upland Fill			Upland Fill	
Upland Old Field*			Upland Old Field*	
Wet Old Field*			Wet Old Field*	
Upland Pasture			Upland Pasture	
Upland Prairie	Upland Prairie	Upland Prairie	Upland Prairie	
Wet Pasture			Wet Pasture	
Open Water	Open Water		Open Water	Open Water
Total Acres	Total Acres	Total Acres	Total Acres	Total Acres
84	91	29	84	183
0	12		0	
9	9		9	9
3	3		3	155
29			29	
13	2		13	
0	21	13	0	
15	87	174	15	
15			15	
40			40	
2			2	
65			65	
19	122	133	19	
53			53	
2	2		2	2
349	349	349	349	349

*Upland Old Field and Wet Old Field were combined for the habitat analysis.

7 RESULTS AND DISCUSSION

The HSI scores for the evaluation species are displayed in Table 5. Habitat suitability under the existing conditions ranged from 0.26 for the Western Pond Turtle in the upland and wet old fields habitats, to 1.00 for the Western Meadowlark in the open wet prairie habitat. HSI scores for several species, (Red-tailed Hawk, 1.00 and 0.60; and Beaver, 1.00 and 0.50), were based on the model requirements of using the lowest of the two values for the reproduction and food (Red-tailed Hawk), and food and water (Beaver) life requisites.

The total number of HUs was relatively low for both the Yellow Warbler and Beaver (both listed as target species for the Willamette Basin Projects) due in part to the small amount of habitat present for these species. The quality of the habitat for both species varied from near optimal (0.86 in the riparian forest habitat for the Yellow Warbler) to below optimal (0.50) for the Beaver in the open water habitat (see discussion below).

7.1 Discussion of Baseline (Table 5) and Future Habitat (Tables 6 and 7) Conditions for each Target Species. (For discussion of AAHUs for the evaluation species and management alternatives, see section 7.3.)

YELLOW WARBLER

- **Baseline Habitat Conditions:** Preferred habitats of the Yellow Warbler are wet areas with abundant shrubs or small trees, but also includes marshes and willow thickets. The HSI model considers the quality of the reproduction (nesting) habitat needs of the Yellow Warbler to determine overall habitat suitability. Food, cover, and water requirements are assumed to be met by nesting needs. In the riparian forest the HSI value of 0.86 reflects the near optimal habitat conditions. The invaded wet prairie was of moderate value (0.58) due to the low number of hydrophytic species in the shrub component and the encroachment of non-native plant species such as Himalaya blackberry into the area.

- **Proposed Action Alternative:** Invaded wet prairie would be converted to wet prairie under this alternative, with a resulting loss of some of the shrub component, and thus a slight decrease in the total number of HUs (see Table 6). The riparian forest would remain, which would provide high quality habitat for the Yellow Warbler.

- **Presettlement Alternative:** Under this alternative, the riparian forest and invaded wet prairie would be converted to wet prairie, and the shrub component (eg. willows in the riparian forest) would be eliminated. As a result, both the quality and quantity of habitat would decrease.

- **Maintain Status Quo Alternative:** Baseline habitat conditions would be maintained under this alternative.

- **No Active Management Alternative:** Both the quality and quantity of habitat would decrease under this alternative. The value of the riparian habitat would decrease somewhat for the Yellow Warbler due to the increase in non-native plant species. The invaded wet prairie would become ash forest, resulting in a loss of nesting habitat.

VALLEY QUAIL

- **Baseline Habitat Conditions:** Optimal habitat conditions for the Valley Quail consist of a high degree of interspersation of herbaceous and woody cover and water sources within a small area. Habitat conditions were optimal in the upland pasture (1.00) and slightly below optimal in the remaining habitats analyzed (0.71 to 0.81).

- **Proposed Action Alternative:** Under this alternative, the conversion of the upland pasture to upland prairie, and invaded wet prairie to wet prairie, would be beneficial by improving habitat conditions (increase in food availability). Both the quality and quantity of suitable habitat would increase.

- **Presettlement Alternative:** Most of the habitat at Willow Creek under this alternative would be restored to open wet prairie or upland prairie, interspersed with ash and oak savannahs. As a result, food availability and cover and reproductive requirements would be at optimal conditions.

- **Maintain Status Quo Alternative:** Baseline habitat conditions would be maintained under this alternative.
(continued on page 31)

- **No Active Management Alternative:** This alternative would result in a loss of suitable habitat, due to the conversion of the pasture and prairie habitats to either forested wetland or conifer forest. Because of the model requirements (high degree of interspersation of food, cover, and reproductive habitats), the value of the remaining habitat (cover) would be low.

Table 5. BASELINE HABITAT CONDITIONS

Willow Creek Habitat Evaluation based on Suitability for Selected Wildlife Species. Results are expressed as Habitat Suitability Indices (HSI) converted to Habitat Units (HU).

<u>SPECIES</u>	<u>HABITAT TYPE</u>	<u>ACRES</u>	<u>HSI</u>	<u>HU</u>
1. <u>Yellow Warbler</u>				
	riparian forest	9	0.86	8
	invaded wet prairie	29	0.58	17
				25
2. <u>Valley Quail</u>				
	upland pasture	65	1.00	65
	upland prairie	19	0.71	13
	invaded wet prairie	29	0.80	23
	wet pasture	53	0.81	43
				144
3. <u>Beaver</u>				
	riparian forest, open water	11	0.50*	6
4. <u>Western Pond Turtle</u>				
	upland prairie, open water	21	0.78	16
	upland pasture, open water	67	0.59	40
	wet pasture, open water	55	0.42	23
	invaded wet prairie, open water	31	0.47	15
	upland & wet old fields, open water	44	0.26	12
				106
5. <u>Black-capped Chickadee</u>				
	riparian forest	9	1.00	9
	forested wetland	84	0.70	42
	conifer forest	3	0.92	3
	oak woodland	13	0.95	12
				66
6. <u>Western Meadowlark</u>				
	upland pasture	65	0.54	35
	upland prairie	19	0.77	15
	open wet prairie	15	1.00	15
	wet pasture	53	0.30	16
	upland & wet old fields	42	0.70	29
				110
7. <u>Red-tailed Hawk</u>				
	upland & wet old fields, conifer forest, upland prairie, riparian forest, upland pasture, oak forest, & open wet prairie	166	0.60*	100
				Total HUs: 575

*HSI determination was based on the lower of the two HSI values (Red-tailed Hawk, 0.6 for reproduction and 1.00 for the food component; Beaver, 1.0 for winter food and 0.50 for water). See the RESULTS AND DISCUSSION section.

Table 6.

COMPARISON OF MANAGEMENT ALTERNATIVES AND AAHU'S

ALTERNATIVES

	Proposed Action	Pre- Settlement	Maintain Status Quo	No Active Mngt.
SPECIES				
1. Yellow Warbler	19.35	13.18	25.08	9.76
2. Valley Quail	159.82	199.36	144.42	20.94
3. Beaver	6.05	1.33	6.05	6.05
4. Western Pond Turtle	155.18	69.02	106.82	22.55
5. Black-capped Chickadee	103.52	38.40	82.84	239.59
6. Western Meadowlark	157.99	232.03	110.58	18.27
7. Red-tailed Hawk	<u>212.80</u>	<u>247.74</u>	<u>99.60</u>	<u>97.11</u>
Total AAHU's:	814.71	801.06	*575.39	414.27

*Management under the Maintain Status Quo alternative would maintain the existing conditions, hence the HUs would be the same.

Table 7. Net Change in Average Annual Habitat Units (AAHU) for Proposed Action, Presettlement, and Maintain Status Quo Management Alternatives compared to No Active Management for Willow Creek

Proposed Action compared to No Active Management

<u>Evaluation No.</u>	<u>Species Name</u>	<u>AAHU's Proposed Action</u>	<u>AAHU's No Active Mngt.</u>	<u>Net Change</u>
1.	Yellow Warbler	19.35	9.76	9.59
2.	Valley Quail	159.82	20.94	138.88
3.	Beaver	6.05	6.05	0.00
4.	Western Pond Turtle	155.18	22.55	132.64
5.	Black-capped Chickadee	103.52	239.59	-136.07
6.	Western Meadowlark	157.99	18.27	139.72
7.	Red-tailed Hawk	212.80	97.11	115.69
Total:		814.71	414.27	+400.45 (net change)

Presettlement compared to No Active Management

<u>Evaluation No.</u>	<u>Species Name</u>	<u>AAHU's Presettlement</u>	<u>AAHU's No Active Mngt.</u>	<u>Net Change</u>
1.	Yellow Warbler	13.18	9.76	3.42
2.	Valley Quail	199.36	20.94	178.42
3.	Beaver	1.33	6.05	-4.72
4.	Western Pond Turtle	69.02	22.55	46.47
5.	Black-capped Chickadee	38.40	239.59	-201.18
6.	Western Meadowlark	232.03	18.27	213.76
7.	Red-tailed Hawk	247.74	97.11	150.63
Total:		801.06	414.27	+386.80 (net change)

Table 7. continued

Maintain Status Quo compared to No Active Management

Evaluation Species		AAHU's	AAHU's	Net
No.	Name	*Maintain Status Quo	No Active Mngt.	Change
1.	Yellow Warbler	25.08	9.76	15.32
2.	Valley Quail	144.42	20.94	123.48
3.	Beaver	6.05	6.05	0.00
4.	Western Pond Turtle	106.82	22.55	84.27
5.	Black-capped Chickadee	82.84	239.59	-156.75
6.	Western Meadowlark	110.58	18.27	92.31
7.	Red-tailed Hawk	99.60	97.11	2.49
Total:		575.39	414.27	+161.12 (net change)

*Habitat conditions under the Maintain Status Quo alternative would be the same as the baseline conditions.

BEAVER

- **Baseline Habitat Conditions:** The HSI for the Beaver (0.50) was based on a "limiting factor concept"; in this case the HSI was equal to the lowest life requisite value obtained for either food (1.0) or water (0.50). In the Beaver model, optimal conditions for the water component of the habitat (in all wetland cover types) require little or no fluctuation in water levels on an annual basis, in order to have a minimum impact on burrow or lodge entrances. Based on conditions on the site (the creek usually dries up in late summer, water levels in the ponds drop, and they eventually become dry for a short time in late summer before the autumn rains return), and the model parameters, water levels in Willow Creek fluctuate at a "moderate" level, resulting in a suitability index of 0.50, somewhat below optimal. Due to the limitations of the model, however, it may not adequately reflect all of the actual conditions on the ground for the Beaver. At the present time there appears to be an active Beaver population, with numerous dams and ponds having been constructed along both the West and East forks of Willow Creek.

- **Proposed Action Alternative:** The amount of suitable habitat for the Beaver would not change under this alternative. The riparian forest and open water habitats would be maintained, and since the fluctuating water level would not change, the HSI value would remain the same (0.50). Conditions for the food component in the riparian forest would remain at optimal levels.

- **Presettlement Alternative:** A loss of habitat would occur under this alternative, due to the conversion of riparian forest and open water to wet prairie habitat. Food availability (eg. woody vegetation) would be reduced with the loss of the riparian forest habitat. The loss of a permanent and stable source of water, which is mandatory for suitable Beaver habitat, would result in the loss of cover for the feeding and reproductive activities of the Beaver.

- **Maintain Status Quo Alternative:** Under this alternative, the baseline habitat conditions would be maintained.

- **No Active Management Alternative:** Without management of the site, natural plant succession would be allowed to continue, resulting in 247 acres of forested habitats with 2 acres of open water. Habitat conditions for the Beaver are expected to remain the same as under the baseline conditions.

WESTERN POND TURTLE

- **Baseline Habitat Conditions:** The HSI model was adapted from the slider turtle model combined with information on the ecology of the Western Pond Turtle. HSI values for the Western Pond Turtle varied from 0.26 in the upland and wet old fields, to 0.78 in the upland prairie habitat. The values obtained in the habitats analyzed reflect the habitat conditions for the foraging, basking, cover, and reproductive life requisites. The HSI value for the upland prairie habitat is relatively high due to the high quality nesting habitat available.

In the remaining four habitats analyzed, the HSI values ranged from 0.26 to 0.59, due to one or a combination of all three of the following: 1) the marginal nesting habitat available, 2) a lack of sufficient basking structures, 3) a low percentage of emergent and submerged vegetative cover, or 4) a combination of all three.

- **Proposed Action Alternative:** Both the quality and quantity of suitable nesting habitat for the Western Pond Turtle would increase under this alternative, with the conversion of the upland pasture and upland old field to upland prairie, and the wet pasture, invaded wet prairie, and wet old fields to wet prairie.

Enhancement activities under this alternative would include the removal of non-native plant species, and the placement of basking structures where needed. This would increase the amount of resting and basking cover, and reduce barriers (thickets of blackberries) between nesting habitat and water sources.

- **Presettlement Alternative:** High quality nesting habitat would be available in the upland prairie under this alternative. However, the loss of most of the open water habitat (which would become wet prairie), would mean a loss of foraging, cover, and basking habitat. Overall, the quality and quantity of suitable habitat would decrease.

- **Maintain Status Quo Alternative:** This alternative would maintain the baseline habitat conditions.

- **No Active Management Alternative:** Under this alternative, the only remaining habitat type for the Western Pond Turtle would be open water (2 acres), which would provide some foraging, resting, and basking habitat. Only a small amount of nesting habitat would be present since most of the open areas (eg. upland prairie) would transition to forest habitat by TY50. This alternative would result in the greatest loss of suitable habitat.

BLACK-CAPPED CHICKADEE

- **Baseline Habitat Conditions:** The HSI values for the Black-capped Chickadee were optimal or near optimal in all of the habitats analyzed except for forested wetland (0.70). Conditions in the riparian and conifer forests, and oak woodland reflect the ability of these habitat types to meet the food and reproductive needs (2 snags per acre, with a d.b.h. of 4-10"; canopy closures between 50-75%; and overstory trees 49' 2" or more in height) of the Black-capped Chickadee.

- **Proposed Action Alternative:** Both the food and reproduction values for the Black-capped Chickadee would increase under this alternative, resulting in optimal habitat conditions. As the forested areas mature, a more open canopy closure would result, and more snags would be available for nesting. The amount of total suitable habitat would increase as compared to the baseline conditions.

- **Presettlement Alternative:** Most of the suitable habitat for the Black-capped Chickadee would become wet prairie, upland prairie, or savanna under this alternative. The remaining habitat (oak or ash savanna), would be marginally suitable (eg. % tree canopy closure would be below optimal).

- **Maintain Status Quo Alternative:** Baseline habitat conditions would be maintained under this alternative.

- **No Active Management Alternative:** If no action was taken to alter plant succession at Willow Creek, habitat conditions for the Black-capped Chickadee would be at optimal levels due to the increase in the amount of forested habitat, with a resulting increase in mature trees, more snags, and a more open canopy closure over time. This alternative would have the largest amount of suitable habitat as compared to the other alternatives.

WESTERN MEADOWLARK

- **Baseline Habitat Conditions:** HSI values for the Western Meadowlark ranged from 0.30 in the wet pasture to 1.00 in the open wet prairie. Optimal habitat conditions include herbaceous cover types dominated by grasses of moderate heights with low shrub densities, and adequate numbers of perches. Habitat conditions in the upland pasture and wet pasture habitats were moderately suitably or marginal due mainly to the encroaching shrubs and trees (ash and pear) in many areas, and a lack of native grasses.

- **Proposed Action Alternative:** Both the quality and quantity of suitable habitat would increase under this alternative, providing optimal habitat conditions for the Western Meadowlark. Native plant communities would be restored, and non-native plants species would be removed in the upland pasture, wet pasture, and upland and wet old fields, improving both the food and reproductive components in these habitats.

- **Presettlement Alternative:** Almost all of the habitat at Willow Creek would be open wet or upland prairie under this alternative, providing optimal habitat conditions (see discussion above for proposed action) for the Western Meadowlark. As a result, this alternative would have the greatest amount of suitable habitat for the Western Meadowlark as compared to the other alternatives.

- **Maintain Status Quo:** Baseline habitat conditions would be maintained under this alternative.

- **No Active Management Alternative:** Under this alternative, most of the open grassland would eventually become forested habitat by TY50. As a result, both the quality and quantity of the remaining habitat would decrease, with little suitable habitat remaining.

RED-TAILED HAWK

- **Baseline Habitat Conditions:** High quality habitat for the Red-tailed Hawk includes a sufficient number of perches from which to hunt, open grassy areas, and mature trees which provide sites for nest locations. The interspersation of these habitat components is important, and the model assumes that the best habitat for the Red-tailed Hawk contains high quality food over 70 percent of the habitat, and high quality reproductive habitat over 15 percent of the area.

The HSI values obtained for the Red-tailed Hawk at Willow Creek were 1.00 for the food component, and 0.60 for the reproductive value; the final HSI was 0.60 based on the lower of the two scores. This value (0.60) indicates conditions were somewhat below optimal for the reproductive component in the forested habitats; the number of trees $\geq$ 20" dbh per acre was below optimum for all the habitats sampled.

- **Proposed Action Alternative:** The restoration of native plant communities in the pasture, prairie, and field habitats would provide optimal conditions for the food component (eg. > 50% herbaceous canopy 3 to 18 inches tall) of the Red-tailed Hawk model. Habitat conditions for the reproductive component would be at optimal levels.

These conditions would result due to an increase in the availability of suitable nest trees (10 or more trees > 20 inches dbh per acre). As a result, both the quality and quantity of suitable habitat would increase.

- **Pre-settlement Alternative:** Optimal habitat conditions for the Red-tailed Hawk would exist under this alternative due to 1) the high quality food components in the open wet prairie and upland prairie habitats, and 2) the ash and oak savannahs would provide high quality reproductive habitat, with large, mature trees for nesting. This alternative would have the greatest increase in suitable habitat from the existing baseline conditions.

- **Maintain Status Quo Alternative:** Under this alternative, the baseline habitat conditions would be maintained.

- **No Active Management Alternative:** The HSI value for the Red-tailed Hawk under this alternative would be low due to the absence of open grasslands for hunting, and thus a decrease in food suitability (abundance and accessibility of suitable prey). Most of the site would be forested, and would provide higher quality nesting habitat than what is present under the baseline conditions. Overall, habitat suitability would be low due to the lack of suitable hunting areas.

7.2 Baseline and Future Habitat Conditions for the Bailey Hill Property

A rough estimate of HUs for the Bailey Hill property was done for the baseline habitat conditions, based on total acres for each habitat on the site, versus the percentage of each habitat on Bailey Hill only. This percentage was then multiplied times the total number of HUs per habitat type. The result was a total of approximately 201 HUs for the Bailey Hill property, out of a total of 574 HUs for the entire site.

Future habitat conditions on the Bailey Hill property would vary, depending on the management alternative. Under the Proposed Action, both prairie habitat and forested areas would be present, with the non-native plant species being removed from areas such as the invaded wet prairie.

The wet pasture and invaded wet prairie habitats would be restored to wet prairie under the Presettlement alternative, the forested habitats (conifer, oak) would become savannas, and the forested wetland would be a mix of wet prairie and ash savanna. Baseline habitat conditions would be maintained under the Maintain Status Quo alternative, and there would be no changes in habitat types or acreages.

If no action was taken to alter plant succession (No Active Management), the open habitat types, such as the upland prairie, would eventually become either conifer forest or forested wetland. The riparian habitat would remain. Estimates of AAHU's for the alternatives was not done for the Bailey Hill property.

7.3 Total AAHUs and Net Changes Between Alternatives

Tables 6 and 7 compare total number of AAHUs for each alternative and net changes in AAHUs. The total AAHUs for each alternative are compared in Table 6. The No Active Management alternative would result in 414.27 AAHUs, the lowest total, since it would be beneficial to the Black-capped Chickadee while negatively impacting the remaining species, except for the Beaver.

Species that utilize the open wet prairie or upland prairie habitats would benefit the most under the Presettlement alternative. Restoration and/or enhancement of native plant communities would improve habitat conditions for species such as the Valley Quail and Western Meadowlark, with a resulting increase in the number of AAHUs to approximately 801.06, as compared to 575 AAHUs under the existing conditions.

Management under the Proposed Action would result in the greatest number of AAHUs, 814.71; while it does not produce the largest number of AAHUs per individual species in some instances, overall it would benefit more species than the other alternatives since it would provide a mix of open grasslands, riparian, and forested habitats.

Table 7 compares future habitat with action (Proposed Action, Presettlement, and Maintain Status Quo) to future habitat without action (No Active Management). All of the three action alternatives would result in net gains in AAHUs as compared to the No Active Management alternative, with the largest gain for the Proposed Action.

Under No Active Management, five of the selected species would have a decline in suitable habitat, and therefore a loss of AAHUs. Habitat for the Beaver under this alternative is expected to be the same as under the baseline conditions. The only species that would benefit under this alternative would be the Black-capped Chickadee, since most of the site would be forested.

8 SUMMARY

At the present time, much of the Willow Creek site provides suitable habitat conditions for many wildlife species. Areas that are being invaded by non-native plant species, such as the invaded wet prairie, provide marginal or below marginal habitat for some of the species evaluated; without management, species such as the Western Pond Turtle and Valley Quail will be negatively impacted due to a decline in the quality and quantity of habitat in these areas. Future management that includes restoration and enhancement activities, such as eliminating non-native plant species and restoring native plant communities, would be beneficial by improving habitat conditions for the evaluation species and other wildlife that utilize the habitat at Willow Creek.

9 REFERENCES

- Allen, A.W. 1982. **Habitat suitability index models: Beaver.** U.S. Fish and Wildlife Service. FWS/OBS-82/10/30. 20pp.
- Cowardin, L.M. 1979. **Classification of Wetlands and Deepwater Habitats of the United States.** U.S. Fish and Wildlife Service. FWS/OBS-79/31. 103pp.
- U. S. Fish and Wildlife Service. 1991. **Habitat suitability index model: Western Pond Turtle.** Unpublished.
- Ingles, L.G. 1965. **Mammals of the Pacific States.** 3rd ed. Stanford University Press, Calif. 506pp.
- Northwest Power Planning Council. 1993. **Resident Fish and Wildlife Amendments to the Columbia River Basin Fish and Wildlife Program (Phase 4).**
- Schroeder, R.L. 1982. **Habitat suitability index models: Yellow Warbler.** U.S. Fish and Wildlife Service. FWS/OBS-82/10.27. 8pp.
- Schroeder, R.L. 1982. **Habitat suitability index models: Black-capped Chickadee.** U.S. Fish and Wildlife Service. FWS/OBS-82/10.37. 12pp.
- Schroeder, R.L., and P.J. Sousa, 1982. **Habitat suitability index models: Eastern Meadowlark.** U.S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.29.
- U.S. Army Corps of Engineers, Seattle District. 1984. **Wetland Plants of the Pacific Northwest.** 85pp.
- U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife. 1987. **A Wildlife Habitat Protection, Mitigation, and Enhancement Plan for Eight Federal Hydroelectric Facilities in the Willamette River Basin.**
- U.S. Fish and Wildlife Service. 1978. **Habitat suitability index models: California Quail.** Draft.
- U.S. Fish and Wildlife Service. 1980. **Habitat suitability index models: Red-tailed Hawk.** Draft.