PINE CREEK RANCH

WILDLIFE HABITAT AND WATERSHED MANAGEMENT PLAN

Confederated Tribes of the Warm Springs Reservation of Oregon

Pine Creek Ranch
39067 Highway 218
Fossil, OR 97830

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I. INTRODUCTION

A. Summary

Pine Creek Ranch, purchased by The Confederated Tribes of Warm Springs in November of 1999, and expanded in September of 2001, is the site of a unique opportunity made possible by mitigation funds from Bonneville Power Administration (BPA). The property offers the possibility of restoring a heavily impacted area to a more highly functioning condition that provides habitats for a variety of native plants and animals.

The issues facing the ranch are diverse and include: encroachment of juniper, non-native annual grasses, and noxious weeds; historic overgrazing and agricultural impacts, altered fire regime, channelization of streams, and declining native fish populations. If significant gains in quality of habitat and water are to be made, it will be through the combined efforts and talents of many people.

The plan includes property goals and objectives, historic and current status, management issues, guidelines for future management, and initial management actions.

B. Purpose and History of the Project

The Bonneville Power Administration (BPA) is mandated to mitigate for fish and wildlife habitat losses caused by the Columbia River dams. BPA achieves their mitigation program primarily through funding projects that are managed by tribes, conservation organizations, and natural resource agencies.

Tribal leaders of The Confederated Tribes of Warm Springs (Tribes) have long traditions of natural resource stewardship. In 1986, Tribal Council adopted Resolution 7410, mandating the use of an integrated approach to resource planning and management. Two Integrated Resource Management Plans have since been completed for reservation lands, IRMP I for forested lands, and IRMP II for non-forested and rural areas. In these plans, the Tribes have adopted the standard that all management decisions will ensure the protection of water quality, riparian vegetation, fish and wildlife habitat, and cultural resources.

In addition to managing natural resources on their reservation lands, the Tribes are active participants in the management of natural resources throughout their Ceded Lands, where the Tribes retain rights to fishing, hunting, gathering, and pasturing stock. Pine Creek Ranch is located near the center of the Tribes' Ceded Lands.

The Tribes identified Pine Creek Ranch as a possible BPA mitigation site in 1997, and by 1998, started the process to secure funds for its purchase. The Tribes took title in November 1999, using Watershed and Wildlife Mitigation funds from BPA.

The Tribes contracted with Oregon State University's Bioresource Engineering Department to prepare a management plan for the ranch, with Dr. Ron Miner and Denise Hoffert-Hay to lead

the project. Mark Berry, Habitat Manager of the ranch, led a 2-day field trip on September 21-22, 2000 for experts in range and water resource management. Denise Hoffert-Hay took detailed notes on field trip conversations, followed up with necessary clarifications, and prepared a summary document that identified management issues and possible strategies. Denise and Mark then collaborated in producing a draft management plan which was circulated for peer review by staff from Oregon State University, The Confederated Tribes, Oregon Department of Fish and Wildlife, Bureau of Land Management, and the Nature Conservancy. A revised draft was delivered from OSU on July 15, 2001. OSU published this draft as Special Report 1035 (Hoffert-Hay, 2002).

Prior to public and BPA review of this plan, it became apparent that acquisition of the Wagner Ranch, an adjacent property to be managed as part of the Pine Creek Ranch project, was likely to occur shortly. Acquisition of Wagner Ranch occurred on September 4, 2001.

This management plan has been amended by the Confederated Tribes to incorporate Wagner Ranch into the property, and will be made available for public review and review by BPA prior to adoption.

B. Purpose of Plan

This document sets forth a Watershed and Wildlife Habitat Management Plan for maintaining and facilitating the recovery of fish and wildlife habitat on Pine Creek Ranch (including Wagner Ranch).

This plan is not a comprehensive list of all management actions that may prove necessary to achieve the identified goals. An adaptive management strategy will allow modifications of management techniques after information is gained through monitoring efforts. This plan provides goals and objectives for the property, a description of ranch resources and management issues, initial management actions, and guidelines for future management actions.

Implementation of this plan is dependent upon receiving adequate Operation & Maintenance and Monitoring & Evaluation funding from BPA.

II. GOALS AND OBJECTIVES

A. Overall Goals for the Property

Pine Creek Ranch is intended, as a wildlife and watershed mitigation site, to partially offset wildlife habitat losses caused by John Day Dam on the Columbia River. Habitat management will, as specified in the MOA between BPA and the Tribes, to the extent possible, focus on strategies designed to achieve and maintain native habitat that is naturally self-sustaining.

In many cases, recovery of watershed functions or native plant communities may only occur over the course of several decades. Other changes, such as community dominance by invasive species, may be permanent without active intervention on the part of land managers. Future climate changes may also limit or prevent recovery to historic conditions.

Where possible, altered or damaged ecosystem functions will be restored through passive restoration techniques, such as the prevention of activities which degrade or prevent recovery. Passive restoration strategies will be paired with active interventions as needed, for replacement of culverts creating fish passage barriers, for example. It is hoped that these efforts will lead to conservation of biodiversity in the form of native fish, wildlife, and plant communities.

An additional goal for the project is to work in partnership with neighboring landowners, local, state and federal agencies, conservation organizations, and educational groups. Pine Creek Ranch has the potential to serve as a model for watershed recovery and wildlife habitat management in the lower John Day Basin. Successful monitoring of changes to vegetation, wildlife, and hydrology will be critical to this effort, and collection of baseline data is thus an immediate management priority.

The following objectives describe the overall management direction for the property. The objectives are listed in order of the plan text sections to which they relate. Objectives are numbered for reference to the specific management actions identified in Section XIX of this plan that address them. Note that each objective may be addressed by several management actions, and each management action may contribute to achieving several objectives.

B. Objectives

Upland Areas (Section VII)

1. Maintain a diverse, dynamic mosaic of native vegetation communities and wildlife habitats. Maintain or increase the extent of native bunchgrass and shrub steppe communities.

2. Maintain appropriate vegetation for healthy watershed function, including infiltration, storage, and release of water to maintain or improve water quality, water quantity and the timing and duration of flow.

3. Allow the occurrence of natural disturbance processes within their range of natural variability and the practical constraints of limited land area and altered ecological potential.

4. Reduce ongoing encroachment of western juniper into bunchgrass and shrub steppe habitat types. Reduce the impacts of juniper encroachment on watershed hydrology. Maintain a diversity of western juniper age classes and habitat structural conditions.

Riparian Areas and Floodplains (Section VIII)

5. Facilitate recovery of riparian systems in Proper Functioning Condition (Prichard, 1998) that will allow development of desired habitat characteristics.

6. Provide quality aquatic and riparian habitats for native fish and wildlife, within their natural potential.

7. Establish functioning riparian buffers and wildlife habitat by restoring key native vegetation species in abandoned agricultural fields adjacent to Pine Creek and the John Day River.

Listed Species (Section IX)

8. Protect habitats of all listed species as appropriate.

Wildlife and Fish (Section X)

9. Manage for native habitats that will sustain populations of diverse native wildlife species, while providing continued hunting opportunities for tribal members and the public.

10. Protect, maintain, or increase local populations of native steelhead and redband trout (*Oncorhynchus mykiss*) by allowing natural recovery of habitat.

11. Eliminate artificial fish passage barriers by replacing problem culverts with appropriate structures.

Water Rights (Section XI)

12. Restore irrigation water rights to instream flows. Utilize water rights on an interim basis as needed to achieve management objectives, including establishment of desired vegetation in floodplain fields.

Introduced Plant Species (Section XII)

13. Minimize the impacts of introduced species on native vegetation and hydrological function.

14. Reduce the potential spread of noxious weeds to uninfested areas and neighboring lands.

Grazing and Fences (Sections XIII & XIV)

15. Allow habitat recovery to occur prior to any managed livestock grazing on deeded lands. Utilize livestock grazing only as a wildlife habitat management tool, in conjunction with this plan and/ or future revisions. Coordinate management of Spring Basin and Amine Peak BLM grazing allotments with Prineville District BLM.

16. Work with neighbors to maintain or replace boundary fences as necessary to minimize trespass grazing.

17. Reduce the impact of interior fences on natural movement patterns of wildlife.

Roads (Section XV)

18. Minimize impacts of roads, including erosion and weed dispersal. Maintain only road segments necessary for management access to property. Allow unnecessary road segments to revegetate.

Fire Management (Section XVI)

19. Allow wildfires to play a role in the restoration and maintenance of native upland habitats, while taking into consideration concerns of neighboring landowners.

20. Utilize prescription fires in a safe and appropriate manner to benefit native habitats, e.g., by minimizing juniper encroachment.

Tribal and Public Access (Section XVII)

21. Allow regulated tribal and public access. Restrict access or activities that may harm natural resources or interfere with achievement of management objectives.

Land Exchange (Section XIX)

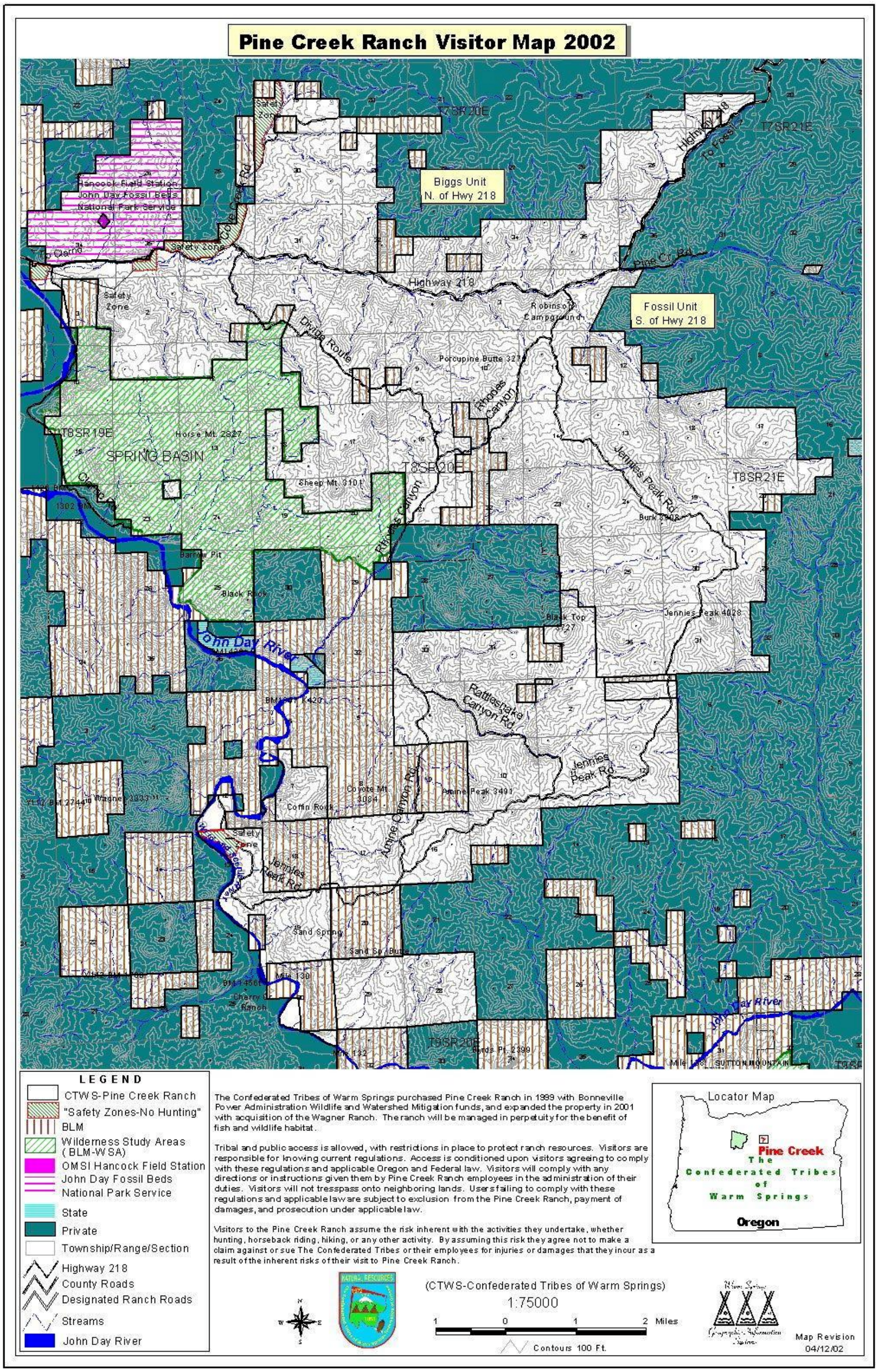
22. Work with the Prineville District BLM to achieve an equal-value land exchange which would consolidate ranch habitat and facilitate management of tribal and public lands.

Monitoring and Evaluation (Section XX)

23. Accurately monitor and evaluate changes in riparian conditions, upland vegetation, and wildlife habitats. Document the effects of management actions. Facilitate increased understanding of ecosystem recovery processes and potentials.

24. Encourage natural sciences research and educational activities.

Figure 1. Pine Creek Ranch Property Map.



III. WATERSHED OVERVIEW AND OWNERSHIP

Pine Creek Ranch is located in the Clarno Basin in the John Day Ecological Province of Eastern Oregon (Figure 1). The ranch is bordered to the west by the by the John Day River and Spring Basin Wilderness Study Area, managed by the Prineville District of the Bureau of Land Management (BLM). The Clarno Unit of the John Day Fossil Beds National Monument, managed by the National Park Service (NPS), is to the northwest of the ranch. The eastern portion of the ranch is bordered by privately owned land.

Wagner Ranch adjoins the eastern portion of the southern boundary of the original Pine Creek Ranch purchase, and extends south and west to the John Day River. Together with the Amine Peak BLM grazing allotment, Wagner Ranch encompasses 9.8 miles of the East bank of the John Day River.

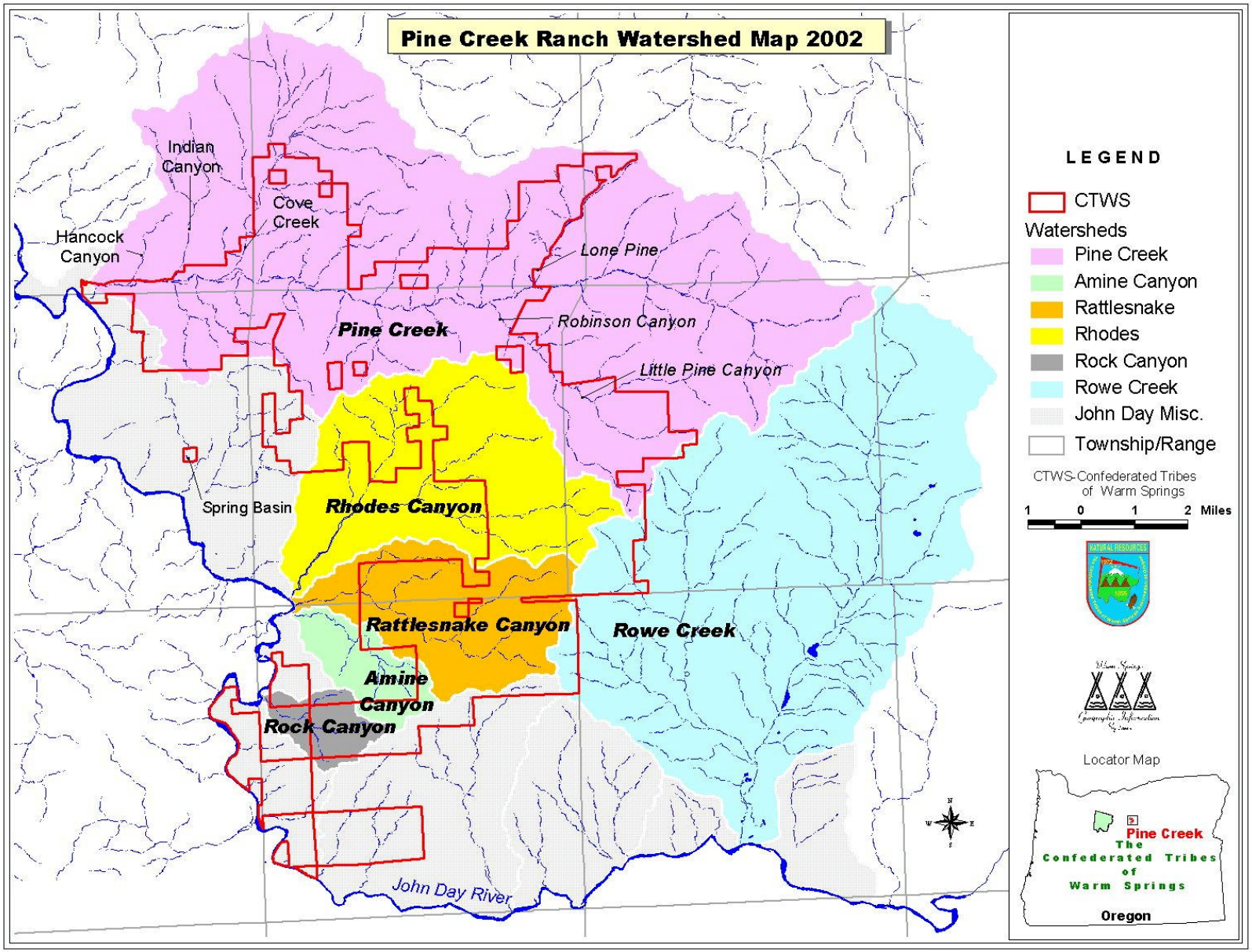
The entire ranch lies within the watershed of the lower John Day River (USGS Cataloging Unit: 17070204). The primary sub-watersheds within the ranch are Pine Creek and Rhodes Canyon, within the original Pine Creek Ranch purchase, and Rattlesnake, Amine, and Rock Canyons within the Wagner Ranch (Figure 2; Table 1).

Table 1. Watershed Ownership

Watershed	Sub-watershed	Size (acres)	CTWS ownership (acres/ % of total)	Other ownership (acres/ % of total)	Comments
Pine Creek	All	41,701	15,382 (37%)		Confluence at John Day River (T8SR19E Sec. 4)
Northern Pine Creek Tributaries	Cove Creek	8,541	1,545 (18%)	BLM (649) Private owners (6,347)	Largest sub-watershed of Pine Creek
	Lone Pine Creek	2,191	1,133 (52%)	BLM (40) Private owners (1,018)	Headwaters of Pine Creek above this tributary not owned by CTWS
	Indian Canyon	1,790	Outside ranch boundaries	John Day Fossil Beds National Mnmt. (33%)	
	Hancock Canyon	1,028	Outside ranch boundaries	John Day Fossil Beds National Mnmt.	

Southern Pine Creek Tributaries	Robinson Canyon	6,025	3,321 (including its tributary Little Pine Canyon)	Private ownership (2,704)	Joins Pine Creek at T8SR20E Sec. 2
	Little Pine Canyon	3,110	1,360	Private ownership (1,750)	Tributary of Robinson Canyon
Rhodes Canyon	All	10,940	6,814 (62%)	BLM (2,071) Private ownership (2,026)	Confluence at John Day River (T8SR20E Sec. 31)
Rattlesnake Canyon	All	6,176	4,922 (80%)	BLM (810) Private ownership (417)	Tributary to John Day River upstream from Rhodes Canyon
Amine Canyon	All	2,000	564 (28%)	BLM (1,436)	Tributary to John Day River upstream of Rattlesnake C.
Rock Canyon	All	1,385	821 (59%)	BLM (564)	Tributary to John Day River upstream of Amine Canyon
Rowe Creek	All	29,942	1306 (4.4%)	Private (27,694)	Tributary to Dry Hollow
Miscellaneous Tributaries & John Day River	All	NA	4,624	NA	Minor tributaries from Spring Basin Canyon upstream to Shaw Canyon

Figure 2. Pine Creek Ranch Watershed Map.



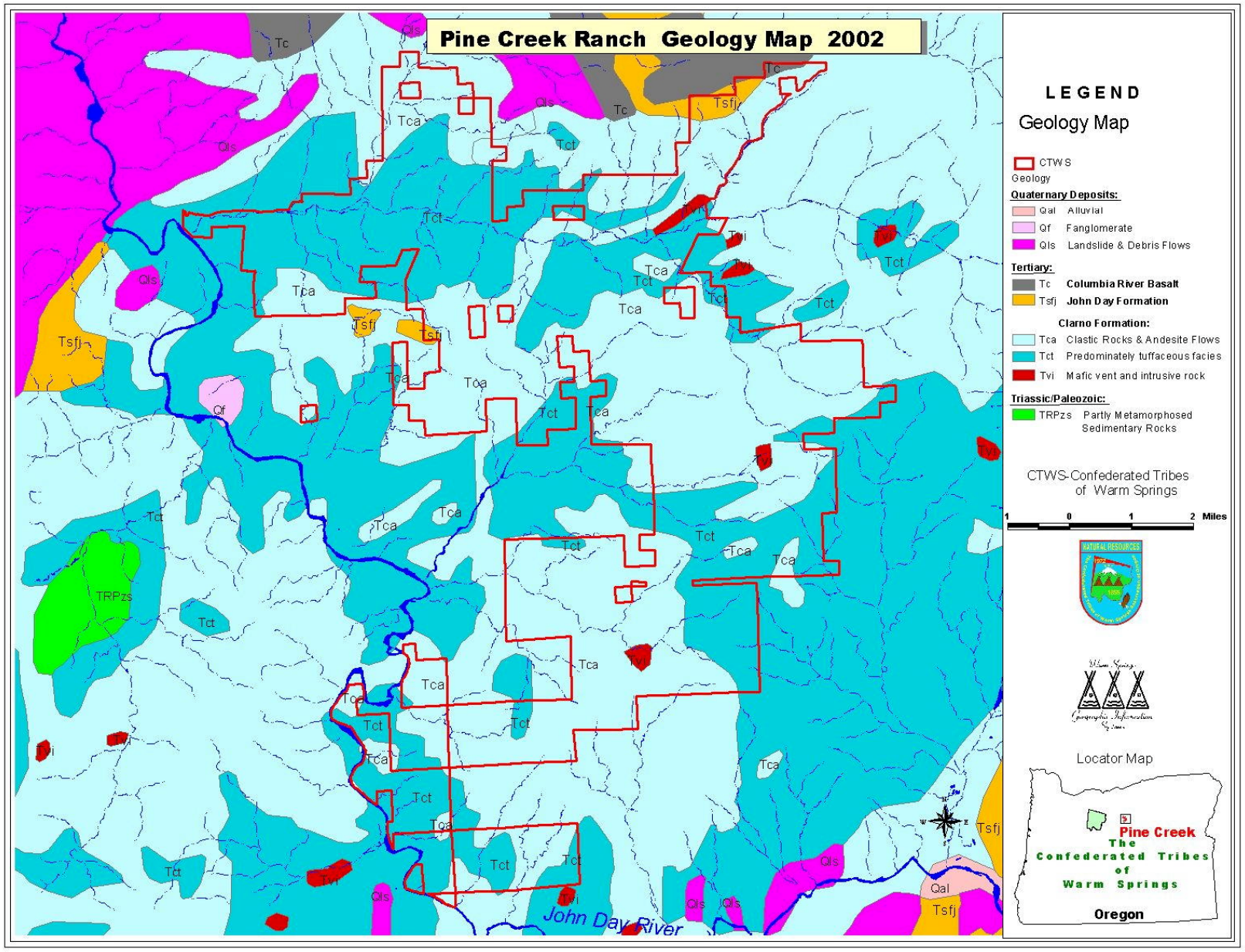
IV. GEOLOGY AND TOPOGRAPHY

The geologic record of the ranch spans a period from approximately 54 to 12 million years ago (Figure 3). The majority of the ranch is within the Clarno Formation, which includes lavas, mudflows, and tuffs formed by widespread volcanic activity between approximately 54 and 37 million years ago.

The ranch also includes areas within the John Day Formation and the Columbia River Basalts. The John Day Formation lies atop the Clarno Formation, and is largely the product of accumulations of volcanic ash from eruptions near the present-day Cascade Range between 37 and 20 million years ago. The Columbia River Basalt Group is the product of flood basalts formed between 19 and 12 million years ago, which form the vast lava plains of north central Oregon.

The ranch lies within an area of generally steep and rugged topography (Figure 1). Numerous canyons dissect remnants of plateaus, leaving little flat terrain. Floodplains exist along major streams and the John Day River, but occupy a small percentage of the land area. Elevations on the property range from slightly over 4,000 feet to approximately 1,300 feet at the mouth of Pine Creek.

Figure 3. Geology Map.



V. CLIMATE

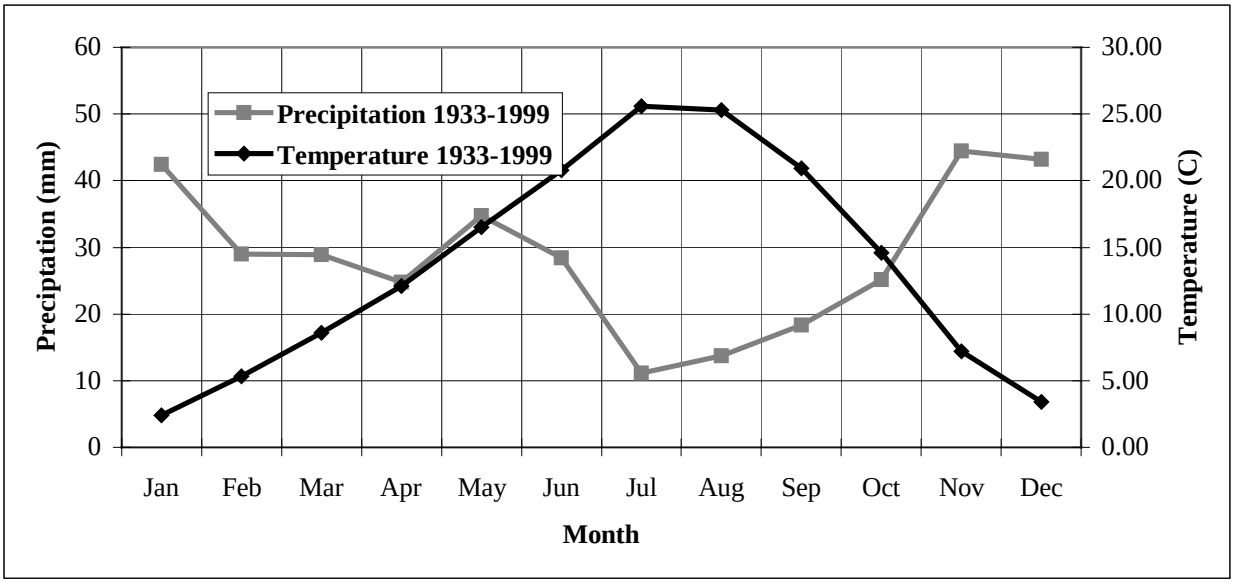
A. Climate Records

Pine Creek Ranch is located near the boundary between Oregon's North Central and South Central Climate Zones. The area is semi-arid, with average annual precipitation ranging between 10" and 16" depending upon elevation, slope, and aspect.

No climate record is available from the ranch. The nearest two National Weather Service monitoring stations are located in Antelope (1NW Antelope) and Fossil. The Antelope station is at 865.6 meters (2840 feet) and the Fossil station is at 807.7 meters (2650 feet). These elevations fall near the middle of the range of elevations on the ranch.

The Antelope station has a more complete data record (missing / incomplete data for 27 out of 912 months) than the Fossil station (missing / incomplete data for 155 out of 792 months). The Fossil station has also changed location three times in the past 70 years (Hannan, 2000), clouding interpretation of patterns of variation.

Figure 4. Climatic Diagram for Antelope, OR Average Values 1933-1999

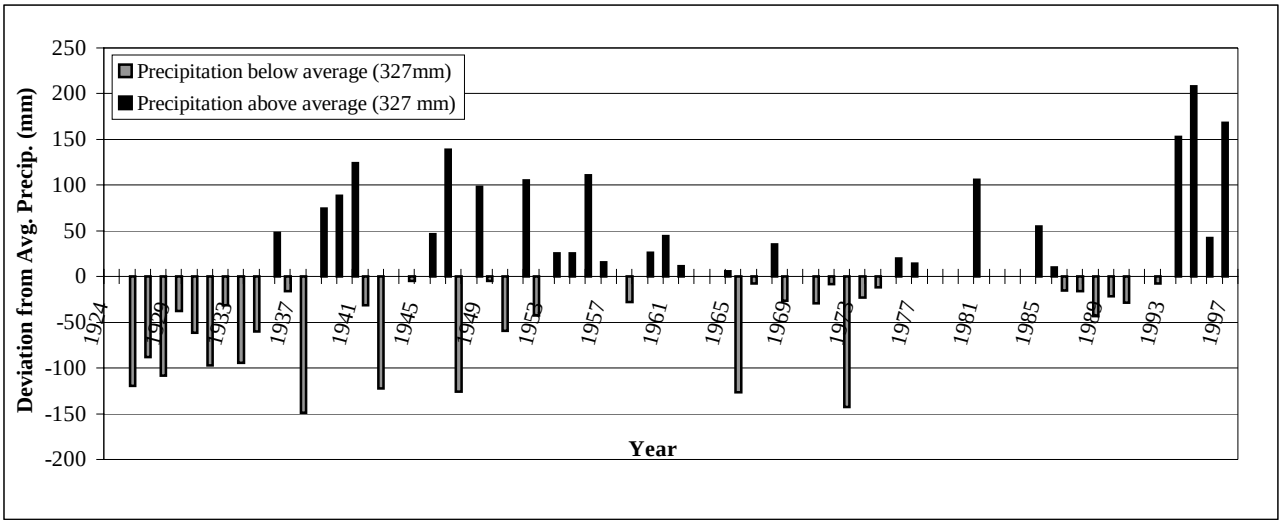


Most of the precipitation in the area falls in the form of rain during the months of November, December and early January. There is another pulse of moisture in the late spring from mid-April to mid-May (Figure 4). Average temperatures reach their peak in July and August, and water deficits, with evaporation demands greater than available moisture, typically exist from June through September.

The average precipitation at the Antelope station is 327 mm. Precipitation amounts are highly variable from year to year, however. Out of 75 years of record, 33 are below this average, 25 are

above, and 17 years could not be included due to missing data (Figure 5). A paleoclimate tree-ring analysis provides a record of annual variations in growing conditions from 1704 to1900 (Garfin, and Hughes 1996) (Figure 6). The average precipitation of the tree-ring dataset from 1704-1900 is only 17 mm different from the average measured values from the years 1933-1999. This record also demonstrates dramatic inter-annual variability.

Figure 5. Deviation from Average Annual Precipitation from 1924-1998 at Antelope, OR. Data from Oregon Climate Center



B. Implications for Recovery and Restoration

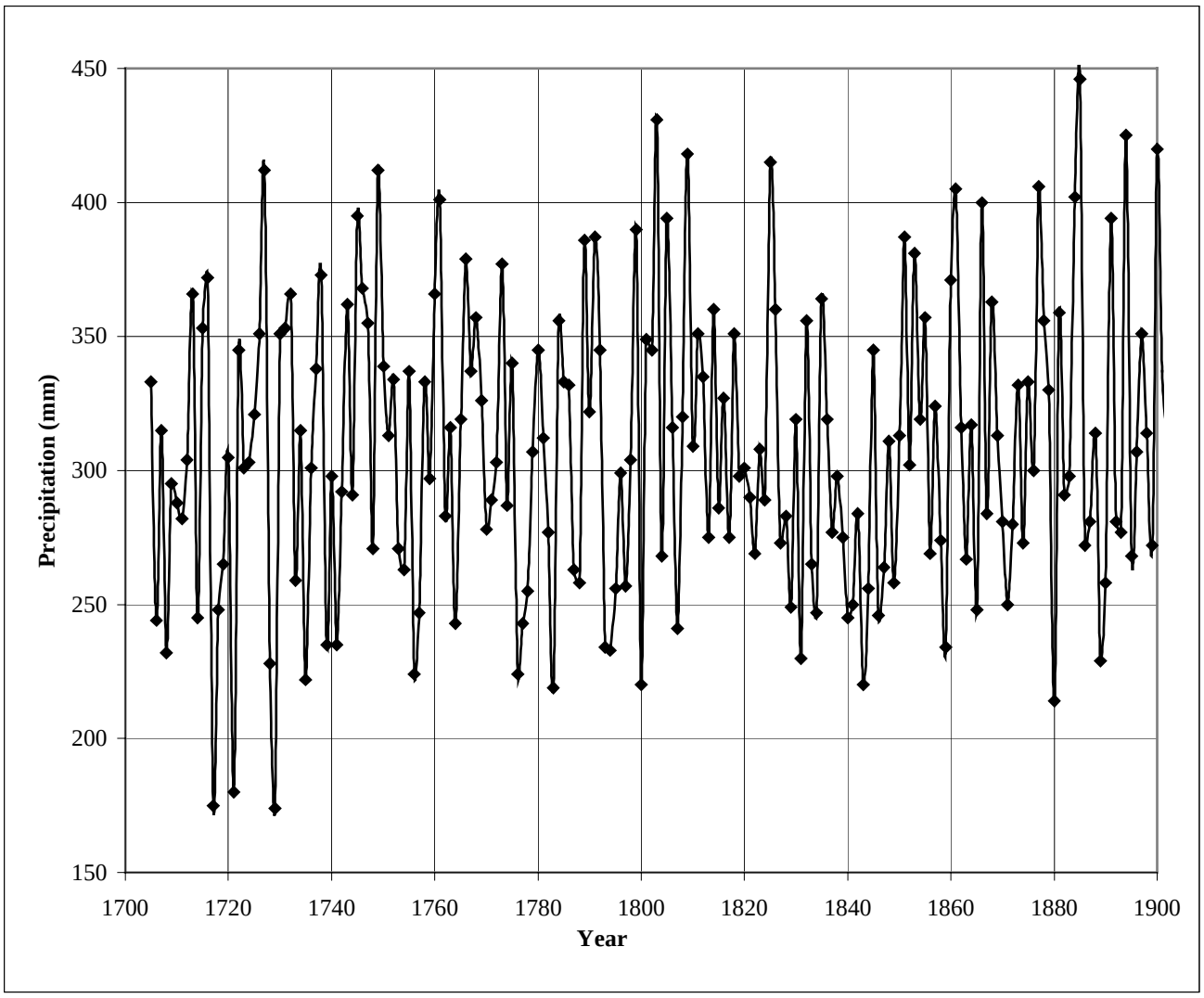
The variability of annual precipitation increases the challenge of planning restoration projects. An analysis of past climate variations did not reveal any trends that can be used to predict future variability. Potential recovery and restoration of vegetation is clearly influenced by available moisture and temperature. Seeding and planting projects rely directly on appropriately timed available moisture. A lack of available moisture is a direct limiting factor for seed germination, emergence and establishment (Eddleman, 2000). Projects must be planned with an understanding of climate variability and its implications for probable success or failure.

Variation in annual precipitation and temperature has great significance for fire management on the ranch. Potential wildfires or controlled burns are influenced by precipitation patterns. The use of prescribed burns in this system is limited by the availability of sufficient fuels to carry the burn. The amount of combustible fuel is a function of how much plant material is on the site and the type of material (i.e. grass, shrubs, or juniper trees). The vegetation growth is directly influenced by precipitation. In a year with above average precipitation, there is increased plant growth, which increases the fuel loading of the system. During dry or drought years, there is less vegetation, which decreases the ability to write a fire prescription for the area (Eddleman, 2000).

Finally, it cannot be assumed that future variations in climate will remain within the pattern of the past climate record. Climate change over the coming decades due to natural variations or

greenhouse gases can be expected to influence the vegetation communities throughout the region.

Figure 6. Tree-Ring Reconstructed Precipitation for Eastern Oregon
(Data from Garfin and Hughes, 1996)



VI. SOILS

A detailed soil survey of the ranch has not been conducted, and there is no complete soil survey for Wheeler County. A survey was conducted using the "old" range site classifications under prior ownership, and the data is available at the NRCS in Condon. These soil classification approximations were used to derive a table of Soil Series names with associated brief descriptions (Table 2). The NRCS recently completed a soil survey of the John Day Fossil Beds National Monument, which will provide an excellent reference for comparison with the ranch.

The soils on the ranch are mostly clays with a high component of gravel. They are generally described as well drained with moderate to rapid runoff and low to moderate permeability. Some areas have a calcareous lower horizon that may create favorable conditions for juniper expansion.

Soils indicate the potential plant communities that would exist on the property. The ranch's soils may no longer support the vegetation they did historically due to erosion. The soil profile in many places may be lacking the upper, or A, horizon. Without an inventory it is not possible to know the extent of past soil loss from the property.

Table 2. Soil Types

Soil Series (NRCS Classification)	Soil Description	Associated Vegetation	Historic/current Use	Geographic setting	Comments
Lickskillet	Shallow, well-drained soils that formed in **stony** colluvium consisting of loess, rock fragments and residuum weathered from basalt and rhyolite.	Bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, western yarrow, and Wyoming big sagebrush	Livestock grazing. Watershed, recreation, wildlife habitat.	Uplands	High stone content limits types of equipment for seeding, plowing, etc.
Hack	Deep, well drained soils formed in alluvium from mixed sources.	Bluebunch wheatgrass, Idaho fescue and big sagebrush.	Irrigated grass, alfalfa hay, irrigated pasture and range.	On low alluvial fans, terraces and footslopes. Slopes of 3 to 20 percent.	Likely productive soils. Good place to do seeding projects with irrigation.
Day	Deep, well drained soils formed in clayey sediments from the John Day Formation. Parent material clay with calcareous sediments.	Bluebunch wheatgrass, giant wildrye, basin big sagebrush, and shadscale.	Livestock grazing and wildlife habitat.	On fans and dissected uplands with irregular topography.	Slow draining, clay holding water for more of the year. Good sites to restore basin wildrye.
Sorf	Moderately deep, well drained soils on foothills. Formed in mixed loess and colluvium over fine textured colluvium and residuum from sedimentary rock or tuff.	Antelope bitterbrush, bluebunch wheatgrass, Idaho fescue, Sandberg blue grass and big sagebrush.	Livestock grazing and wildlife habitat.	Nearly level to steep side slopes at elevations 1,200 to 2,800 feet.	At depth, very high pH, calcareous tuff, susceptible to juniper. (See juniper section for discussion).
Simas	Very deep, well-drained soils formed in loess and colluvium from tuffaceous sediments.	Bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and Wyoming and basin big sagebrush.	Livestock grazing and wildlife habitat	On hills at elevations of 1,200 to 4,000 feet. At high elevations, only on south facing slopes.	Alkaline, see Sorf above.

Waterbury	Shallow, well-drained soils that formed in material weathered mainly from basalt and tuff.	Bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, low sage, and antelope bitterbrush.	Livestock grazing and wildlife habitat	Uplands, at elevations of 1,800 to 4,600 feet. At higher elevations, only on south facing slopes.	Only 14 inches to bedrock (basalt). Very shallow, makes water storing capacity low, possible areas of subsurface runoff during large storms.
Powder	Very deep, well-drained soils formed in mixed alluvium.	Giant wildrye, bunchgrasses and forbs.	Irrigated row crops, small grains, potatoes, and alfalfa.	On bottomlands and alluvial fans. Elevations from 500 to 3500 feet.	Historically highly productive soils (may have lost productivity due to erosion during floods when under cultivation).
Donnelly	Very deep, somewhat excessively drained soils formed in micaceous silt loess overlying sand and gravel. Sandy-skeletal.	Native white spruce, paper birch, quaking aspen forest.	Some areas used for small grains, hay and pasture.	On outwash plains and moraines.	Gravel and rocks at depth of 7 to 60 inches. No water holding capacity.
Snell	Moderately deep, well-drained soils that formed in a mixture of loess and basaltic colluvium.	Bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass.	Livestock grazing and wildlife habitat.	Canyon walls, 2,000 to 6,800 feet mainly on north and east exposures.	High stone content in A horizon (top 4 inches 20% stones). Equipment use difficult.
Tub	Deep and very deep, well-drained soils formed in old sediments of volcanic origin.	Bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, and related forbs.	Small grains and livestock grazing.	Hilly uplands at 2,600 to 4,500 feet.	
Curant	Fine-silty, well-drained formed of old alluvium or colluvial material from sedimentary and igneous rocks of mixed mineralogy.	Idaho fescue, bluebunch wheatgrass, Sandberg bluegrass. Forbs: yarrow, lupine, arrowleaf balsamroot, carrot, milkvetch.	Grazing, wildlife habitat and recreation.	North aspects of slopes 2,200 to 3,700 feet.	
Wrentham	Moderately deep, well-drained soils formed in loess with colluvium weathered from basalt.	Idaho fescue, bluebunch wheatgrass, Sandberg bluegrass, forbs and shrubs.	Grazing and wildlife habitat.	North facing canyon slopes.	

VII. UPLAND HABITAT AREAS

A. Description of Natural Conditions

While it is difficult to describe conditions of upland habitats prior to European settlement in great detail, major changes in upland vegetation have been observed within the last 140 years. Natural conditions can be inferred from historic accounts, soil classifications, and current vegetation. Soils and associated vegetation for the ranch are summarized in Table 2.

According to the 1936 State of Oregon Forest Type Map, the ranch area was non-forested with primarily sagebrush-grassland and less than 10% juniper cover (Anderson et al., 1998). Lack of western juniper is particularly noticeable in the John Day River drainage where only scattered stands existed in the late 1930s. Soil-plant relationship studies in the John Day Province indicate that nearly all non-forested sites were natural shrub-grasslands originally and indicate only a 10% canopy cover of shrubs.

From these sources, it is clear that bunchgrass grasslands and sagebrush steppe dominated ranch uplands. Bluebunch wheatgrass would have been dominant on south facing slopes, with Idaho fescue prevalent on north slopes. Basin big sagebrush would have been most common on all foot slopes and well-drained areas on valley floors.

Juniper woodlands were present in the area, as indicated by scattered old trees remaining on the property and historical accounts, but were not nearly as extensive as they are currently. Shrub communities of mountain mahogany, bitterbrush, and other species occurred on rocky slopes and in some canyon bottoms. Ponderosa pine and Douglas-fir forests would have been present on north-facing slopes at the highest ranch elevations. Spring sources would have supported riparian vegetation, including aspen (at higher elevations), cottonwoods, and willows.

Wild fires presumably occurred relatively often, with ignitions from lightning strikes or Native Americans deliberately setting fires. These fires served to maintain open grasslands, preventing the spread of western juniper, and maintaining a mosaic of sagebrush and bunchgrass dominated areas. Fire frequency for the ranch property is not known, however, mean fire return intervals of 12 to 15 years have been documented for a watershed in south central Oregon between 1601 and 1897. (Miller & Rose, 1999) Fire return intervals on portions of the ranch would presumably have ranged from this low figure to 35 - 50 years.

B. Historic Impacts

The dominant initial land use in the local area was livestock grazing, including both sheep and cattle. Major operations were established prior to and during the homestead era, which began locally in the 1860s. Livestock numbers peaked in the early 1900s, and impacts to rangeland and riparian areas were severe.

The most significant change in upland areas has been a major increase in the extent of western juniper woodlands, generally attributed to overstocking of domestic livestock, reduced fire

frequencies, and climatic conditions during the 1800s (Miller & Rose, 1999). In the 1960s, Larry Haverfield and Bill Anderson observed the juniper north of the mainstem John Day River increasing rapidly (Anderson, et al., 1998). In a study of the growth rings along a transect from the river north to the forest boundary on top of the main ridge, showed increasing age classes from the river to the ridge top. This study also showed the expansion of juniper started in the early 1900s. The very old juniper were likely protected from wildfire from lack of surface fuel.

Grazing activities have also contributed to the spread of invasive annual grasses, most notably cheatgrass and medusahead, throughout upland grasslands. Later construction of roads and motor vehicle use throughout upland areas, has increased the spread of annual grasses and noxious weeds, while increasing soil erosion.

The creation of stock-watering ponds and spring tanks, which helped keep livestock in upland areas and away from creeks or the river, had the additional effects of altering hydrologic patterns and causing localized soil disturbance and weed establishment.

The timbered area in upper Little Pine Canyon was recently logged, with most large ponderosa pine and Douglas-fir trees removed. A road was constructed through the canyon bottom of upper Little Pine Canyon for timber removal.

C. Assessment of Current Conditions

1. Grasslands

Grassland habitats are currently widely distributed on the ranch. The July 2000 Landsat vegetation classification included 2,732 acres of grassland in the original Pine Creek portion of the ranch. An additional 3,086 acres burned in the July 2000 “Two Horse Fire”, most of which would now be classified as grassland or scattered juniper due to mortality of juniper in the fire.

Grasslands on the ranch fall within two of the 30 habitat types used by the Atlas of Oregon Wildlife (Csuti, et al, 1997): Perennial Bunchgrass and Idaho Fescue Grasslands. The primary difference is an increased occurrence of shrubs and juniper in the Perennial Bunchgrass type. Dominant native grass species on the ranch are bluebunch wheatgrass, Idaho fescue, and Sandberg’s bluegrass. Other native grass species include bottlebrush squirreltail, sand dropseed, and a variety of species associated with more mesic conditions. A diverse assemblage of forbs is present, and cryptobiotic crust occurs between bunchgrass clumps.

The greatest concentrations of grassland habitats occur in the Chichester Pass uplands, the plateau to the north of Spring Basin within the fire area, the Cove Creek area, and lower elevation portions of the Wagner Ranch. Grasslands also occur in smaller patches throughout the property, and a great portion of the area that is currently juniper woodland would historically have been grassland.

Ranch grasslands conditions vary greatly. Cheatgrass, medusahead, and bulbous bluegrass, all introduced annual grasses, are widespread. In many areas these species have replaced the native bunchgrasses. Introduced annuals are most frequent in areas that have experienced heavy

disturbance. In general, lower portions of slopes are in worse conditions than higher areas, and south facing slopes are in worse condition than north facing slopes. Flats and saddles, along with historic corral sites, tend to be in the worst condition. In many of these areas, cheatgrass and medusahead are dominant to the near exclusion of all native species. Native grasses, forbs, and cryptobiotic crust species are all susceptible to invasion by these annual grasses. Grasslands are also susceptible to invasions by noxious weeds. At this point, noxious weed infestations on the ranch are largely confined to riparian floodplain fields and ranch roads, but these infestations have potential to spread into grasslands.

The other major challenge to restoring native grasslands on the ranch is encroachment by western juniper. While juniper is a native species, it has increased its extent dramatically since European settlement, primarily into shrub and bunchgrass communities. While juniper has encroached on thousands of acres on the ranch, many grassland areas are now occupied by scattered individual junipers, or by young trees at moderate density. These areas retain most of their native species, and could potentially return to grassland.

Native bunchgrass communities are thought to provide greater infiltration of precipitation than annual grasslands or juniper woodlands, thus recharging groundwater supplies and improving watershed function. Native bunchgrasses evapotranspire less water than juniper, and leave more water available to reach riparian areas or provide groundwater and soil moisture storage. Juniper management will be discussed in the Juniper Woodland habitat section.

Grasslands are an important component of wildlife habitat on the ranch, providing habitat for small mammals, songbirds, raptors, and other species that require grassland habitats for reproduction or foraging. The quality of grassland as wildlife habitat is diminished by the invasion of annual grasses. Grasslands are a high priority wildlife habitat on the ranch, because they are regionally threatened to a greater extent than juniper woodlands.

2. Sagebrush Steppe

Sagebrush is currently widespread on the property, although there are few extensive areas of sagebrush-dominated steppe. Sagebrush areas are likely included within the grassland and/or scattered juniper cover types in the 2000 Landsat vegetation classification of the ranch.

Sagebrush areas on the ranch fall within three of the 30 habitat types used by the Atlas of Oregon Wildlife (Csuti, et al, 1997): Big Sagebrush, Low Sagebrush, and Mixed Sagebrush.

Big sagebrush (*Artemisia tridentata*) is most common in deep soils of valleys and alluvial fans that have not been recently plowed or burned, although it also occurs on slopes with moderate soil development. The understory includes a variety of native bunchgrasses and forbs, or introduced pasture grasses or annual grasses. Scattered juniper commonly occurs in big sagebrush areas. Basin big sagebrush (*A. t.* subsp. *tridentata*) is dominant on lower elevation sites with deep soils, while Wyoming big sagebrush (*A. t.* subsp. *wyomingensis*) may occur on drier slopes, and mountain big sagebrush (*A. t.* subsp. *vaseyana*) may occur on high elevation moist soils. These subspecies can be useful indicators of site potentials, and vary in their value to wildlife.

Low sagebrush (*A. arbuscula* and / or *A. rigida*) communities are found on ridge tops, plateaus, or gentle slopes typically on shallow, rocky soils. Sandberg's bluegrass and a variety of native forbs are common in the understory. Where low sagebrush occurs in saddles with adequate soil development, cheatgrass and medusahead are often present.

The mixed sagebrush habitat type is composed of a mosaic or mixture of sagebrush species. Basin big sagebrush and low or stiff sagebrush rarely occur as a mixture on the ranch, but they are often in close proximity. Some areas may appear as "mixed sagebrush" if mapped.

As with grasslands, sagebrush habitats vary greatly in their current condition. Low sagebrush communities are relatively intact, although they occupy a very small acreage of the ranch. These communities provide habitats for native plants that do not occur in deeper soil areas. Basin big sagebrush habitats are presumably highly altered from their historic condition and locations. Basin big sagebrush was likely a dominant species in the floodplains along Pine Creek, which are currently occupied by agricultural fields and pasture grasses. Basin big sagebrush often dominates within the boundaries of historic corrals associated with homesteaders' or herders' cabins, often in association with introduced grasses. Basin big sagebrush is common in some riparian areas that presumably would have been occupied by riparian trees and shrubs originally. Basin big sagebrush remains widespread on slopes throughout the ranch.

Sagebrush habitats are also vulnerable to encroachment by western juniper, and basin big sagebrush habitats were likely among the first areas to become dominated by juniper. Sagebrush, like juniper, can increase under conditions of heavy grazing and reduced fire frequencies. Sagebrush is much more vulnerable to fire than mature juniper, but reproduces from seed more rapidly after a fire.

3. Juniper Woodland

Juniper woodland is currently widespread on the ranch, and dominated by stands of younger age class trees. Scattered individual, and occasional patches, of older trees occur primarily on rocky sites with low fire frequencies. The Landsat vegetation classification for the ranch describes three juniper cover types: Dense juniper woodland, Moderate density juniper woodland, and Scattered juniper.

	Original Pine Creek Ranch Purchase	
Cover Type:	Acres:	Percent:
Dense Juniper Woodland	5,152	21%
Moderate Density Juniper Woodland	8,014	33%
Scattered Juniper	6,718	28%

These cover classes have not been ground-truthed, but can be coarsely related to a juniper classification presented in a 1997 Western Juniper Forum. Dense juniper woodland presumably corresponds to Closed Stand or Late Transitional conditions, while Moderate Density Juniper Woodland likely describes primarily Mid Transitional stage stands. These stand descriptions will not correlate perfectly with observed densities, due to variation in site potentials and histories.

The Two Horse Fire burned approximately 3,086 acres of the ranch in July 2000, including a mosaic of juniper woodlands and grasslands. Juniper mortality as a result of this fire will result in conversion of a portion of the juniper woodlands in this area to grasslands. The Two Horse Fire area is not included in the above Juniper cover types, but some of this area will remain juniper woodland.

Table 3. Juniper Classification System:
Key Characteristics of Western Juniper Woodland Successional Stages

Key Characteristics	Early Transitional	Mid Transitional	Late Transitional	Closed Stand
Tree canopy	Open; canopy cover <5%; expanding	Canopy cover 6-20% actively expanding	Canopy cover 21-35%; canopy expansion greatly reduced	Canopy cover >35%; canopy expansion stabilized
Leader growth (dominant trees)	Good terminal and lateral growth	Good terminal and lateral growth	Good terminal growth reduced lateral growth	Good to reduced terminal growth; no lateral growth
Crown lift (lower limb die-off) (Dominant trees)	Absent	Absent	Reduced lateral growth of lower limbs	Present (for productive sties)
Potential berry production	Low	Moderate to high	Low to moderate	Scarce to low
Tree recruitment	Active	Active	Reduced; limited to within drip line	Absent
Growth (Understory trees)	Good terminal and lateral growth	Good terminal and lateral growth	Greatly reduced terminal and lateral growth; reduced ring growth	Absent: some mortality; greatly reduced ring growth
Shrub layer	Intact	Nearly intact to showing mortality around dominants	>40% mortality	>85

From: Western Juniper Forum 1997 Proceedings, PNW-GTR-432

Community Impact of Juniper Encroachment

As noted in Table 3, increasing stand closure of juniper results in mortality within the shrub understory, and loss of native bunchgrasses and forbs. The loss of native vegetation elements and the structural change of adding juniper to bunchgrass or sagebrush steppe communities results in the loss of the characteristics that defined the original communities. Grasslands and sagebrush steppes are severely impacted throughout the Intermountain Region by conversion to agricultural use and encroachment by juniper.

Hydrologic Impact of Juniper Encroachment

Alteration of uplands from grasslands or sagebrush steppe to juniper woodlands may have significant consequences for the hydrologic characteristics of the watersheds. Water consumption by western juniper is potentially much greater, on both a spatial and temporal scale, than that of the communities it replaces. This increased water use may result in decreased water availability to riparian areas.

Al Winward has suggested that only in areas receiving more than 15" annual precipitation will juniper encroachment in upland areas likely result in reduced stream flow, because all precipitation in areas receiving less than 15" annually is probably used by local vegetation and soil, and not available to riparian areas (Winward, 2001). However, late fall and winter precipitation would not be utilized by any vegetation other than juniper so the soil moisture storage is depleted by juniper year-round.

Juniper-dominated watersheds have shortened response times to rainfall events and streams are now flashier than they were historically. Increases in bare soil and loss of understory vegetation decrease water infiltration during precipitation events and increase surface runoff. The high runoff during storm events increases the velocity of the water during those events and increases soil loss in stream channels, leading to incision. Increased surface flow results in decreased groundwater recharge, which decreases stream flows later in the year. Summer stream flow has become even more critical with the loss of habitat for native salmonids.

Anecdotal information dominates the literature concerning juniper removal and stream flow (Brown, 1987; Eddleman & Miller, 1992; Oregon State University, 1984). Landowners and extension personnel report increases in surface water, increases in water at springs, and decreases in surface water flow following juniper removal. Anecdotal results are reported from juniper cuts ranging from 5,000 acres out of a 40,000-acre watershed to 1,000 acres from a 20,000-acre watershed (Wood, et al., 1994). These anecdotal sites were not gauged either before or after this reported increase in water yield.

In order to understand how much water could be available to recharge streams, juniper water usage must be compared with the water usage of the vegetation that will replace it. In addition, the geography of the area including soil types and geologic parent materials need to be mapped, average rainfall must be calibrated for both the control and treated watershed, vegetation and percent cover need to be mapped, and pre and post-treatment stream flow at continuous gauging stations monitored (Baker, 1984; Collings & Myrick, 1966; Fisher & Buckhouse, 1998).

From a strictly water balance perspective, if the water is not being intercepted, evaporated, and transpired by juniper, then it has to go somewhere. Most of this water is used to decrease the soil moisture deficit. The percentage that travels to the streams via overland or below-ground flow depends on the soils and geology of the area (Eddleman & Miller, 1992; Hawkins, 1996; Miller, et al, 1987). When the soils are shallow and depth to bedrock is shallow or when hydraulic conductivities are slow (less than 1 mm/hr), excess moisture is available to the streams (Baker, 1984). It seems intuitive that if juniper use up to 50 liters of water per day, and vegetation with a much lower moisture demand replaces it, that the excess moisture would recharge the stream system. Discovering to what degree that moisture contributes to measurable flow presents many challenges however. Water balance approaches do not account for cracks in bedrock and macropore flow that may result from juniper roots. Underground storage capacities are not easy to map and have not been considered in any of these studies.

Results from vegetation removal studies vary. When the trees are bulldozed, chained, or removed from the site, the water balance is not affected (Collings & Myrick, 1966). When dead trees are left standing, changes in stream flow are observed. Standing dead trees presumably influence microclimate by shading and reducing wind, decreasing moisture loss. When juniper stands have been replaced with grasses, the stream flow response has included increasing flow further into the year (Baker, 1984, Davis, 1984, Eddleman & Miller, 1992).

Water resource problems are not entirely attributable to juniper encroachment. Variations in precipitation play a major role. Further, removal of juniper cannot be expected to provide immediate returns in increased stream flow. Increases in stream flow could occur as late as 10 years after juniper removal.

Juniper Benefits

Juniper is a native species that plays an important role in the ecology of upland systems. Juniper is directly beneficial to some wildlife species, including big game animals that use the heavily wooded areas as refuge during the winter months. Wildlife diversity in moderate density juniper stands with healthy understories of shrubs, forbs, and bunchgrasses can be very high, but decreases as juniper stand closure occurs (Bedell, et al., 1993).

4. Mountain Mahogany / Bitterbrush Shrubland

Shrub habitats dominated by mountain mahogany and bitterbrush occur at scattered locations throughout the ranch. Typical sites have shallow rocky soils, and range in topographic position from near the summits of rocky buttes, down steep or gradual slopes, into canyon bottoms. Other associated woody species include serviceberry and chokecherry in moister locations.

These shrub habitats do not occupy a large land area, and were not distinguished by the Landsat vegetation classification. They likely were included in the scattered juniper category.

Both mountain mahogany and bitterbrush are important browse species for deer and elk, and these shrubs provide habitat for birds and other wildlife.

5. Ponderosa Pine / Douglas-fir Forest

Ponderosa Pine / Douglas-fir Forest occurs at the higher elevations of the property on N. slopes. The only significant area of this conifer forest on the property is in upper Little Pine Canyon. Lesser amounts occur in the Old Mill Canyon drainage along a property boundary, and in upper Robinson Canyon. Limited amounts of Ponderosa Pine occur in association with juniper near the northern portion of Wagner Ranch's west boundary.

Scattered individual ponderosa pines occur at lower elevations in Robinson Canyon, presumably established from cones or seeds that washed down the canyon during high flows. Individual ponderosa pines also occur more widely on the property, including in minor Pine Creek tributaries, Rhodes Canyon tributaries, and in Jennies Peak Canyon.

The timbered area in Little Pine Canyon was recently harvested, with most large trees removed. A small stand of Douglas-fir, and individual pines, located below the mouth of Old Mill Canyon were not harvested, because Little Pine Canyon is too narrow to allow passage of mechanized equipment below this point. Some mature pines and firs were not harvested, and can serve as seed sources for regeneration. Seedlings and saplings are also well distributed. Slash piles are present throughout the logged area.

Juniper woodlands grade into ponderosa woodlands and ponderosa / Douglas-fir forest. There are few areas of open ponderosa woodland with well-developed grass understory.

6. Trembling Aspen

There are a few small stands and isolated individuals of trembling aspen on the property, at higher elevations. The largest patch of aspen occurs in Chichester Gulch, with additional patches in Robinson Canyon, Little Pine Canyon, and Old Mill Canyon. Most of these occur within riparian areas, but some patches in Old Mill and Little Pine Canyons are away from stream channels. These communities, like sagebrush steppe and bunchgrass areas, are subject to encroachment by western juniper.

D. Management Considerations

The primary management concerns in upland habitats are juniper encroachment, fire management, and invasion of non-native annual grasses. Management of juniper, fire, and annual grasses are inextricably linked, and will be discussed together.

1. Juniper Management

The scale of juniper encroachment into other habitats, combined with the topography of the ranch, limits possible strategies for juniper control. Large areas of the ranch are steep enough that vehicle access would be damaging to soil, vegetation, and watershed function, offsetting possible gains from juniper control. The lack of potential vehicle access limits mechanical control options. Herbicide approaches are also not feasible, due to likely impacts to non-target species or water supplies, and prohibitive costs, of applications at large scales. These

considerations leave fire as the primary management tool for control of juniper on the ranch, with mechanical control in selected areas.

Wildfires and controlled burns each have the potential to play a major role in managing juniper on the ranch. Many variables affect fire spread and intensity, including: humidity, wind speed, temperature, slope and aspect, time of day, available fuels and their structure, fuel moisture, soils, and amount of bare ground. The susceptibility of juniper to fire decreases with age, but also varies with fire intensity and the amount and type of fuel present.

Wildfire Management

Wildfires occurring within the last decade in the Clarno area, including the July 2000 Two Horse Fire which burned approximately 3000 acres of the ranch, and the 2001 Wagner Mountain Fire, have resulted in high mortality of young junipers, with moderate to high mortality of older trees. Almost all small trees (under 6 feet tall) are killed in areas where sufficient fuel exists to carry a fire. Mortality of larger trees depends upon fire intensity and the presence of ladder fuels, such as sagebrush, which deliver fire into the tree crowns.

Wildfires have the potential to reduce the encroachment of western juniper into other habitats, while maintaining a mosaic of juniper woodlands within the landscape. Wildfires also can have negative ecological effects, primarily due to the altered landscape they now occur in. Severe wildfires can cause mortality among bunchgrasses and other native plants, favoring invasion by non-native annual grasses.

The ranch is not a large enough area for a “let burn” policy to be a viable management strategy. Neighboring ranchers are concerned about the potential for wild fires to impact their fences, homes, livestock, and forage. Many of the ranchers also recognize the beneficial aspects of fire, but are unable to afford the costs of the potential damages from wildfires. Nevertheless, wildfires are inevitable in the area due to lightning strikes and / or accidental ignitions.

The Tribes will develop a wildfire response plan, in cooperation with the Bureau of Land Management, which will acknowledge the beneficial role of fire, the potential ecological and economic impacts of fire, and the potential ecological impacts of fire-fighting activities. This wildfire plan should utilize pre-designated firebreaks, and allow fires to burn that are not threatening structures or neighboring private lands. This wildfire response plan must also emphasize the importance of communicating with neighboring landowners.

Prescribed Fire

Prescribed burning is an option for juniper control. Fire as a management tool will be beneficial for many areas of the ranch – especially in areas with young juniper, sagebrush and native grass.

The Prineville District BLM conducted a prescribed fire on Sutton Mountain in September, 2001, and preliminary results suggest the burn was effective for juniper control and habitat improvement. The goal was approximately 50% burn of a 20,000-acre area, and was met with burning approximately 11,000 acres.

Juniper control will be most effective in areas with sufficient understory vegetation to carry a flame into juniper canopies. Some of the juniper does not have sufficient understory to carry a burn (those areas with juniper and bare soil between the trees). However, these areas can be used as fire barriers in a prescribed burn. To carry a burn, 500 to 700 pounds of fine fuels per acre are needed. Selecting burn sites on steep slopes, with adequate ladder fuels present, may allow fire to kill large trees even if conducted outside of the primary wildfire season.

In some years, winter controlled fires can be successful in juniper control. A fire can be started after several dry, cold February days (10-20 °C or below) to "freeze-dry" the trees. A fire under these conditions does not result in a total kill of juniper on the burn site, but can be effective against younger trees, and may create some patches that allow sagebrush to move in. If enough sagebrush establishes over the following 10 years, then the fire could be repeated with the sagebrush contributing fuel to increase the effectiveness of the burn.

The pre-fire vegetation will need to be carefully inventoried to determine what plants will respond following the burn. Prescribed burning should be used only where sufficient cover of fire-tolerant grasses and forbs are present or where post-fire seeding is practical. If seeding is not an option, fire should be used only in those areas with at least 20 percent desirable species and at least one bunchgrass plant per square yard (m^2) (Young, 1983).

Burn sites should be selected that do not have dense infestations of medusahead and cheatgrass, as these annual grasses typically respond well to fire. Spring burns can be used to reduce seed-set of annual grasses, but often do not carry well. Soils with high clay content need to be seeded following fire to prevent medusahead from invading. A seed source for medusahead is available throughout the ranch and would likely invade the burned areas. Caution is advised when burning in areas with significant amounts of bitterbrush because of its susceptibility to fire, which varies with the age and size of the plant. It is an important winter range food source for deer (Young, 1983).

Depending upon fire intensity and pre-fire vegetation health, re-seeding of native grasses may be necessary after fires. The Tribes should work with BLM and TNC to develop sources of native seed mixes for planting after prescribed burns or wildfires in the John Day Basin.

Fire prescriptions will need to be written for each area under consideration for burning. The Prineville District BLM could assist with developing fire prescriptions. In order to use controlled burns, careful coordination and communication with neighboring landowners is critical. Several of the neighboring landowners have concerns about wildfire and would likely have these same concerns about prescribed fires. Efforts will need to be made to educate the adjacent landowners on the benefits of fire if it is chosen as a management technique.

Mechanical Control

As noted above, mechanical control options are limited on the ranch due to steep topography and concerns about impacts of motor vehicles or other mechanized equipment.

Limited harvest of juniper trees may become an option on the ranch, especially in productive sites in valley bottoms with tall, straight-trunked trees. At this time, juniper harvest is not an economic proposition, but the value of the timber could help offset the costs of removal. This strategy would be limited to selected trees along Pine Creek or in lower Robinson Canyon, and should be considered only if the impacts of the harvest operation are minimized.

Chainsaw felling can be used to directly kill juniper. Large felled junipers burn at very high intensity in subsequent wildfires or controlled burns, leading to mortality of bunchgrasses and supporting invasion of annual grasses. Any large felled junipers should have all limbs lopped and scattered, and boles removed. Boles could be used for firewood or donated to community service organizations. Scattered limbs provide shade to the soil, may decrease moisture loss, and provide fine fuels that will increase future fire spread. Felling, lopping, and scattering is an extremely labor-intensive process, and using equipment to remove boles can lead to soil compaction.

In order to increase efficiency, more closely mimic the results of fire, and gain the hydrologic and wildlife benefits of leaving standing dead trees, chainsaw girdling could be used on larger trees. Girdling must cut deep enough to completely sever the cambium, which is often deep within folds in the trunk. Juniper is often capable of surviving girdling, although multiple deep cuts may prove effective. Trees under ten feet tall could be readily felled and scattered.

Mechanical control should leave old growth trees and snags intact for their wildlife habitat value. Mechanical control, like controlled burning, should be focused on areas that have remaining native vegetation in the understory that will be capable of revegetating the site.

For hydrologic benefit, juniper in obvious areas of groundwater presence could be targeted for girdling or felling (areas such as floodplains, drainage ways, and first order streams high in the watershed). Trees with leaders on the tops and side branches would need to be selected, as leaders indicate high water use.

Juniper Control Monitoring

Any place juniper are removed, photos, soil moisture, tree widths and ages, and density measurements and time of year should be collected as well as the response of the system. Soil moisture analysis will show a measurable increase or decrease after a few years (1 to 3) versus flow measurements in the creek which may take over 10 years to show any differences. A comparison analysis could be done to look at the response of two different locations in the watershed. Careful data collection will assist other land managers in the basin in making juniper control decisions.

2. Annual Grasses

Cheatgrass and medusahead are the primary non-native annual grasses of concern on the ranch. Both have the potential to be highly invasive in bunchgrass and sagebrush habitats. As annuals, the key to control efforts is reducing seed-set. Seeds can be viable in the soil for a few years, and control efforts based on reducing seed-set therefore need to be repeated for several years. Soil

disturbance also increases the spread of these species, and minimizing soil disturbance should be a basic component of the management strategy. Any control strategy must be paired with restoration of native species to avoid reinfestation of annuals.

Mechanical Control

Targeted mowing can prevent seed-set, but often must be repeated several times annually to be effective. On a small scale, mowing with a handheld weed-whacker has provided a means of avoiding impacts to desirable species. Hand-pulling is also possible at small scales. No mechanical control techniques are currently feasible at large spatial scales.

Chemical Control

Herbicide approaches to date have either involved spot-spraying targeted at the annual grasses, careful timing and use of chemical concentrations low enough to reduce mortality among desirable natives, or complete kills in areas where little native vegetation remained. Spot-spraying is not feasible at large spatial scales, and large scale herbicide applications on the ranch are not desirable due to the presence of culturally significant plant foods and other native species located among the areas of annual grass infestations. However, some of the controlled application rate tests using sulfometuron, glyphosate, or Ammonium salt of imazapic have shown low impacts to native perennials with successful control of annuals. This research will be monitored, and experimental trials may be conducted on the ranch. Chemical control may be most feasible in historic agricultural fields with little or no native vegetation.

Restoration

Restoration of native bunchgrasses and other species to annual grass infested sites is a developing field. Most seeding efforts have had relatively low success. Restoration efforts have typically relied on several years of annual grass control prior to plantings. The Nature Conservancy has successfully planted plugs of bunchgrasses, nursery-raised from native seed, at Lawrence Memorial Grasslands Preserve near Shaniko, Oregon. This approach is extremely labor-intensive, and would be difficult to apply at large scales. Other range-restoration projects have used non-native perennials to compete with cheatgrass and medusahead. Bottlebrush squirreltail and sand dropseed are native grass species that have shown some promise in their ability to compete with annual grasses.

Fire avoidance

Avoiding hot wildfires can help reduce the spread of invasive annual grasses. The use of “greenstrips” is one means of isolating annual grasses from wildfire. Greenstrips can be created by burning prior to wildfire season, or by planting with a non-native species such as crested wheatgrass that carries fire more poorly than native bunchgrasses.

Summary

Control of annual grasses and restoration of native species is an emerging field. Millions of acres of rangeland in the western U.S. are infested with cheatgrass and medusahead, yet reliable restoration techniques remain largely unproven. Efforts are also underway to develop biological control organisms for cheatgrass and medusahead. The Tribes will monitor this research, and may implement experimental-scale restoration projects prior to any large-scale upland restoration attempts.

VIII. RIPARIAN HABITAT AREAS

A. Description of Natural Conditions

Very little information is available about the natural conditions of riparian areas on the current ranch property prior to European settlement. General conditions on the John Day River have been described as heavy riparian cover along stream banks, including aspen and willow, with wide cottonwood galleries (Knapp, et al., 1001; Wissmar et al. 1994).

Historic accounts from some of the earliest homesteaders in the Clarno area describe a "virtual forest of large willow" near the John Day River at Clarno (Campbell, 1977). A turn of the century account from Albert Lyle (available at the Fossil Museum) described obtaining firewood as "somewhat of a problem" in the Cove Creek – lower Pine Creek area. Fuel wood was hauled from upper Pine Creek, which was, then as now, forested with ponderosa pine, and also from "the Juniper areas of the surrounding countryside". Very few early photographs of the area are available, and most do not show riparian conditions. Photos from Clarno in 1899 (Oregon Historical Society collections) depict low deciduous trees in the background, probably willows, or possibly hackberry. The only large trees depicted in any early photographs are Lombardy Poplars planted by homesteaders.

More recent historical data can also provide information on the trend of riparian areas after the homestead era. Accounts of area residents describe degradation of riparian vegetation on Pine Creek within recent decades. An aerial photograph from the 1950s that shows Pine Creek in T7SR19E, Sec. 34, shows a distinct headcut, with an incised channel in the western half of Sec. 34, and little to no channel incision above this point.

General information about natural riparian conditions can be inferred from soil types, topography, and remnant native vegetation. Current and historical use of the creek by spawning steelhead provides evidence that natural riparian conditions were suitable for steelhead habitat.

Based upon inferences from these sources, and opinions from watershed and range experts, the following rough outline of presumed natural riparian conditions is offered:

1. John Day River Mainstem

The portions of the lower John Day abutting Pine Creek Ranch vary considerably in the geomorphology of the valley bottom: ranging from broad floodplains to narrow canyon segments constricted by rock outcrops. Areas with broad floodplains presumably supported more diverse riparian vegetation than narrow canyon areas. Cottonwoods were likely present, along with willow and diverse shrub and herbaceous communities. Floodplains may have been dominated by basin wildrye and big sagebrush.

2. Pine Creek Mainstem

Pine Creek is a perennially flowing stream, with a sinuous channel through broad floodplains, constrained locally by narrower canyon segments. Diverse woody and herbaceous vegetation in the riparian area probably included scattered individual cottonwoods. Beaver ponds occurred along the creek. Floodplains dominated by basin wildrye and basin big sagebrush were subject to periodic flooding, in some areas, wet meadows were likely sub-irrigated.

3. Pine Creek Tributaries

Tributaries of Pine Creek varied widely in their natural condition. Major drainages such as Lone Pine Creek, Little Pine Canyon, Robinson Canyon, and Cove Creek likely had perennial stream flow. Spring sources in minor and major tributaries, would have had willows and other deciduous riparian vegetation, probably including scattered cottonwoods. Old cottonwoods still occur in Robinson Canyon.

4. John Day Tributaries: Rhodes, Rattlesnake, Amine, & Rock Canyons

All of the remaining John Day tributaries within the ranch have much smaller watersheds than Pine Creek (Table 1).

Rhodes Canyon flows primarily SSW toward the John Day River, and a large portion of the watershed is composed of south-facing slopes. The upper portions of the watershed lie primarily within Pine Creek Ranch (7,285 acres plus approximately 680 acres of BLM land within ranch boundaries). Below the ranch, Rhodes Canyon flows through BLM land for over one mile, and then through small parcels of private and state land for less than ½ mile before joining the John Day River.

Rhodes, Rattlesnake, and Amine Canyons drain a combined area of 19,116 acres, and all three meet the John Day river within ¼ mile of one another. Rattlesnake and Amine Canyons drain the northern portion of Wagner Ranch.

Upper portions of these drainages were likely similar in condition to tributaries of Pine Creek, with scattered spring sources providing perennial water. Seasonal flow in the lower portions of these canyons likely was more prolonged and less “flashy” than under current conditions, and perennial or near-perennial flow may have occurred to near the mouth of each canyon.

B. Historic Impacts

Historic impacts to riparian areas fall into two categories: 1) direct impacts within the riparian area, and 2) impacts from management activities within the watersheds upstream of riparian areas. Impacts to upland habitats have been summarized in Section VII. B.

The impacts to riparian areas from early intensive grazing and agricultural use were severe. Soil compaction and reduction of plant biomass from upland grazing increased run-off and erosive potential of streams. The invasion of bunchgrass habitats by annual grasses such as cheatgrass and medusahead, combined with juniper encroachment, increased the “flashiness” of watersheds,

with the consequence of greater erosion during high flow events. Subsequent changes in grazing management reduced ongoing impacts, but recovery has been incomplete.

Agricultural activities and settlement were concentrated in productive floodplains, irrigated with water diverted from the river and creek. Plowing floodplains into agricultural fields caused direct losses of native plant communities, and increased erosion. The invasion of noxious weeds has further displaced native vegetation in riparian areas and floodplains. Grazing within riparian areas further accelerated erosion through direct impacts to riparian vegetation.

Beaver were trapped for their pelts, to the point of near extirpation from many areas. The temporary loss of beaver dams exacerbated the increased erosion from other impacts, leading to incision by stream channels, and loss of access to historic floodplains.

The construction of a carriage road, and eventually a paved highway, through Pine Creek's canyon also constrained the creek in areas where the canyon was narrow.

These practices also occurred throughout the watershed of the John Day. Additional impacts to the hydrology of the river came from mining and timber harvesting in the upper watershed. A significant net effect of these changes has been a shift in the hydrology of the basin from a relatively stable flow throughout the summer to increased peak flows and decreased summer flows (Knapp, et al., 2001). Flooding during high peak flows increased the erosive power of the river in its lower reaches, increasing impacts to areas with riparian habitats damaged by local activities.

C. Assessment of Current Conditions

1. John Day River Mainstem

Current conditions on the mainstem John Day River within the ranch vary greatly. The Wagner Ranch portion of the property includes two primary agricultural fields on floodplains, several other low terrace areas, and a large portion of steep riverbank grading directly into upland slopes or rock outcrops. A few islands occur along this section of the river, ranging from a high terrace with a few ponderosa pines to low gravel bars.

The agricultural fields on the Wagner have been unplowed for at least several years, since acquisition by the prior owner in 1998. They are not entirely flat fields, and include several lower swales or flood channels that increase the potential habitat diversity. Weedy annual grasses and noxious weeds currently dominate the fields. Scattered patches of native basin wild rye and other perennial grasses remain.

Unplowed terrace areas along the John Day are in better condition, with native bunchgrasses, sagebrush, and juniper present, although annual grasses and weeds also occur in these areas.

Riparian vegetation shows minimal development along the Wagner Ranch portion of the John Day, with only occasional patches of willow, and relatively sparse communities of native sedges

and rushes. Reed canary grass, along with sedges, commonly forms a narrow strip of riparian vegetation along the bank.

The John Day River riparian area at the mouth of Pine Creek is fairly well developed. The river has a broad historic floodplain here, with active farm fields on the West bank, and a historic farm field on the ranch property on each side of the creek. From the property boundary downstream to the mouth of Pine Creek, the riparian area is narrow (2-10 meters), and dominated by coyote willow (Salix exigua). Downstream of the creek mouth, the riparian area is considerably broader (up to 30 m), and includes flood channels through a dense willow community.

2. Pine Creek Mainstem

Several assessments provide information on current conditions on Pine Creek. Oregon DEQ collected water quality data from 1990 to 1992, and again in 2001; a Proper Functioning Condition Assessment was completed by the National Riparian Service Team in April, 2001; and Duckfoot Survey Company conducted riparian vegetation monitoring in July 2001.

DEQ collected water chemistry, stream habitat, and macroinvertebrate community data on Pine Creek between 1990 and 1992 as part of an evaluation of an EPA Rapid Bioassessment Benthic Protocol (Caton, 1993). This Assessment found Pine Creek in "very poor condition" despite several OWEB projects to improve conditions. Habitat assessments at seven locations ranked all sites as "poor" and macroinvertebrate communities were ranked as severely impaired at 5 of 7 sites. Pine Creek is on the Oregon DEQ 303(d) list for violating the water quality standard for biotic criteria in 1990-91. Segments of Pine Creek lacked surface flow, at the time attributed to drought conditions. A similar lack of surface flow in two segments is currently observed on the creek (August 2001 to April 2001). DEQ repeated water quality monitoring at 6 of the original 7 sites (excepting one site upstream of Pine Creek Ranch) in 2001.

A Proper Functioning Condition Assessment (Prichard, 1998) was performed with the National Riparian Service Team April 3-5, 2001. PFC assessment is a methodology for determining the physical functioning of riparian and wetland areas through consideration of hydrology, vegetation, and soil/landform attributes (Prichard, 1998). The on-the-ground condition termed "PFC" refers to a state of resiliency that will allow a riparian-wetland system to hold together during a 25 to 30 year flow event, sustaining that system's ability to provide physical and biological values. PFC is not equivalent to the desired future condition of the creek, nor is it the historic condition of the creek.

The NRST noted that Pine Creek's channel had been altered and/or moved in many locations due to agricultural use of valley bottom fields, as well as uncontrolled cattle grazing in the riparian zone. The creek is currently showing initial signs of recovery after cattle exclusion. Release of woody vegetation has occurred, and streambank colonizing species are numerous. Adequate diversity of riparian vegetation exists, but channel conditions and extent of riparian vegetation along most of the creek are currently inadequate to withstand moderate flow events. Recovery is expected to be a prolonged process dependent upon year-to-year climatic variation. High flow events are expected to cause apparent degradation but contribute to development of appropriate channel characteristics. The currently incised channel needs to continue development of

floodplains and meanders that dissipate energy during high flows.

Fourteen reaches were assessed. With the exception of a 0.2 mile reach of well-developed wetlands that was assessed as in PFC, all reaches of the creek were rated as "Functional-At Risk," a category encompassing all conditions between Nonfunctional and PFC. More detailed information on each reach was noted as comments on the PFC checklist and has been integrated into a monitoring database for the ranch.

Duckfoot Survey Company conducted riparian vegetation monitoring on 30 transects across Pine Creek, 5 at each of the six DEQ study points within the ranch. Dominant vegetation species were recorded in each canopy layer (tree, shrub, graminoid/forb) along transects running across the valley bottom. Streamside woody and herbaceous vegetation were measured in 10 m plots extending downstream from each transect.

Wet site vegetation was found to be restricted to a narrow band along the creek, averaging between 3 and 5 m in width. As a result of past channel incision and agricultural practices, terraces are dominated by weedy dry site vegetation. Streamside vegetation was noted to generally be in good condition, while recovery of terraces will depend upon channel aggradation, which should occur gradually with continued exclusion of livestock grazing.

The historic floodplains of Pine Creek are some of the most highly altered areas on the property. Their condition varies depending on the local impacts of activities such as agriculture, heavy grazing, and highway construction. These activities and upland watershed changes altered the hydrology of the creek, creating incised channels.

The floodplains have a high component of introduced vegetation, including cheatgrass, pasture grasses, yellow star-thistle, knapweeds, and Scotch thistle. Some areas are currently dominated by big sagebrush, and there are residual patches of native basin wild rye.

The historic floodplains are marginally functional as riparian buffers in their current condition. The most functional areas are those dominated by big sagebrush and basin wild rye. The other areas are generally densely vegetated, but often with annual grasses or noxious weeds with poor soil-holding and water-infiltrating properties.

The floodplains are providing wildlife habitats of low to moderate quality in their current condition. They are important winter range for mule deer and elk. They provide habitat for small mammals, grassland birds, and raptors. These habitat attributes could be greatly improved by restoration of native plant communities.

3. Pine Creek Tributaries

Tributaries to Pine Creek vary in their natural condition, the impacts they have experienced, and their current condition. No formal assessment of conditions of tributary riparian areas has been conducted. This section first describes general conditions in Pine Creek tributary riparian areas, then focuses on individual major tributaries. The majority of minor tributaries have conditions similar to those described below.

Conditions of Note

1. The majority of tributaries currently have channels that are incised where they pass through non-resistant material.

2. The best conditions in riparian habitats in tributaries are found where resistant bedrock has prevented incision.

3. Most tributaries have one to several spring sources, some of which provide a year-round source of water. In most cases, these spring sources have experienced heavy impacts from livestock, and in many cases, have been dammed to create stock ponds or piped into stock watering tanks. The majority of the stock tanks are no longer functioning. Infestations of noxious weeds or other non-native plant species are common at stock-watering sites.

4. All Pine Creek tributaries have only seasonal or ephemeral surface flow near their confluence with Pine Creek.

5. Noxious weeds currently are not abundant in tributary drainages. Most tributaries have at least remnant native riparian vegetation, often as little as a single willow near a spring in smaller drainages. Some tributaries, including some of the smaller drainages, have dense stands of old willows and other riparian shrubs.

6. Several tributary drainages have been used for road construction. Ranch roads in riparian areas are likely contributing sediments to the Pine Creek system, and have served as corridors for noxious weed dispersal. These roads are not designed to withstand high flow events in tributary channels, and are likely to wash out during flood events.

7. The majority of Pine Creek tributaries do not currently provide fish spawning and rearing habitat, and are not known to have historically provided fish habitat. The exceptions are Robinson Canyon and its tributary Little Pine Canyon (known current and historic habitat), Lone Pine Creek (possible current and historic habitat), and Cove Creek (possible historic habitat).

8. Riparian areas of tributary drainages have high importance as wildlife habitat, primarily due to water availability. Springs in tributary drainages provide water sources that increase habitat suitability of upland areas for wide-ranging species, and provide local habitat for amphibians, reptiles, birds, and small mammals.

Major Pine Creek Tributaries

1. Lone Pine Creek

Lone Pine Creek is a 2,191 acre drainage tributary to Pine Creek near the point where it enters Pine Creek Ranch. Highway 218 follows the North side of Lone Pine Creek from Pine Creek to

the top of Chichester Pass toward Fossil. Pine Creek Ranch includes 1,133 acres, plus 40 BLM acres, in the Lone Pine drainage, but the creek itself lies within adjacent private property, currently used for livestock grazing. Lone Pine Creek has near-perennial flow to its confluence with Pine Creek, extensive riparian vegetation, and active beaver dams.

Chichester Gulch is the major northern tributary of Lone Pine Creek, and lies within Pine Creek Ranch (other than its upper extremity, which lies within private ranch land). Chichester Gulch has perennial flow, and riparian vegetation including aspen, willow, bitter cherry, other shrubs, and sedges.

2. Robinson Canyon

Robinson Canyon is the largest southern tributary of Pine Creek, with a drainage area of 6,025 acres. Pine Creek Ranch includes 3,221 acres in the Robinson Canyon drainage, plus 179 acres of BLM land. The upper portions of eastern tributaries to Robinson Canyon are on private land used for livestock grazing.

The lower ½ mile of Robinson Canyon currently has only seasonal surface flow. This segment has experienced heavy deposition of gravel in a broad floodplain, and lacks surface flow for much of the year. A ranch road runs along this section of the creek, within the floodplain.

There is a headcut in this segment, where the stream re-entered the channel after flowing on the road surface. The channel has moved slightly to the west, away from a bedrock outcrop it previously flowed across. Approximately ½ mile up Robinson Canyon is a homestead site with old Lombardy poplars, orchard trees, and native cottonwoods. This site is a unique wildlife habitat on the property.

From the poplars upstream to Little Pine Canyon, Robinson has seasonal surface flow, with occasional pools that maintained water throughout the summer and fall in 2000 and 2001. This section had continuous or nearly-continuous surface flow beginning in early winter 2000-2001. Riparian vegetation is limited, with occasional patches of willows and other shrubs, scattered wild rose, and several individual large cottonwoods. Western juniper is dense in lower Robinson Canyon, often growing in the stream channel and on the banks and floodplain. Occasional ponderosa pines (primarily saplings) occur in or next to the stream channel in this section, likely germinated from seeds or cones washed down from upstream. The channel is composed primarily of gravel and cobbles, with occasional sections of exposed bedrock. A ranch road is adjacent to the creek, and crosses the creek several times in this section. Robinson Canyon is known to have historically been a steelhead spawning habitat, and pools in this section of the canyon held juvenile steelhead or resident rainbow trout in 2000. This relatively low-elevation section of Robinson Canyon is also important for wildlife habitat, with available water, occasional large cottonwoods, and juniper woodlands.

Robinson Canyon above Little Pine Canyon is generally similar to the lower section, but is of higher gradient, with more exposure of bedrock in the channel, and a narrower valley with little floodplain. Surface flow was perennial in 2000. Riparian vegetation is present only in clumps, with many areas of bare gravel or rock. Cottonwood is absent from this section. A few aspen

are present high in this section. The ranch road continues to cross the riparian area, and in places runs directly down the channel. No steelhead or trout were observed in this section in 2000, although it likely provided historic spawning and rearing habitat.

The uppermost portion of Robinson Canyon lies within a broader valley. There is a deep incised channel, with old willows in clumps rooted within the channel. A stock pond lies just below an old homestead site (Brinkley). This pond was dry in late summer to fall of 2000 and 2001, but full in winter and spring. Above the Brinkley site, riparian vegetation includes occasional willows, among thick juniper woodland with scattered ponderosa pine. The ranch road is to the west of the stream channel below the Brinkley site, and there is no road within the canyon above.

3. Little Pine Canyon

Little Pine Canyon flows into Robinson Canyon from the east approximately 2 miles upstream from Pine Creek. Little Pine Canyon is a 3,111-acre drainage within Robinson Canyon's 6025 acres. Pine Creek Ranch includes 1,360 acres within the Little Pine Canyon drainage.

The lower 1/3 mile of Little Pine Canyon has a gravel and cobble channel that lacked surface flow from August 2000 through January 2001, with the exception of an occasional short segment. Little riparian vegetation is present, primarily an occasional wild rose. The canyon bottom is a dense juniper woodland with an occasional ponderosa pine sapling.

The next section of Little Pine Canyon, from 1/3 mile above Robinson Canyon to the confluence of Old Mill Canyon, a large eastern tributary, is in relatively good condition. (Old Mill Canyon and another eastern tributary of Little Pine Canyon lie primarily outside of Pine Creek Ranch.) The channel is primarily cobbles and gravel, with occasional bedrock exposure. The canyon is extremely narrow, with steep sides. Mountain mahogany is abundant on the canyon slopes and near the creek. Riparian shrubs are present, including occasional willow, mock-orange, and chokecherry. Proceeding upstream, ponderosa pine becomes increasingly common, and Douglas-fir occurs next to the stream and on a small bench above the stream on the south bank near Old Mill Canyon.

From Old Mill Canyon upstream, Ponderosa pine timber was recently logged from Little Pine Canyon. The canyon bottom was used as the logging road, which was frequently directly in the stream channel. The channel is now recently incised within the logging road, or has been constrained by placing the logging road adjacent to the channel. The substrate is primarily gravel with occasional bedrock in the lowermost section, which is currently in the earliest stages of revegetation, with only herbaceous vegetation present. Upstream, deeper soil is present, and occasional willows and a few clumps of aspen remain where the valley was wide enough to allow placement of the road outside of the riparian channel. Ponderosa pine seedlings, saplings, and occasional larger trees are present, within a matrix of juniper.

4. Cove Creek

Cove Creek is the largest tributary of Pine Creek, with an 8,541 acre drainage area. The majority of this drainage lies outside of Pine Creek Ranch, which includes only 1,545 acres plus an

additional approximately 320 acres of BLM land within the boundaries. Steelhead or trout do not currently utilize Cove Creek and it is not known whether it historically provided spawning habitat. The Cove Creek drainage lies at low elevations and is primarily south-facing, resulting in warmer and drier conditions than other smaller tributaries of Pine Creek.

South of Highway 218, Cove Creek enters a broad portion of Pine Creek's floodplain, and parallels Pine Creek through the floodplain for approximately ½ mile before joining. This section of channel is deeply incised in deep floodplain soils, and lacked surface flow from August 2000 through February 2001. Little riparian vegetation is present, with knapweed, cheatgrass, and pasture grasses from the floodplain extending down into the channel.

From Highway 218 upstream to the north, for approximately 1 mile, Cove Creek lies in a moderately incised channel, flowing through a broad valley bottom dominated by sagebrush with low-density juniper. The channel substrate is a mix of cobbles and fine sediments. This section of stream also is intermittent or seasonal, lacking surface flow from August 2000 until February 2001. Occasional willows are present, but riparian vegetation is generally lacking. A ranch road parallels the creek channel on the east side. This road was one of the first in the area, a spur that led to Fossil from the Dalles- Canyon City Military Road.

Approximately 1 mile upstream of the highway, a homestead site (Widow Hildebrand) lies on the east side of the creek, with a group of large Lombardy poplars and a spring that is piped into a stock-watering trough. This spring has perennial flow, and a stock pond below the trough is densely vegetated with cattails, sedges, and grasses. Surface flow from this spring continues across the ranch road and into the Cove Creek channel. From this point upstream for approximately ½ mile, Cove Creek also has surface flow, and a dense stand of willows occupies the creek channel. From the Widow Hildebrand site, the primary ranch road leaves Cove Creek, but a side road crosses the creek and continues upstream on the west side.

From approximately 1½ miles above the highway, the main channel of Cove Creek lacks perennial surface flow. Cove Creek has numerous unnamed tributaries, most of which lie outside of Pine Creek Ranch. A large tributary that joins from the east approximately two miles upstream from the highway has two main forks, each of which are largely in Pine Creek Ranch property. Both of these forks have spring sources and areas of healthy riparian vegetation. The other tributaries also have spring sources outside of Pine Creek Ranch.

4. John Day Tributaries: Rhodes, Rattlesnake, Amine, & Rock Canyons

The lower portions of all of these canyons currently lack perennial surface flow. Lower Rhodes Canyon shows evidence of major historic flooding, with substantial deposition of gravel and cobbles. Rattlesnake Canyon has substantial spring sources in its upper reaches, as well as a narrow rocky section with perennial surface flow, and has intermittent surface flow into the John Day River. Rhodes, Amine, and Rock Canyons also have spring sources in their upper portions.

Upper sections of these drainages are broadly similar to smaller tributaries of Pine Creek. Most channels are incised where they pass through non-resistant material, and the best riparian habitat

conditions are found where bedrock has prevented incision. Many have perennial flow from spring sources, many of which have been dammed to create stock ponds or piped into watering troughs.

Most upper segments have at least remnant native riparian vegetation, often as little as a single willow near a spring in smaller drainages. Some have dense stands of willows and other riparian shrubs. Noxious weeds are not widespread in these watersheds, although they occur along some ranch roads.

Steelhead or trout do not currently utilize any of these tributaries (to the best knowledge of the habitat manager) and they are not known to have historically utilized these drainages.

Riparian areas of these canyons are important wildlife habitat, primarily due to water availability. Springs in tributary drainages provide water sources that increase habitat suitability of upland areas for wide-ranging species, and provide local habitat for amphibians, reptiles, birds, and small mammals.

1. Rhodes Canyon

Rhodes Canyon through its lower 3 ½ to 4 miles is an ephemeral stream, generally lacking surface flow. The stream channel is composed almost entirely of cobbles and gravel through this lower section. The floodplain of the creek is a broad area of deposition of coarse gravels and cobbles, suggesting a tendency toward episodic high flow events. Very little riparian vegetation is present in this lower section of Rhodes Canyon. A ranch road lies within the floodplain of the creek, and often within the creek bed itself. This road is subject to washing out in high flow events.

Sluice Canyon is a major eastern tributary of Rhodes Canyon, joining inside Pine Creek Ranch near the property boundary. The lower portion of Sluice Canyon is very similar to Rhodes Canyon, composed of a broad depositional area for coarse gravels and cobbles.

Several ranch roads lie in the Rhodes Canyon watershed, all of which pass through riparian areas. The Rhodes Canyon road has two branches, with one branch staying in Rhodes Canyon until near the top of the drainage before joining the Jennies Peak Road. The second branch goes up a tributary to the north before leaving the watershed. The Jennies Peak Road enters the Rhodes Canyon drainage from lower Robinson Canyon, and passes through or crosses several headwater channels before returning to Robinson Canyon's watershed near the Brinkley site. These three roads may all be necessary to maintain for management purposes. A side road leaves Rhodes Canyon and follows Sluice Canyon upstream for over a mile before exiting ranch property. An easement with a neighbor exists on this road. None of these roads are engineered to withstand flooding events.

2. Rattlesnake Canyon

Rattlesnake Canyon probably has greater seasonal flow than Rhodes, Amine, or Rock Canyons. It has surface flow into the John Day River during the spring. A ranch road follows this canyon

from the John Day upstream to near the head of the canyon, crossing the stream channel multiple times. It may prove necessary to maintain this road for management and or easement purposes.

The upper portion of Rattlesnake Canyon includes a narrow rocky canyon, with perennial surface flow and riparian vegetation including sedges, rushes, and shrubs. Above this segment are several spring sources, including one that has been dammed to create two ponds that currently support a dense growth of sedges and reeds.

3. Amine Canyon and Rock Canyon

Amine and Rock Canyons are relatively free of road developments compared to other major drainages on the property. A ranch road crosses Amine Canyon approximately 2 miles above the John Day River, and follows the Canyon bottom for approximately ¾ mile before climbing a slope. This same road crosses Rock Canyon near its upper end, about 2.5 miles above the John Day River, but no roads follow Rock Canyon.

D. Management Considerations

Ecological restoration of riparian zones requires a holistic approach whereby activities and conditions across an entire watershed should be considered. Problems affecting riparian and aquatic resources are unlikely to be solved by ignoring deleterious land management practices, either historical or current, that occur at landscape or watershed scales. Management actions taken throughout the relevant watersheds are expected to affect the riparian zones on the ranch.

Over 2/3 of the John Day River's 8100 square mile watershed lies upstream of Pine Creek Ranch. Recovery of riparian habitats along the John Day within Pine Creek Ranch is clearly dependent upon management actions in the upper watershed of the river as well as local practices. Observation of other riparian habitat improvement projects on the lower John Day suggests that substantial recovery can occur as a result of limiting or excluding livestock grazing.

Pine Creek Ranch includes only 37% of the 41,701 acre Pine Creek watershed. The predominant activity in the remainder of the watershed is cattle grazing, with timber harvesting a possible factor in the upper watershed. While acknowledging the importance of potential impacts from outside of the ranch property, the scale and arrangement of the ranch suggests a great deal of recovery may occur.

Restoration of degraded riparian zones and their subsequent conservation after recovery requires knowledge of how these systems function as well as the attributes responsible for their composition, structure and productivity. Three features that must be understood include 1. soils, geomorphology; 2. hydrology; and 3. biota. The soils/geomorphology features include streambank and floodplain form and development, channel gradient, geologic substrates influencing soil and channel composition, and subsoil features of the floodplain (e.g., gravel lenses important for subsurface flows). Hydrologic features include the frequency, magnitude and temporal distribution of stream flow (including peak and low flows), sediment availability and transport, subsurface hydrology, and water quality. Biotic features include vegetation, vertebrates, invertebrates, and microorganisms.

The first and most critical step is the halt of activities causing the degradation or preventing recovery and allowing the system to recover on its own. Livestock grazing has been the most prevalent cause of ecological degradation for many riparian and stream ecosystems. After Beschta and Kauffman field reviewed fish habitat improvement projects in eastern Oregon, they found that the cessation of livestock grazing in riparian zones was the single most ecologically effective approach to restoring salmonid habitats. The Tribes removed livestock from the ranch upon purchase of the property.

In reviews of eastern Oregon projects and throughout the western U.S., passive restoration has been the first critical step, and often the only step needed for recovery of riparian systems (Beschta, et al. 1991, Kauffman et al. 1993; Beschta et al. 1994).

Beaver are widespread in Pine Creek, and can be expected to play a major role in restoring the hydrology of the creek. Willow and other native riparian shrubs are currently widespread, and will likely expand their range as appropriate soils and hydrology return (e.g., narrowing and deepening of the channel). Other than improving vegetation in abandoned farm fields, monitoring of natural recovery of Pine Creek's riparian area is recommended over active restoration techniques. Active restoration practices will be considered if monitoring data provide evidence that such a strategy is appropriate.

Recovery of riparian habitats in tributary drainages is most likely to depend upon successful management of upland areas, especially as related to vegetation changes that will promote healthy watershed function.

IX. LISTED SPECIES

No Endangered Species are currently known or expected to occur on the ranch, however, several Threatened species and numerous Species of Concern or Sensitive species are known or expected to occur (Table 4).

Table 4. Species listed as Endangered, Threatened, Candidate, Species of Concern, or Sensitive.

Species	Scientific Name	US			OR		Observed		Expected
		T	C	SC	T	S	00-01	Prior	
MAMMALS									
Pygmy rabbit	*Brachylagus idahoensis*			√		√			√
White-tailed jackrabbit	*Lepus townsendii*					√		√	
Pale western big-eared bat	*Corynorhinus townsendii pallescens*			√		√		√	
Spotted bat	*Euderma maculatum*			√				√	
Silver-haired bat	*Lasionycteris noctivagans*			√		√		√	
Small-footed myotis	*Myotis ciliolabrum*			√		√		√	
Long-eared myotis	*Myotis evotis*			√		√			√
Long-legged myotis	*Myotis volans*			√		√			√
Yuma myotis	*Myotis yumanensis*			√		√			√
Pallid bat	*Antrozous pallidus*					√		√	
California wolverine	*Gulo gulo luteus*			√	√			√	
Bighorn sheep	*Ovis canadensis*			√			√		
BIRDS									
Bald eagle	*Halieatus leucocephalus*	√			√		√		
Mountain quail	*Oreortyx pictus*			√			√		
Ferruginous hawk	*Buteo regalis*			√		√			√
Northern goshawk	*Accipiter gentilis*			√		√	√		
Western burrowing owl	*Athene cunicularia hypugea*			√		√		√	
Lewis' woodpecker	*Melanerpes lewis*			√		√	√		
Willow flycatcher	*Empidonax trailli adastus*			√				√	

Species	Scientific Name	US			OR		Observed		Expected
		T	C	SC	T	S	00-01	Prior	
Yellow-breasted chat	*Icteria virens*			√					
Tricolored blackbird	*Agelaius tricolor*			√		√	√		
Swainson's hawk	*Buteo swainsoni*					√		√	
Sandhill crane	*Grus canadensis*					√	√		
Flammulated owl	*Otus flammeolus*					√		√	
Northern pygmy owl	*Glaucidium gnoma*					√	√		
White-headed woodpecker	*Picoides albolarvatus*					√		√	
Black-backed woodpecker	*Picoides arcticus*					√		√	
Horned lark	*Eremophila alpestris*					√	√		
Bank swallow	*Riparia riparia*					√	√		
Pygmy nuthatch	*Sitta pygmaea*					√		√	
Loggerhead shrike	*Lanius ludovicianus*					√	√		
AMPHIBIANS									
Columbia spotted frog	*Rana luteiventris*		√			√			√
Western toad	*Bufo boreas*					√	√		
FISH									
Middle Columbia summer steelhead	*Oncorhyncus mykiss*	√					√		
Pacific lamprey	*Lampetra tridentata*			√				√	
Interior redband trout	*Oncorhyncus mykiss gibbsi*			√			√		
INVERTEBRATES									
Lynn's clubtail dragonfly	*Gomphus lynnae*			√					√
PLANTS									
Washington monkeyflower	*Mimulus washingtonensis var. washingtonensis*			√					√
Little mousetail	*Myosurus minimus ssp. apus (= var. sessiliflorus)*			√					√
Arrow-leaf thelypody	*Thelypodium eucosmum*			√					√

US = USFWS, OR = Oregon, T = Threatened, C = Candidate, SC = Species of Concern, S = Sensitive

X. WILDLIFE & FISH

A. Wildlife

The ranch provides habitat for a diverse assemblage of terrestrial wildlife species. The list of terrestrial vertebrate species known or expected to occur on the ranch includes 6 amphibians, 14 reptiles, 160 birds, and 66 mammals (Appendix 1).

1. Game Species

Big game species on the ranch include mule deer (*Odocoileus hemionus*) and Rocky Mountain elk (*Cervus elaphus*), each of which are abundant enough to support limited public and tribal hunting. Bighorn sheep and pronghorn antelope (*Antilocapra americana*) also occur, but which occur only peripherally and are not currently numerous enough to support hunting on the property.

Native upland game birds include California Quail (*Callipepla californica*) and Mountain Quail (*Oreortyx pictus*; not currently a game species due to recent population declines). Introduced Ring-necked Pheasants (*Phasianus colchicus*) and Chukar (*Alectoris chukar*) are well established, and Wild Turkey (*Meleagris gallopovo*) have been observed on the property. Migratory game birds include Mourning Doves (*Zenaida macroura*) in the uplands, and waterfowl (esp. Mallard (*Anas platyrhyncos*) and Canada Goose (*Branta canadensis*)) that use the creek and river.

2. Wildlife Habitat Conservation and Management Plan

Pine Creek Ranch is enrolled in the Wildlife Habitat Conservation and Management Program through Oregon Department of Fish and Wildlife. This program allows ODFW to insure that the property is being managed for the benefit of fish and wildlife habitat, and allows the Tribes to receive a deferred property tax rate from Wheeler County. The property was enrolled in the program through completion of a Wildlife Habitat Conservation and Management Plan (WHCMP) that has been approved by ODFW. The program has been approved by the Wheeler County Commissioners, and the ranch is therefore eligible to be taxed at a rate equivalent to the deferred ranch tax rate. In order to receive this deferred tax rate, the WHCMP must be followed, and ODFW is responsible for monitoring its implementation. This Wildlife Habitat and Watershed Management Plan is more detailed than the WHCMP, but fully compatible with it. Implementation of this plan will support the objectives of the WHCMP.

The Wagner Ranch portion of the property is not yet enrolled in the program, but will be enrolled through amendment of the original WHCMP.

B. Fish

The John Day River was historically one of the most significant anadromous fish producing rivers in the Columbia River basin. The John Day River spring chinook salmon and summer steelhead populations are two of the last remaining intact wild populations of anadromous fish in the Columbia River basin, however, both populations are depressed relative to historic levels (Knapp, et al., 2001). Recent runs of spring chinook salmon (2,000 – 5,000 fish) and summer steelhead (5,000-40,000 fish) are a fraction of their former abundance.

An estimated 27 species of fish, including 17 native species, are found in the John Day River subbasin. Of these, 13 are considered to occur basin-wide, and 6 in the Lower Mainstem of the John Day (Table 5; the remaining 8 species occur in higher elevation portions of the basin or in lakes and ponds).

Among these species, only steelhead and redband trout are known to occur in Pine Creek. Other native species may occur, but none of the introduced species abundant in the lower river are likely to use small low-elevation tributaries such as Pine Creek.

1. Steelhead and Trout in Pine Creek

Summer Steelhead (*Oncorhynchus mykiss*)

The John Day River supports what may be the largest wild run of summer steelhead in the Columbia River basin with an estimated run of between 5,000 and 40,000 fish. No hatchery steelhead have been released in the John Day River subbasin since the late 1960's, and those releases were from a stock that had very little probability of survival (Knapp, et al., 2001)

Stray hatchery fish from other drainages have been observed during incidental and statistical creel programs since 1986, with what appears to be an increasing trend. Stray hatchery steelhead (ad-clipped) are removed in the lower river to minimize the potential for negative interactions between out-of-basin strays and wild fish. Stray concentration is greatest near the mouth of the river.

Low, warm water in the lower John Day River during summer months precludes adult summer steelhead from exiting the Columbia River and entering the John Day until mid- to late September (Figure 7). After entering the John Day River, they gradually move upriver entering spawning tributaries along the way. Spawning commences in April in lower river tributaries and continues through mid-June in high elevation tributaries of the North Fork. Emergence of summer steelhead fry is usually complete by mid-July.

Very little life history or genetic information has been collected on summer steelhead within the John Day sub-basin. Available information indicates steelhead smolt primarily as 2-year-olds (74%) and spend one year (58%) in the ocean before returning as adults. A smaller proportion of fish smolt as either 1- or 3-year-olds (10% and 16%, respectively) or spend 2 years in the ocean (39%) before returning as an adult.

Steelhead spawn and rear in Pine Creek from the mouth upstream at least 10 miles, beyond the upper property boundary of Pine Creek Ranch, and in Robinson Canyon and its tributary Little Pine Canyon.

ODFW monitors the steelhead population within the John Day sub-basin with spawning ground surveys each spring on approximately 85 miles of tributaries, including 3 to 4 miles on Pine Creek. Spawning densities vary considerably (Figure 8) depending on environmental conditions, including ocean productivity. Redd counts on Pine Creek vary from a high of 18.7 redds/mile in 1987 to zero redds in 1994, 1998, and 2000. A downward trend throughout the basin is indicated for the past 40 years.

In March 1999, the National Marine Fisheries Service (NMFS) listed the John Day River summer steelhead as a threatened species as part of the Middle Columbia Evolutionarily Significant Unit (ESU) under the Endangered Species Act (ESA). In contrast to the NMFS finding, Chilcote (2001) found that John Day subpopulations were at no risk to extinction.

Redband Trout (***O. mykiss gibbsi***)

Redband trout are the resident, non-anadromous form of steelhead, with which they are conspecific. They are found throughout the John Day sub-basin, and difficult to distinguish from juvenile anadromous *O. mykiss*. Spawning of the two types overlaps and they are not reproductively isolated.

It is not known what extent of the *O. mykiss* population in Pine Creek is resident or anadromous. The ESA listing of Summer Steelhead as Threatened excluded resident redband populations, which are currently considered a Species of Concern at the Federal level, and Sensitive at the State level.

Throughout this plan, discussion of steelhead habitat on the ranch will be assumed to also refer to habitat for resident redband trout.

2. Species of Note in the Lower John Day River

Spring Chinook Salmon *(Oncorhynchus tschawytscha)*

Spring chinook salmon adults enter the John Day River in May and June, and arrive at spawning and rearing areas in the Upper John Day and tributaries by early July. Fish spawn from late August through late September (Figure 7). Juveniles migrate downstream in the spring one year following emergence (Knapp, et al., 2001). Pine Creek Ranch is relevant to spring Chinook salmon for its watershed function, but not as current spawning habitat.

Fall Chinook Salmon *(Oncorhynchus tschawytscha)*

A remnant run of fall chinook salmon spawns sporadically in the lower river below Cottonwood Bridge (RM 38). It is believed fish historically spawned below Tumwater Falls (RM 10), which

were part of a larger population spawning in the mainstem Columbia, that was all nearly extirpated when John Day Dam was constructed on the Columbia (Knapp, et al., 2001).

Coho Salmon (*Oncorhynchus kisutch*)

Coho salmon historically occurred in the Middle Fork of the John Day River, but have been extirpated from the John Day Subbasin (Knapp, et al., 2001).

Pacific Lamprey (*Lampetra tridentata*) and **Western Brook Lamprey** (*L. richardsoni*)

Little is currently known about the status of lamprey in the John Day sub-basin, although research is underway (Knapp, et al., 2001). Lamprey are a traditional tribal food, and are of cultural significance to the Tribes.

Smallmouth Bass (*Micropterus dolomieui*)

The John Day River is nationally known for supporting a fishery of smallmouth bass. Smallmouth bass were initially stocked in the lower river in 1971, and the population has expanded to all suitable habitat. A concern exists that smallmouth predation may impact migrating salmonids in the John Day, although one study concluded that this predation was not significant (Knapp, et al., 2001).

3. Role of Pine Creek Ranch in Regional Fish Recovery

The National Marine Fisheries Service's recent Biological Opinion on the federal Columbia River hydropower system recognizes the importance of the John Day sub-basin to fish and wildlife restoration efforts (NMFS 2000).

The Draft Sub-basin summary (Knapp, et al., 2001) identifies habitat protection and/or restoration as the most critical need in the sub-basin, which if addressed "would provide the greatest long-term benefit for both fish and wildlife within the sub-basin". The sub-basin summary also acknowledges the importance of addressing mainstem passage and ocean/estuary survival to complement in-basin habitat restoration efforts.

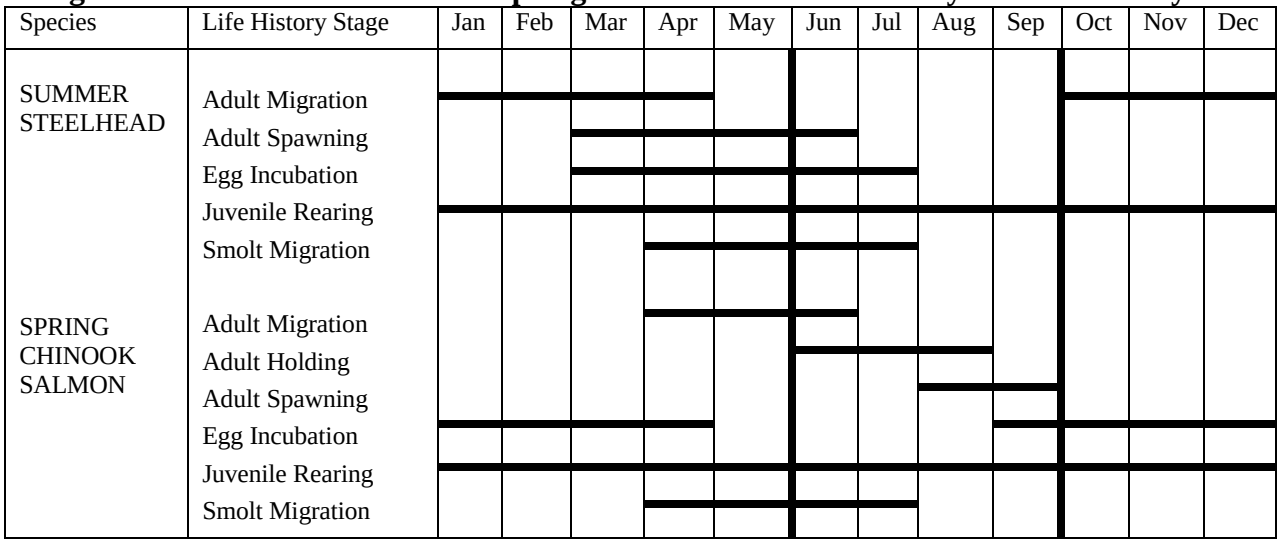
Fish managers have agreed to fisheries goals and objectives through the *U.S. v. Oregon* and NWPPC planning process. The John Day River will be managed for production of wild anadromous fish and increased production from the basin will be attained primarily by protecting high quality habitat and by improving degraded habitat.

Table 5. Fish Species known or expected to occur on Pine Creek Ranch.
Modified from Draft Subbasin summary, NWPPC 2001, to include only species of John Day basin-wide or lower mainstem distribution. Spring Chinook are included due to their migratory use of the lower mainstem. Special status species are in bold text.

Species	Origin	Location	Status
Torrent sculpin *(Cottus rhotheus)*	N	B	C
Mottled sculpin *(Cottus bairdi semiscaber)*	N	B	C
Spring chinook *(Oncorhynchus tschawytscha)*	**N**	**UM, NF, MF**	**C**
Summer steelhead *(Oncorhynchus mykiss)*	**N**	**B**	**T**
Redband trout *(Oncorhynchus mykiss gibbsi)*	**N**	**B**	**S**
Speckled dace *(Rhinichthys osculus)*	N	B	C
Longnose dace *(Rhinichthys cataractae dulcis)*	N	B	C
Redside shiner *(Richarsonius balteatus balteatus)*	N	B	C
Chiselmouth *(Acrocheilus alutaceus)*	N	B	C
Carp *(Cyprinus carpio)*	I	LM	C
Bridgelip sucker *(Catastomus columbianus)*	N	B	C
Largescale sucker *(Catastomus macrocheilus)*	N	B	C
Northern pikeminnow *(Ptychocheilus oregonensis)*	N	B	C
Pacific lamprey *(Lampetra tridentata)*	**N**	**B**	**S**
Brook lamprey *(Lampetra richardsoni)*	N	B	U
Black bullhead *(Ictalurus melas)*	I	LM, L	O
Brown bullhead *(Ictalurus nebulosus)*	I	LM, L	O
Channel catfish *(Ictalurus punctatus)*	I	LM	C
Largemouth bass *(Micropterus salmoides)*	I	LM, L	O
Smallmouth bass *(Micropterus dolomieui)*	I	LM, UM, NF	C

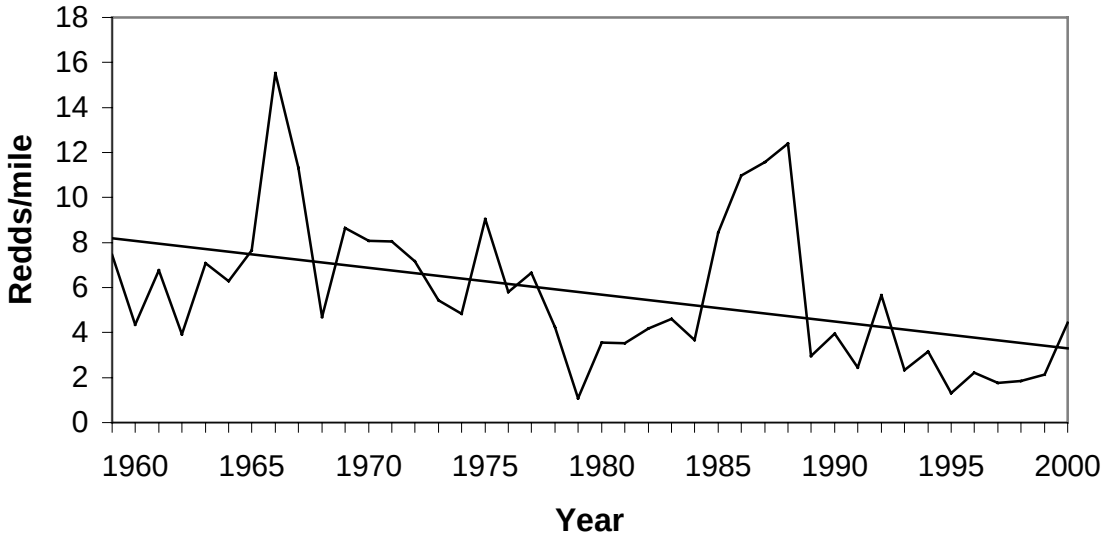
I=Introduced, N=Native, L=Lakes or ponds, B=Basinwide, LM=Lower Mainstem, UM=Upper Mainstem, MF=Middle Fork, NF=North Fork, C=Common, O=Occasional, S=Sensitive, T=Threatened

Figure 7. Summer steelhead and spring chinook salmon life history in the John Day River.



Source: USDI 2000

Figure 8. Spawning density (redds/mile) of summer steelhead in the John Day Subbasin, 1959 – 2000.



XI. WATER RIGHTS

Data on water rights was supplied by Bancroft Appraisal Company, Oregon Water Resources Department, and Oregon Water Trust (Table 6).

Water rights on both Pine Creek and the John Day River were acquired with the ranch. Most of the water rights were originally obtained prior to 1909, and are therefore decreed, not permitted.

According to the Oregon Water Trust, the tribe's water rights on Pine Creek are among the most senior rights on the creek. This is important as far as low flows are concerned because if the water rights were turned over to instream rights, that water could not be appropriated by other users, thus assuring more flow during the critical summer months. The percent of the total flow the tribe owns is substantial. The OWT assessment shows the tribes water rights on Pine Creek total 2.48 cfs from June 1 to the end of the irrigation season.

The rights for the John Day include both relatively senior rights from 1900, and relatively junior rights from 1982 and 1983. The rights to the John Day River near the mouth of Pine Creek are permitted, not certified. Certified rights are recognized as final and binding by the OWRD, whereas permitted rights are those with an application for certification pending. This process can take years to finalize. The John Day water rights have been applied for and a permit issued for them, but there is no certificate. Only certificated, primary rights may be leased for instream use.

The prior owner of Pine Creek Ranch provided documentation of recent irrigation history on the ranch to the Tribes. The Tribes leased water rights on Pine Creek to instream use for 2001 by Lease Agreement Number 190 with OWT and OWRD, and are renewing that lease, as well as the instream lease on Wagner Ranch water rights, for 2002.

Table 6. Pine Creek & Wagner Ranch Water Rights

Applic. #	Per.#	Cert. #	Priority	Permit Name	Type	Source	CFS		Twn	Rng	Sect	Right Acres
							Apr1-Jun1	Jun1-Sep30				
Decreed		25332	1870	Charles Hilton and C.E. Burgess	Prim.	Pine Creek	0.8	0.4	7S	19E	33	12.5
											34	10.00
									8S	19E	3	10.00
Decreed		25333	1872	Charles Hilton and C.E. Burgess	Prim.	Pine Creek	0.09	0.045	8S	20E	3	3.6
Decreed		25334	1874	Charles Hilton and C.E. Burgess	Prim.	Pine Creek	0.48	0.24	7S	20E	31	3.00
											32	0.20
									8S	20E	5	16.00
Decreed		25335	1874	Charles Hilton and C.E. Burgess	Prim.	Pine Creek	0.187	0.09	8S	20E	4	7.50
Decreed		25365	1870	A. L. Huntley	Prim.	Pine Creek	1.84	0.92	7S	19E	36	52.40
										20E	31	21.20
Decreed		25167	1881	First National Bank	Prim.	Pine Creek	0.357	0.178	8S	20E	1	3.30
											2	11.00
Decreed		24919	1871	George Bowley	Prim.	Pine Creek		Unk.	7S	19E	34	9.00
											35	19.60
Decreed		25462	1871	Ellen Lee: Edward Lee Estate	Prim.	Pine Creek	0.557	0.278	7S	19E	35	22.30
Decreed		25523	1880	WJ McGreer	Prim.	Pine Creek	0.34	0.17	8S	19E	4	13.90
T6736	D25739	67640	1900	Derby Smith Partners	Prim.	John Day R.	1.425		9S	19E	12	39
											13	10.8
T6737	D25739	68636	1900	Derby Smith P.	Prim.	John Day R.					13	7.2
S 64855	S47613	67885	1983	Derby Smith Partners	Prim.	John Day R.	0.525		9S	19E	12	19
											13	2.4
T6737	S47613	68638	1983	Derby Smith Partners	Prim.	John Day R.	0.095		9S	19E	12	0.2
											13	3.6
S63407	S46754	n/a	1982	W. Dan Eddleman	Prim.	John Day R.	2.62		7S	19E	33	26.40
					Sup.						33	12.50
					Prim.						34	8.60
					Sup.						34	9.70
					Prim.				8S	19E	3	10.00
					Prim.						3	15.00
					Prim.						4	8.60
					Sup.						4	13.90

XII. INTRODUCED PLANT SPECIES MANAGEMENT

A. General Guidelines

Introduced plant species are numerous on the ranch, as they are throughout North America. While maintaining communities of native vegetation is a management goal for the property, it is recognized that introduced species will always be a component of the ranch vegetation.

Action will be taken to control an introduced species after careful consideration indicates leaving the plant unchecked will result in more damage than controlling it with available methods. Weed control will focus on the effort to restore native species and communities to the areas currently occupied by noxious weeds. Preventative efforts will focus on avoiding infestations of species currently not present, but known to be problematic in the region.

Weed management will follow an adaptive management strategy, based upon:

- Identifying species that interfere with management goals
- Prioritizing these species based upon their impacts
- Evaluating available control methods
- Developing and implementing control plans
- Monitoring management results

Weed management priorities will be based upon the goal of efficiently managing infestations, and minimizing the long-term workload. New infestations and existing infestations with the greatest potential to rapidly spread and impact a wide area will receive high priority. Probability of success is also considered, giving the technologies and resources available.

B. Assessment of Current Conditions

Due to the long history of human use of the area, the current vegetation of the ranch includes a mixture of native species and species introduced deliberately or inadvertently by people. The working draft plant list for the ranch (Appendix 2??) includes nearly 300 species of native plants known or expected to occur on the ranch, and over 100 introduced species.

Introduced species range from widespread throughout the property (cheatgrass, some other annuals) to extremely local in occurrence (black locust). Similarly, introduced species vary in their ability to invade natural vegetation. Species such as yellow star-thistle are considered highly invasive, while others, such as cereal grains, are unlikely to spread beyond the area where they were planted.

The species currently identified as high priority species are:

Yellow star-thistle (*Centaurea solstitialis*)
Russian knapweed (*C. repens*)

Diffuse and spotted knapweeds (*C. diffusa* & *C. maculosa*)
Scotch thistle (*Onopordum acanthium*)
Himalayan blackberry (*Rubus discolor*)
Whitetop (*Cardaria draba*)

C. Weed Management Plan

The Habitat Manager will develop a weed management plan for the ranch following a Site Weed Management Plan template created by The Nature Conservancy. This template provides a planning structure compatible with the adaptive management strategy and general principles identified above.

D. Work Completed to Date:

A survey of noxious weeds in the floodplains of Pine Creek was conducted under ODA Weed Grant #694 GR by Larry and LaRee Hyder. In conjunction with this survey, herbicidal treatment of yellow star-thistle and knapweeds was conducted by Floyd Paye of the Jefferson County Public Works Dept., using Transline (clopyralid).

After the July 2000 wildfire, knapweed rosettes were abundant in 32 acres of burned floodplain fields. This area was treated with the herbicide Curtail (clopyralid & 2,4 D) in November 2000 by Wilbur Ellis, Inc., under contract to Pine Creek Ranch. A 41 acre area extending beyond the sprayed 32 acres was subsequently broadcast seeded with Triticale in December 2000 by Dan Greenfield to provide competition with knapweed. This seeding was conducted using funds from the ODA Weed Grant. This area will need repeated control of knapweed, and restoration to native species within a few years.

In 2001, the Tribes received additional ODA Weed Grant funding, and contracted with Jefferson County Public Works for herbicidal control of yellow star-thistle, Russian knapweed, Scotch thistle, Whitetop, and Russian olive. Biocontrol agents (yellow star-thistle hairy weevil, Eustenopus villosus) were released on a yellow star-thistle population along Pine Creek.

E. Herbicide Use Guidelines

The following guidelines are derived from draft herbicide use guidelines from TNC's Wildland Invasive Species Program.

Carefully consider the overall impacts of herbicide use on conservation goals, native species, and the ecological system. Base all decisions whether to control weeds, and whether to use herbicides instead of other methods, on the management goals for the site.

In addition, the health and safety of applicators and others in the vicinity must be considered **BEFORE** pesticides are applied. Simply put, one should be confident that the proposed herbicide will do more conservation good than harm and not endanger the health of the applicators or others in the area. If herbicide is used, reasons for doing so must be recorded.

1. Site Conditions

Site conditions to consider include accessibility, proximity to open water, depth to groundwater, the presence of rare species and other conservation targets, and the site's sensitivity to trampling that could occur when the herbicide is being applied.

To prevent contamination of water bodies, management plans should carefully consider the hydrology of the system that is being treated. Hypothesize potential runoff scenarios and take appropriate measures (such as buffer zones) to prevent them. Underground aquifers and streams should be considered as well.

2. Regulations

Follow all federal, state and local regulations regarding herbicide use. It is a violation of federal law to use an herbicide in a manner inconsistent with its label.

Herbicides may be applied only by employees or contractors who have all certificates and licenses required by the state and/or county. Volunteers may NOT apply herbicides unless they are properly licensed AND have signed a consent & release form. Applicators MUST wear all protective gear required on the label of the herbicide they are using.

3. Herbicide Properties

Consider the following herbicide properties when deciding which compound to use:

1. Effectiveness against the target species.
2. Mechanisms of dissipation (persistence, degradation, and likelihood of movement via air or water to non-target organisms).
3. Behavior in the environment (in soils, water, and vegetation).
4. Toxicity to birds and mammals, aquatic species, and to other non-target organisms (including algae, fungi, and soil organisms).
5. Application considerations
6. Safety
7. Human toxicology

In general for work in natural areas, it is best to select compounds that are effective against the weed, not likely to drift, leach to groundwater or wash into streams, nontoxic to people and other organisms, not persistent in the environment, and is easy to apply. In some circumstances, a single application of a more toxic or persistent chemical that kills the weed, however, may be preferable to a less persistent, less toxic compound that must be applied repeatedly. Strive to do the job with the smallest **total** negative impact to the environment. Information on types of herbicide available and appropriate application rates can be found in the Pacific Northwest Weed Control Handbook.

4. Posting Treated Areas

Federal requirements for posting treated areas, if any, are listed on the herbicide label. Glyphosate, triclopyr and most other herbicides used in natural areas have no federal posting requirements. Always keep treated areas off limits to the public at least until the herbicide dries. Treated areas may be kept off limits for longer periods if the herbicide is persistent in the environment.

Post notices of herbicide applications at all information kiosks. The posting should include a notice that the area has or will be treated, the name of the herbicide used, the date of the treatment, appropriate precautions to be taken, the date when re-entry is judged to be safe, and a phone number for additional information. The notices should be removed after it is judged safe to re-enter the area.

5. Record Keeping

When using herbicides it is critical (and, in some cases, required by law) to keep records of all plants/areas treated, amounts and types of herbicide used, and dates of application. This information will be important in evaluating the project's success, improving methodology, and identifying mistakes. In addition, it documents the procedure for future site managers and biologists. Records of abundance/condition of the targeted weeds and nearby desirable plants before and after treatment will also be valuable in evaluating the effectiveness of the herbicide.

F. Vegetation Restoration Projects

Selecting appropriate plant materials and methods to use in restoration projects is challenging. Site conditions typically include highly impacted areas, and competition from weeds is often intense. In most situations, it will be appropriate to attempt to restore a mixture of species, including perennial grasses and forbs. Shrub species provide numerous wildlife benefits and should be considered as well. (Vallentine, 1986)

1. Native vs. Non-Native Species

Locally adapted native plant materials are the ideal goal of restoration projects on the ranch, however, non-native plants may need to be used when natives are unlikely to establish. Using local genetic material in restoration projects helps prevent loss of biodiversity that can occur from importing plant materials from different populations of native species.

- Utilize native materials from the local region. Avoid importing native plant materials from more than 300 miles north or 200 miles south of their origin, or from populations that have been demonstrated to differ significantly from the local population. The use of carefully selected non-native plant species is preferred to the use of native species from outside of the local region.

- Utilize as diverse a local source population as possible. If collecting seed, sample from sites at varying elevations and aspects within the John Day Basin. By sampling a large

population, appropriate genetic material for the site may be re-introduced, and a diverse local population will be more likely to survive varying climatic conditions or other stresses.

Site conditions and availability of appropriate materials may prohibit use of native plant materials in certain projects. If a site has experienced heavy impact and lost the characteristics that native plants need (such as loss of the A-horizon of the soil, compaction, soil structure, moisture holding capacity, frost heaving, etc) non-natives may be the only vegetation that will survive on the site. A site may need to be seeded with non-native species in order to build up organics on the site, capture soil resources, re-establish a soil profile, break up compacted surface crust, re-establish horizontal channels for water to move into the soil, etc.

Non-native species used in restoration plantings should:

- Be comparable to native species in ecosystem functionality, or differ in a manner likely to contribute to restoring ecosystem functionality.
- Be unlikely to invade intact native vegetation communities.
- Be amenable to future restoration of native plants.

2. Restoration Methods

Vegetation can be restored through seeding or transplanting whole plants in several manners. The method selected will depend upon the site conditions and the likelihood of success of restoring the desired species.

Seeding

Seeding is often the first approach considered. It is relatively inexpensive compared to whole plant methods. Seeds are often available from commercial growers, especially for grass species. Seedbed preparation may be required, and competition from weeds may require herbicide use. Irrigation may be appropriate depending upon the species used.

Seed Availability

- Seed growers can propagate locally collected seed on a contract basis. Seed will typically be available for planting 2-3 years after initial collection.
- Native species are often available from commercial growers as genetically homogeneous cultivars rather than locally adapted populations.
- Seed costs and availability can vary widely, depending upon demand. Regional demand for native seed is high after intense fire seasons.
- Seed for perennial grasses is more widely available than for forbs or shrubs.
- Non-natives are widely available from commercial seed growers

Whole Plant Methods

Transplanting whole plants may be the only way to establish some species. This is especially true for some drought-tolerant shrubs (Van Epps and McKell, 1980). Seeding may be less effective because the seed of some long-lived woody plants germinates infrequently and their seedlings grow slowly (Whisenant, 1999). Planting whole plants bypasses the vulnerable seed establishment and seedling stages and provides greater success. In difficult to establish sites, transplanting seedlings brings more reliable results of grass and forb establishment (Whisenant, 1999).

The visibility of a project may also dictate that transplants be used. If a location is near an educational sign or alongside a roadway, and will be viewed by many people, it may be desirable to give the site a jump-start with transplants.

Wildings

Wildings are plants removed from natural settings and transplanted at repair sites (Munshower, 1994). This approach can be used for any vegetation, but is more frequently used for woody species. Wildings are not commonly used due to costs and low wildland survival rates. Adequate sources for transplants are often lacking.

Bare-root Stock

Bare-root seedlings are typically grown for 8 to 10 months in outdoor nurseries before removing them from the soil (lifting) for transplanting. They are hardier, older, easier to transport and less expensive than container grown plants. They also do not become root bound as do container grown plants. They establish as well as containerized stock under good conditions – but under dry or harsh conditions do not fare as well (Whisenant, 1999).

Container-grown Stock

Containerized planting stock is grown in greenhouses or outdoor facilities. Container-grown seedlings are the most reliable method for establishing woody plant seedlings in arid and semiarid ecosystems (Vallentine, 1989). Bare-root seedlings of many shrub and forb species require 1 to 2 years growth before transplanting into arid or semiarid rangelands, containerized seedlings may be transplanted after 12 weeks. Long, narrow paper containers (plant bands) are being used to grow shrub seedlings destined for desert planting. The seedlings in these containers grow deep root systems especially when watered from below.

Container grown plants tolerate competition and harsh environmental conditions more readily than seeded or bare-root transplants. In southern California, where competition from annual weeds prevented the re-establishment of coastal sage scrub, restoration was made possible through the use of container-grown stock (Eliason & Allen, 1997). The root development and volume provide significant advantages that can make the difference between success and failure in arid environments (Whisenant, 1999).

1. Seedlings are started at any time in the greenhouse.
2. Rare seed are most efficiently used because of the higher survival rate compared with direct seeding or bare-root transplants.
3. Rapid growth reduces the time required for quality seedlings.
4. Containerized stock is less susceptible to injury during transport.
5. Containerized stock has fewer storage problems after transport.
6. Transplanting time is longer for containerized stock.
7. Containerized stock has intact roots that are well developed when planted.
8. Containerized stock is less susceptible to shock after planting.
9. Growth in a container insures faster root development and larger and healthier plants after one or two growing seasons than comparably sized bare-root stock or wildings (Munshower, 1994).
10. Field survival is higher under difficult conditions (Vallentine, 1989).

XIII. GRAZING

A. Memorandum of Agreement

The Memorandum of Agreement between BPA and the Confederated Tribes specifically prohibits grazing of domestic livestock or feral horses and cattle on the property unless used as a method to manage for wildlife, as outlined in this site specific management plan and approved by BPA.

B. Pack Animals

Limited grazing by pack animals will occur within the context of utilizing pack animals for management purposes or for big game hunting. Regulations on the property prohibit use of pack animals other than for management purposes or by permitted big game hunters.

Pack animals will be used for management purposes only after careful consideration of potential impacts, including the spread of noxious weeds.

The use of pack animals by big game hunters is permitted to facilitate achievement of wildlife management objectives. All feed transported onto ranch property must be weed-free.

C. Public Land Grazing Allotments

In order to maintain the BLM grazing preference on the Spring Basin and Amine Peak Allotments, public lands on portions of the allotment will need to be grazed periodically based on current BLM grazing regulations.

The frequency, amount, and time of use will be based on BLM grazing regulations, Spring Basin Allotment Evaluation (dated 8/91), Final Oregon Wilderness EIS (dated 12/89), and coordination with the Prineville BLM.

Grazing use on these allotments, although partially intended to maintain grazing preferences, and subject to BLM regulations, will be managed with the goal of maintaining or improving wildlife habitat and watershed values on these public lands. Both allotments are currently being rested from livestock grazing.

D. Grazing for Weed Control

Grazing may be conducted to target specific noxious weeds prior to restoration of desired plant species. This type of grazing would be limited to carefully controlled use of livestock, most likely goats or sheep that would preferentially graze forbs, including weeds. Any such grazing will be conducted only with a specific plan documenting the purpose of the treatment, the expected benefits, and any risks associated with the treatment.

XIV. FENCES

A. Boundary Fence Conditions

Conditions of boundary fences vary considerably. No complete survey of boundary fences has been conducted. Boundary fences are primarily 3 or 4 strand barbed-wire. The majority of the ranch boundary fence is old, and has a combination of steel t-posts and occasional juniper posts or live juniper trees used as posts. Boundary fences are in need of repair or replacement in several areas, and other areas will continually need spot-repair when damaged by livestock and wildlife.

Boundary fences often do not follow boundaries precisely, but rather follow more convenient topography. In some cases this has resulted in 40 acre parcels being fenced either inside or outside of the property, independent of their ownership. For example, a 40 acre parcel in the SE ¼ of the SW ¼ of T8SR21E is fenced outside of the ranch, although owned by the Tribes. This is also true of the SE ¼ of the NE ¼ of Sec. 29, T8SR20E. On the other hand, the NW ¼ of the NE ¼ of Sec. 32, T7SR20E, although legally a portion of Knox Ranch, is fenced within Pine Creek Ranch boundaries.

Boundaries with BLM lands are sometimes not fenced, because grazing allotments typically span these private / public borders. Smaller parcels of BLM land on the boundaries of Pine Creek Ranch are variously fenced to the inside or the outside of the property. In certain cases, no boundary fence exists between BLM and Pine Creek Ranch land, as in some areas of the Spring Basin boundary where topography may have been sufficient to limit movement of livestock. Boundaries with BLM land in this area need to be clearly demarcated due to varying hunting access regulations between the ranch and the public land. There are no boundary fences between Wagner Ranch private lands and BLM lands within the Amine Peak Allotment.

Boundary fences along Highway 218 are often in poor condition, especially where steep slopes exist on the road bank down into the creek. These fences are of diminished importance in the central portion of the property where the Tribes own land on both sides of the highway. The fences here currently serve only as boundary markers and to assist in preventing unauthorized vehicle access.

B. Interior Fences

Interior fences on the ranch have not been surveyed. Interior fences include older fences that are either downed or partially downed, and several recently constructed fences that are in good condition. Interior fences disrupt natural movement patterns and represent entanglement threats to wildlife. Interior fences will be removed as funding and/or volunteer labor become available, beginning with older fences that have no current or potential value.

XV. ROADS

A. State Highway 218

1. Location

State Highway 218 (Shaniko – Fossil Highway) passes through the length of the property, trending in an east-west direction. The highway follows the north side of Pine Creek from near its mouth (at Clarno Road) to Lone Pine Creek (at Pine Creek Road). From this confluence, the highway continues upstream on the northwest side of Lone Pine Creek, angling northeast (Figure 1).

2. Impacts

Highway 218 is the major access route to Pine Creek Ranch. It provides convenient management access, as well as public visibility and access, to the interior of the property and the Pine Creek riparian area. The highway follows a traditional travel route through the Clarno basin, once the stagecoach route between Antelope and Fossil. The road remains a primary travel route for residents and visitors to Wheeler County.

The impacts of Highway 218 include direct physical impacts to the watershed, impacts on wildlife from vehicle traffic, spread of noxious weeds, and the effects of public access and visibility.

The primary physical impact of the highway on Pine Creek is a constraint upon the potential of the channel to meander through its floodplain in certain segments. In most areas, the floodplain is wide enough that the highway presumably has little effect, but in narrow sections of the valley, the roadway clearly occupies a portion of the natural riparian area. This constraining effect may increase the erosive power of flows below these segments.

Traffic on the highway has largely unknown impacts to wildlife, but likely has altered the behavior of some species sensitive to human disturbance. Traffic also has a direct impact on wildlife through mortality from collisions.

Highway 218 is also a potential distribution route for noxious weeds. The Oregon Department of Transportation contracts to have the road shoulders sprayed with an herbicidal sterilant annually, and follows this early spring treatment with later spot spraying. Weed seeds that blow or are washed off the roadway beyond the treatment area have potential to create new infestations, however. Herbicide sprayed on shoulders adjacent to the creek may have deleterious impacts on fish and other aquatic species.

The most significant impact of the highway, however, is its role in providing ready access through the property. This is convenient for management purposes, and facilitates restoration and monitoring work along Pine Creek. It also provides convenient access for visitors to the property. Local residents and travelers appreciate the opportunities to view wildlife from the

highway. On the other hand, the highway provides access for people violating ranch regulations or state and federal laws. Poaching has been a long-term problem because deer and elk frequently use the Pine Creek floodplains at night. Oregon State Police Fish and Wildlife Division, and ranch staff, patrol the highway. The highway corridor is also a frequent source of litter.

B. Wheeler County Roads

1. Clarno Road

Clarno Road crosses Pine Creek approximately 0.3 miles above its confluence with the John Day River. The county road follows the east bank of the river upstream for approximately 5 miles before reaching a locked gate on private land. This road is the access route for several residences, and is used by boaters and fishermen to access the John Day, and public hikers and hunters to access the Spring Basin BLM Wilderness Study Area. The Wheeler County Road Department maintains the graded dirt surface.

Clarno Road passes through only approximately 0.2 miles of Pine Creek Ranch property, and its direct impacts are minor. Pine Creek flows through a culvert under Clarno Road, which is undersized for the watershed and a fish passage barrier due to water velocity at high flows. The Tribes are working with the Wheeler County Road Department and the Wheeler Soil and Water Conservation District to replace this culvert with an appropriately sized structure that will be capable of withstanding high flows and will not be a fish passage barrier.

2. Pine Creek Road

Pine Creek Road follows the north side of Pine Creek upstream from Highway 218 at Lone Pine Creek. The road follows Pine Creek for several miles and joins Cottonwood Road, another county road that rejoins Highway 218 close to Fossil. This route provides access to several private ranches that occupy the upper Pine Creek watershed. The Wheeler County Road Department maintains the graded dirt and gravel surface.

Pine Creek road follows the boundary of Pine Creek Ranch property for approximately 0.4 mile, and constrains the stream channel at one point in this section. The dirt and gravel surface presumably contributes some sediment to the stream during precipitation events. Lone Pine Creek passes through a culvert under Pine Creek Road.

C. Ranch Roads

1. Current Conditions

Numerous road tracks exist on the ranch, yet none are engineered to withstand frequent vehicle use, and most are not likely to withstand high precipitation events. Ranch roads have been created either by long-term use by trucks, or by driving a dozer either for road-building purposes or to create a fire break.

In no case is an interior road on Pine Creek Ranch engineered with culverts, water bars, drive-able dips, or other drainage structures. All interior roads are surfaced with local dirt or rock, in many cases the surface has a heavy clay component. In most areas where roads are on fairly level terrain the surface is in fair condition. Where gradients increase, erosion has carved gullies into the road surface.

2. Impacts

The impacts of extensive vehicle use and road construction on Pine Creek Ranch are significant. Through soil disturbance and seed transport, ranch roads have served as dispersal routes for noxious weeds. Nearly all the noxious weed infestations away from the Pine Creek floodplain are located along and in ranch roads, which are often vegetated with cheatgrass and medusahead. Ranch roads are also contributing to soil erosion, and contributing sediments to riparian systems. Impacts of ranch roads increase with continued use, especially during wet conditions.

3. Easement Routes

Negotiated easements with neighboring landowners require the Tribes to allow vehicle access to several road segments. Vehicle access is allowed to Knox Ranch via the Cove Creek Road, as specified in the easement. Vehicle access on the Cove Creek Road is also allowed to Jim Hubbard and Chet Parker, owners of 40 acres along Cove Creek Road in the SE ¼ SE ¼ of T7SR19E Sec. 25. This easement also allows the Tribes access through Hubbard and Parker's property on the Cove Creek Rd.

An easement through sections 28 and 27, T8SR20E, from Rhodes Canyon, may be requested for the use of Ernst and Keys, adjacent landowners to the south. Ernst and Keys also own 640 acres east of Wagner Ranch, T9SR20E Sec. 28. The Tribes are currently negotiating possible reciprocal easements, granting access through Wagner Ranch, and receiving access to Wagner Ranch through Ernst and Keys property off Clarno Road.

4. Management Access Routes

Although the impacts of ranch roads are substantial, the difficult topography and risk of wildfires demand that a few routes are kept available for management and fire-fighting purposes. Motor vehicle use on all ranch roads will be for management purposes only, and will be limited to periods when road surfaces are either dry or frozen to minimize impacts. ATVs will be used in preference to trucks to reduce impacts. Equestrian use is similarly limited to management purposes, with the exception of use by permitted big game hunters.

The following routes are proposed as management access routes, and shown on Figure 1:

i. Cove Creek Road: Highway 218 to Knox Ranch boundary
ii. Robinson Canyon Road: Highway 218 to Poplars
iii. Jennies Peak Road: Robinson Canyon to Wagner Ranch at John Day River
iv. Rhodes Canyon Road: Jennies Peak Road to Ranch boundary (ATV only)
v. Divide Route: Highway 218 to Rhodes Canyon Road (ATV only)

vi. Rattlesnake Canyon Road: Jennies Peak Road to Ranch boundary
vii. Left Hand Canyon Road: Jennies Peak Road to Ranch boundary

5. Closed Routes

All interior ranch roads not listed as Easement Routes or Management Access Routes will be closed to all motor vehicle traffic. If deemed necessary for rehabilitation, roads will be ripped or reshaped with a hydraulic excavator and seeded with a native bunchgrass mixture.

XVI. FIRE MANAGEMENT

A. Historic Role of Fire in Rangelands

Fire is a natural factor on wildlands, and probably no range site with its associated plant community has developed without being influenced by fire (Vallentine, 1989). Fire likely occurred on the property when fuel accumulation and weather conditions made ignition and burning possible. Years with abundant winter and spring rains that allowed plant growth to flourish, followed by dry summer and fall conditions, likely produced the largest fires. The frequency of fire prevented the encroachment of juniper into grassland and sagebrush areas and restricted its range to rocky outcrops or slopes with thin soils that lacked the understory vegetation to carry fire. (See uplands section for more information on the spread of juniper).

Burning by native people likely also played a role in the fire history of the property. Deliberate burning was used in the Blue Mountains to increase visibility of game animals, to drive game animals, and to attract game animals after the burning by vegetative resprouting. It was also used to encourage the growth of food plants (Vallentine, 1989).

Plant species vary dramatically in their response to fire, with some capable of surviving fires, others capable of root-sprouting, and others dependent on regeneration from seed. In general, grasses and forbs are favored by fire and shrubs and trees decline following fire. This is due to the different physical characteristics of the species as well as the timing of the fire. Most prescribed fires do not affect forbs because forbs complete their life cycle prior to the time of year appropriate for burning. Grasses have many physiological adaptations that allow them to survive and thrive following a burn.

The vegetation on Pine Creek suggests a fire free interval of 15 to 25 years, this has now either been extended to over 100 years in the areas dominated by juniper or has decreased to less than 10 years and allowed the proliferation of medusahead and cheatgrass. The historic fire regime has been altered by land management practices. The intensity, size, frequency, severity, season, and pattern of burning have all been altered by overgrazing and fire suppression (Eddleman, 2000). A secondary effect of the changes in fire regime is the reduction of fine fuel loads (due to the expansion of juniper and overgrazing) limiting the potential of occurrence of all but the most severe fires (Riggs, et. al, 1996). The wild fire response plan will relate control methods to fire intensity, as well as delineating potential firebreaks.

B. Fire Management Partners

The Tribes are currently working with the Bureau of Land Management to develop a cooperative agreement for wildfire control on the ranch. Only 160 acres of ranch property in T8SR21E, Sec. 21, falls within an Oregon Department of Forestry fire protection district. Final determinations of wildfire control responsibility for the ranch have not yet been made.

C. Fire Management Plan

A wildfire response plan will be developed in cooperation with fire management personnel. This plan will take into consideration the concerns of neighboring landowners as well as the management needs of the ranch.

The wildfire response plan will specify that suppressing wildfire should be accomplished in a manner least damaging to wildlife habitats, plant communities, streams, roads, and other resources, and when possible wild fires should be allowed to burn out to natural firebreaks. The wildfire response plan will further specify that only in emergency situations will heavy machinery be used and vehicles including ATV's taken off management access routes.

D. Prescribed Fire

Prescription fire will be used as a vegetation management tool on the ranch. Prescribed fire as a management option is discussed under Juniper Management in the Upland Habitats Section.

XVII. TRIBAL AND PUBLIC ACCESS

A. Memorandum of Agreement

The Memorandum of Agreement between BPA and the Tribes specifies that:

> "The public shall have reasonable access to the Project. The Tribe may regulate access, provided that access and transportation regulations shall apply equally to tribal members and non-tribal members. The Tribe will not provide public access or use that will result in adverse impacts to wildlife, the reduction of wildlife habitat values, or the destruction of other natural resource values for which the Properties are managed, or impede the increase in HEP value of improvement HUs. Nothing in this Agreement limits the authority or ability of the Tribe to manage the properties for public safety and wildlife habitat conservation, or to preserve and protect cultural, historic, and religious sites, and to carry out and protect the federally guaranteed rights of the Tribe and its members. Nothing in this agreement limits or diminishes any treaty retained right or privilege of the Tribe or its members afforded under federal law as a result of the status of the Tribe or Tribal members, provided that treaty reserved rights will be exercised consistent with this Agreement."

B. Access Regulations

The Tribes have created Access Regulations with the assistance of the Pine Creek Ranch Access Advisory Committee. The committee will continue to meet yearly to review the Access Management Plan and to agree upon regulations. The committee is composed of representatives from the following groups:

The Confederated Tribes of Warm Springs
Oregon Department of Fish and Wildlife
Bureau of Land Management
National Park Service
Oregon Museum of Science and Industry
Oregon State Police, Fish and Wildlife Division
Wheeler County landowners

Current access regulations are attached as Appendix 3. Hunting regulations for 2002-03 are attached as Appendix 4.

XVIII. MANAGEMENT ACTIONS

Currently planned management actions are summarized in Table 7. As noted in the introductory sections, knowledge of ranch resources, and restoration and management strategies, will continue to increase through monitoring and evaluation. Additional management actions not identified in this plan will likely be necessary, and will be permitted providing they are compatible with guidelines set forth within this document.

Table 7. Management Actions

Management Action	Description	Objective Addressed
Eliminate artificial fish passage barriers.	The Tribes are working with Wheeler County Road Department, Wheeler SWCD, and USFWS. OWEB provided funding for design of passage solutions; cost-share funding has been provided by USFWS for work in 2002.	6, 8, 10, 11
Restore native vegetation in riparian zones. Improve functionality of riparian buffer.	Five miles of riparian buffer has been enrolled in the Conservation Reserve Enhancement Program (CREP) with NRCS. Plantings will occur in 2004. Initial cottonwood restoration trials began in April, 2001. The primary species for planting include cottonwoods, basin wildrye, and a mix of native shrubs and grasses.	5, 6, 7, 8, 9, 10, 13, 14
Reduce the spread of annual grasses into bunchgrass communities.	Minimize soil-disturbing activities such as motor vehicle use, mountain biking, and horseback riding. Take precautions if prescribed fires will be used in areas with heavy infestations of annual grasses.	1, 2, 9, 13, 14, 18, 21
Seek restoration strategies for annual grass dominated sites.	Monitor relevant on-going research by university, agency or conservation organization personnel. Encourage restoration research.	1, 2, 9, 13, 14
Establish biological control agents.	Biological control agents for yellow star-thistle were established in riparian areas in 2001. Additional releases of biological control agents will be made as needed for yellow star-thistle and other invasive weed species.	1, 2, 3, 5, 6, 7, 9, 13, 14, 18
Control noxious weeds.	Mechanical and herbicidal control of yellow star-thistle, knapweeds, Scotch thistle, and white-top will be conducted.	1, 2, 3, 5, 6, 7, 9, 13, 14, 18
Close unnecessary ranch roads.	All ranch roads are currently closed to public motor vehicle use. The only motor vehicle use of ranch roads permitted is for neighbors with easements, management purposes, or to access the Robinson Canyon campsite.	1, 2, 3, 5, 6, 7, 9, 10, 13, 14, 18
Rehabilitate closed roads.	Rip or re-shape closed roads as necessary, and re-seed with native bunchgrasses, or fell junipers and scatter limbs across roadways to reduce erosion and unauthorized use.	1, 2, 3, 5, 6, 7, 9, 10, 13, 14, 18

Improve road drainage.	Subcontract to install drainage dips to reduce erosion from management roads.	5, 6, 10
Develop fire control agreement with BLM.	Manage wildfires in a manner that considers the concerns of neighboring landowners and allows wildfires to play a role in diminishing juniper encroachment. Develop a Wildfire Response Plan. The plan should utilize pre-designated firebreaks and allow fires to burn that are not threatening structures or neighboring private lands.	1, 2, 3, 4, 9, 19, 20
Utilize prescribed fire as a habitat management tool.	Work with BLM to develop fire prescriptions. Conduct prescribed burns in areas with young juniper encroaching into sagebrush and native bunchgrass vegetation. Coordinate and communicate closely with neighboring landowners.	1, 2, 3, 4, 9, 19, 20
Conduct targeted mechanical control of juniper for watershed benefit.	Chainsaw girdle and /or fell trees in areas of groundwater availability within selected tributary drainages. Fell, lop, and scatter trees too small for girdling. Do not cut trees with old growth characteristics or with nests or nest cavities. Target trees with leaders indicating high water usage.	1, 2, 3, 4, 5, 6, 9, 19, 20
Lease water rights for instream flows.	Water rights are being leased to Oregon Water Trust for instream flows in 2002.	5, 6, 8, 9, 10
Use water rights for restoration plantings.	Pine Creek water rights will be utilized on an interim basis to irrigate CREP riparian buffer plantings as needed.	5, 6, 7, 8, 9, 10
Permanently transfer water rights to instream flows.	Donate water rights to Oregon Water Trust for permanent transfer to instream flow status with OWRD, after completion of restoration plantings. OWT non-profit status allows a tax deduction to the Tribes.	5, 6, 8, 9, 10

XIX. LAND EXCHANGE

The irregular shape of Pine Creek Ranch and neighboring public lands managed by the Prineville District BLM, and the multiple isolated parcels of public land within the ranch, create a situation in which a land exchange between the Tribes and the BLM would benefit management of both Pine Creek Ranch and the public lands.

The Tribes are currently working with the BLM on an equal-value land exchange proposal. The Oregon Natural Desert Association (ONDA) has assisted with developing the exchange proposal. Through the land exchange, the Tribes would:

- Acquire habitats of equal value to those exchanged to the BLM. Exchange riverfront property with no net loss of riverfront mileage to either the Tribes or the BLM.

- Acquire all BLM inholdings within the Tribes' ranch. The BLM would acquire the Tribes' inholding within the BLM Spring Basin Wilderness Study Area.

- Significantly reduce the length of boundary between the ranch and public lands, leading to immediate and long-term savings in fencing costs. (The total length of boundary between the Tribes' ranch and adjoining properties would be reduced by approximately 30 miles).

- Consolidate the Tribes' ranch property into a cohesive unit, greatly facilitating management.

The Tribes believe that this exchange would also benefit management of, and access to, public lands outside of the ranch. All public lands associated with the ranch would be accessible, from a public road and/or the John Day River, after the land exchange with the Tribes.

The Tribes' hold the grazing preference on all BLM land which they would acquire, and would similarly retain grazing preference on all parcels acquired by the BLM from the Tribes.

XX. MONITORING AND EVALUATION

Monitoring is a vital component of any restoration program. In order to confidently assess the effectiveness of any treatment, it is necessary to know the antecedent conditions, keep records of treatments, and record post treatment results. While some records exist from projects on Pine Creek prior to acquisition of the ranch by the Tribes, a detailed record of conditions prior to overall project initiation does not exist. Interpretations of the causes of future changes will be limited by this lack of pre-treatment data.

Pine Creek Ranch has the potential to serve as a model for watershed recovery in the lower John Day basin. There is a widely acknowledged need for long-term, small watershed studies to provide reference data for other short-term studies and to guide future watershed restoration efforts (Hawkins, 1986; Miller, et al., 1987; Schmidt, 1986). To maximize the value of watershed recovery on the ranch, it is critical to record baseline conditions as soon as possible and monitor changes through time.

In an ideal experimental design, a set of treatment areas would be paired with a similar set of control study areas. In watershed studies, this is generally not possible due to geographic and logistical constraints. A common compromise approach is a paired design, with one treatment and one control area. The paired area should approximate the geology, soils, vegetation, and stream flow to the extent possible.

While there are no watersheds identical to Pine Creek, nearby tributaries of the lower John Day may prove useful for future comparisons. The BLM is currently monitoring Bridge Creek as part of the Sutton Mountain Coordinated Resource Management Plan. Butte Creek and Thirty Mile Creek are other options for comparison. These watersheds face different impacts and restoration projects than Pine Creek.

The Oregon Department of Environmental Quality (DEQ) initiated a biomonitoring program in the John Day Basin in 2000. DEQ will be sampling water quality and macroinvertebrates in randomly selected stream reaches throughout the basin, and will also sample selected reference reaches. Pine Creek may serve as a useful reference reach for the DEQ project, while conversely, the sampling of randomly selected stream reaches through the basin may provide an excellent reference for changes in Pine Creek.

A. Habitat Evaluation Procedure (HEP)

As a BPA Wildlife Habitat Mitigation site, Pine Creek Ranch is obligated to conduct a Habitat Evaluations Procedure (HEP) survey of wildlife habitats on the property. HEP procedures are intended to document the availability of habitats that were impacted by the construction of John Day Dam on the Columbia. The purchase of Pine Creek Ranch will provide BPA with mitigation credits for the amount of appropriate habitat that occurs on the property.

HEP is a procedure for measuring the quality and quantity of habitat by using models of habitat suitability for selected indicator species. A baseline HEP measurement took place on the ranch

in 2001. This baseline measurement determines the minimum mitigation credit BPA will receive for funding the project. A subsequent HEP survey must be conducted between 5 and 10 years after the completion of improvement activities on the property. This HEP may result in BPA receiving additional credit, if habitat improvements have occurred. All mitigation credit received by BPA will be in accordance with the MOA between BPA and the Tribes.

Field work for the baseline HEP on the original Pine Creek Ranch purchase was conducted in April, 2001. The summary report is attached as Appendix E. A total of 14,057 Habitat Units were estimated in the baseline HEP. A baseline HEP on the Wagner Ranch portion of the project will be conducted in 2003.

B. Riparian Monitoring

Riparian Monitoring strategies will vary between the John Day River, Pine Creek, and other tributary drainages (Table 8).

Table 8. Riparian Monitoring Plan.

	Cost-share	Method	Sites	Freq.	Cost*
1. Stream flow	USGS (50%)	Telemetered data-logging gage	PC (1)	Continual	5,510 annual
2. Water Temperature	USGS (50%)	Telemetered data-logging probe	PC (1)	Continual	3,140 annual
3. Water Quality	DEQ (100%)	Field Chemistry	PC (6)	Annual	None
4. Macro-invertebrates	DEQ (100%)	Laboratory ID	PC (6)	Annual	None
5. Habitat conditions Channel & Vegetation	DEQ (100%)	DEQ Habitat Monitoring	PC (6)	Annual	None
5. Habitat conditions Channel & Vegetation	ODFW	Modified Hankin & Reeves	JDR (10 miles)	10-20 years	10,000
6. Steelhead Spawning	ODFW (in-kind)	Redd Surveys	PC (3 miles)	Annual	200
7. Beaver Activity	OMSI (in-kind)	GPS & measure dams	PC (length within ranch)	As needed	200
8. Photomonitoring	None	Digital photo from marked locations	JDR &Trib.s PC & Trib.s	Annual	1,000
9. Breeding Birds	None	Point counts	JDR &Trib.s PC & Trib.s	Annual	1,000
10. Channel location, sinuosity, structure; Vegetation Mapping	BLM, NPS, OR NHP	2’ color digital orthophotography	Entire Property	10-20 years	? (part of complete coverage)
11. Vegetation Composition	None	Transect sampling	PC (30)	10-20 years	5,000

* Cost to Tribes after cost-share, all costs are approximate.

C. Wildlife Monitoring

Ground surveys of big game will be conducted annually in the fall to enable estimation of age and sex ratios for mule deer (Table 9). Long-term trends in age and sex ratios will inform harvest decisions. Spring flights or ground surveys to estimate age ratios for elk and deer will be conducted as necessary. All hunter harvests will be recorded.

Point count surveys of breeding birds will be conducted at riparian and upland monitoring points during breeding seasons. These surveys will be repeated to assess long-term changes in breeding bird communities. The habitat manager will maintain a list of weekly bird observations.

Table 9. Wildlife Monitoring Plan

Survey	Cost-share	Method	# of Sites	Freq.	Cost
Spring Game Survey	CTWRSO	Aerial or ground	Entire property	Annual	5,000 or 2,000
Fall Game Survey	CTWRSO	Ground	Established routes	Annual	2,000
Breeding Birds	None	Point Counts	40 Upland	Annual	2,000

D. Vegetation Monitoring

Vegetation will be monitored at multiple scales (Table 8). GIS personnel have classified vegetative cover using Landsat scenes obtained in 2000. This vegetation cover type information is stored within the Tribes' GIS database. This coverage has been used to generate sampling points and calculate habitat areas for the Pine Creek Ranch baseline HEP. This coverage is limited to distinctions between broad cover types such as juniper (varying densities), and grassland, and does not make distinctions between shrub steppe communities or timbered areas.

In 2002, the Tribes will undertake a cooperative aerial photography and vegetation mapping project with BLM, NPS, and the OR NHP. This project will cover an area including Pine Creek Ranch, John Day Fossil Beds National Monument Clarno and Painted Hills Units, and BLM lands in the Spring Basin WSA, Amine Peak Allotment, and Sutton Mountain and Pats Cabin WSAs, as well as approximately 25 miles of the John Day River. Aerial flights will be used to generate 2 foot pixel color digital orthophotography and an associated digital terrain model (DTM).

The Oregon Natural Heritage Program will use the imagery and field plots to classify ranch vegetation according to the US National Vegetation Classification. Field plots will be permanently marked on the ground, and will be used to investigate species composition of vegetation types identified on the aerial imagery.

Satellite images with a 1 m pixel will be used to track vegetative changes on the property over time, with repeat sampling of field plots as needed. Images will be obtained every ten years, and after major wildfires or projects as necessary.

E. Weather Monitoring

A meteorological station will be installed in conjunction with the USGS streamflow gauge on Pine Creek. The weather station will include instruments for monitoring air temperature, precipitation, solar radiation, and wind speed and direction. All data will be telemetered, and precipitation data will be reviewed and published by the USGS. Annual operating and maintenance cost for the weather station, including data review and publication, is approximately $4,640.

F. Project Monitoring

All management actions that are likely to impact soils, vegetation, or wildlife will be accompanied by photomonitoring. Additional monitoring will be conducted as appropriate.

G. Management Research

The Tribes will seek to accomplish research as needed to inform management decisions, and will make the results of research and monitoring available to other researchers and land managers. When appropriate, research results will be published in peer-reviewed journals.

H. Independent Research

The Tribes encourage research in conservation related sciences. Priority research projects on Pine Creek Ranch will have the potential to guide future management of the property. Direct investigations of alternate management techniques will be highly useful. Basic ecological research is also encouraged, especially research with the potential to increase understanding of natural communities.

Research Guidelines

1. All research projects must be approved by ranch management.
2. It is suggested that researchers confer with ranch personnel prior to proposing on-site research projects.
3. All projects must be compatible with management objectives and activities.
4. During initial project evaluation, suggestions may be made for either minimizing impacts or integrating research with other programs (management, education).
5. During initial project evaluation, decisions will be made as to the permanence of study plots or markings. All materials not designated as permanent will be removed by the researchers.
6. Collection of specimens will be allowed by permit only, and will follow guidelines.
7. Approved researchers will coordinate research activities with Pine Creek Ranch staff, and will abide by rules and regulations.
8. Researchers must submit annual reports, final reports by the completion date, and copies of any relevant publications. Researchers are expected to provide a reasonable amount of consultation with Pine Creek Ranch on the implications of their work.

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APPENDIX A. TERRESTRIAL VERTEBRATE WILDLIFE SPECIES LIST.

May 2002
Taxonomic listings, Status and Rank information, and species listed as expected are drawn from Csuti, et al., 1997.
Past observations are from Natural Heritage Program data or a "Pine Creek Watershed Restoration Project" report dated 9/19/97.
Heritage Rankings: G (Global), S (State), followed by: 1 (critically imperiled), 2 (imperiled), 3 (vulnerable to extirpation or extinction), 4 (apparently secure), 5 (demonstrably widespread, abundant, and secure), or E (Exotic); Entries in *italics* denote introduced species.

						Observed?			Status		Rank	
	Order	Family	Genus	species	Common name	2000-2002	Past	Exp.	State	Federal	Global	State
AMPHIBIANS:												
1	Caudata	Ambystomatidae	Ambystoma	macrodactylum	LONG-TOED SALAMANDER	x					G5	S5
2	Anura	Bufonidae	Bufo	boreas	WESTERN TOAD	x			Sensitive		G4	S4
3		Hylidae	Pseudacris	regilla	PACIFIC CHORUS FROG	x					G5	S5
4		Pleobatidae	Scaphiopus	intermontanus	GREAT BASIN SPADEFOOT			x			G5	S5
5		*Ranidae*	*Rana*	*catesbeiana*	*BULLFROG*	x					G5	S5
6			Rana	pretiosa	SPOTTED FROG			?	Sensitive	C	G3G4	S2
REPTILES:												
1	Squamata	Anguidae	Elgaria	multicarinata	SOUTHERN ALLIGATOR LIZARD	x					G5	S5
2		Iguanidae	Phrynosoma	douglasii	SHORT-HORNED LIZARD			x			G5	S4?
3			Sceloporus	graciosus	SAGEBRUSH LIZARD			x		SC	G5	S5
4			Sceloporus	occidentalis	WESTERN FENCE LIZARD	x					G5	S5
5			Uta	stansburiana	SIDE-BLOTCHED LIZARD			x			G5	S5
6		Scincidae	Eumeces	skiltonianus	WESTERN SKINK	x					G5	S5
7		Boidae	Charina	bottae	RUBBER BOA			x			G5	S4
8		Colubridae	Coluber	constrictor	RACER	x					G5	S4?
9			Hypsiglena	torquata	NIGHT SNAKE	x					G5	S3
10			Masticophis	taeniatus	STRIPED WHIPSNAKE	x					G5	S4
11			Pituophis	melanoleucus	GOPHER SNAKE	x					G5	S5
12			Thamnophis	elegans	W. TERRESTRIAL GARTER SNAKE	x					G5	S5
13			Thamnophis	sirtalis	COMMON GARTER SNAKE	x					G5	S5
14		Viperidae	Crotalus	viridis	WESTERN RATTLESNAKE	x					G5	S4
BIRDS:												
1	Podicipediformes	Podicipedidae	Podilymbus	podiceps	PIED-BILLED GREBE	x		x			G5	S5
2		Ciconiformes	Botaurus	lentiginosus	AMERICAN BITTERN			x			G4	S4
3			Ardea	herodias	GREAT BLUE HERON	x					G5	S4
4			Nycticorax	nycticorax	BLACK-CROWNED NIGHT-HERON			?			G5	S4
5	Anseriformes	Anatidae	Cygnus	columbianus	TUNDRA SWAN	x					G5	S4
6			Branta	canadensis	CANADA GOOSE	x					G5	S5
7			Aix	sponsa	WOOD DUCK	x		?			G5	S4
8			Anas	crecca	GREEN-WINGED TEAL	x					G5	S5
9			Anas	platyrhyncos	MALLARD	x					G5	S5
10			Anas	discors	BLUE-WINGED TEAL		x				G5	S4

Appendix A: Terrestrial Vertebrate Wildlife Species List

						Observed?			Status		Rank	
	Order	Family	Genus	species	Common name	2000-2002	Past	Exp.	State	Federal	Global	State
11			Anas	cyanoptera	CINNAMON TEAL		x				G5	S5
12			Aythya	affinis	LESSER SCAUP	x						
13			Bucephela	clangula	COMMON GOLDENEYE	x					G5	S4
14			Bucephela	albeola	BUFFLEHEAD	x					G5	S2B,S5N
15			Oxyura	jamaicensis	RUDDY DUCK	x					G5	S4
16			Anas	strepera	GADWALL	x					G5	S5
17			Mergus	merganser	COMMON MERGANSER	x					G5	S4
18			Lophodytes	cucullatus	HOODED MERGANSER	x					G5	S4
19	Falconiformes	Cathartidae	Cathartes	aura	TURKEY VULTURE	x					G5	S5
20		Accipitridae	Pandion	haliaetus	OSPREY	x					G5	S4
21			Circus	cyaneus	NORTHERN HARRIER	x					G5	S5
22			Accipiter	striatus	SHARP-SHINNED HAWK	x					G5	S4
23			Accipiter	cooperii	COOPER'S HAWK	x					G4	S4
24			Accipiter	gentilis	NORTHERN GOSHAWK	x			Sensitive	SC	G4	S3
25			Buteo	swainsonii	SWAINSON'S HAWK		x		Sensitive		G4	S3
26			Buteo	jamaicensis	RED-TAILED HAWK	x					G5	S5
27			Buteo	regalis	FERRUGINOUS HAWK			x	Sensitive	SC	G4	S3
28			Aquila	chrysaetos	GOLDEN EAGLE	x					G5	S4
29			Haliaeetus	leucocephalus	BALD EAGLE	x			Threatened	Threatened	G4	S3
30			Falco	sparverius	AMERICAN KESTREL	x					G5	S5
31			Falco	peregrinus	PEREGRINE FALCON		x		Endangered	Endangered	G4	S1
32			Falco	mexicanus	PRAIRIE FALCON	x					G4G5	S4
33			Falco	columbiarus	MERLIN	x					G5	S1B,S3?N
34	Galliformes	Phasianidae	*Perdix*	*perdix*	*GRAY PARTRIDGE*			?			G5	SE
35			*Alectoris*	*chukar*	*CHUKAR*	x					G5	SE
36			*Phasianus*	*colchicus*	*RING-NECKED PHEASANT*	x					G5	SE
37			Dendragapus	obscurus	BLUE GROUSE			?			G5	S4
38			Bonasa	umbellus	RUFFED GROUSE			?			G5	S4?
39			*Meleagris*	*gallopavo*	*WILD TURKEY*	x					G5	SE
40		Odontophoridae	Callipepla	californica	CALIFORNIA QUAIL	x					G5	S4
41			Oreortyx	pictus	MOUNTAIN QUAIL	x				SC	G5	S4?
42	Gruiformes	Rallidae	Rallus	limicola	VIRGINIA RAIL	x					G5	S4
43			Porzana	carolina	SORA		x				G5	S4
44			Fulica	americana	AMERICAN COOT	x		x			G5	S5
45		Gruidae	Grus	canadensis	SANDHILL CRANE	x			Sensitive		G5	S3
46	Charadriiformes	Charadriidae	Charadrius	vociferus	KILLDEER	x					G5	S5
47		Scolopacidae	Actitis	macularia	SPOTTED SANDPIPER	x					G5	S4
48			Numenius	americanus	LONG-BILLED CURLEW			?			G5	S3S4
49			Gallinago	gallinago	COMMON SNIPE	x					G5	S4
50	Columbiformes	Columbidae	*Columba*	*livia*	*ROCK DOVE*	x					G5	SE
51			Zenaida	macroura	MOURNING DOVE	x					G5	S5
52	Strigiformes	Tytonidae	Tyto	alba	BARN OWL		x				G5	G4?
53		Strigidae	Otus	flammeolus	FLAMMULATED OWL		x		Sensitive		G4	S4
54			Otus	kennicottii	WESTERN SCREECH-OWL	x					G5	S4
55			Bubo	virginianus	GREAT-HORNED OWL	x					G5	S5
56			Glaucidium	gnoma	NORTHERN PYGMY OWL	x			Sensitive		G5	S4?
57			Athene	cunicularia	BURROWING OWL			x	Sensitive	SC	G4	G3

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						Observed?			Status		Rank	
	Order	Family	Genus	species	Common name	2000-2002	Past	Exp.	State	Federal	Global	State
58			Asio	otus	LONG-EARED OWL	x					G5	S4?
59			Asio	flammeus	SHORT-EARED OWL	x					G5	S4?
60			Aegolius	acadicus	NORTHERN SAW-WHET OWL	x					G5	S4?
61	Caprimulgiformes	Caprimulgidae	Chordeiles	minor	COMMON NIGHTHAWK	x					G5	S5
62			Phalaenoptilus	nuttallii	COMMON POORWILL	x					G5	SU
63	Apodiformes	Apodidae	Chaetura	vauxi	VAUX'S SWIFT	x					G5	S5
64			Aeronautes	saxatalis	WHITE-THROATED SWIFT	x					G5	S4?
65		Trochilidae	Archilochus	alexandri	BLACK-CHINNED HUMMINGBIRD	x					G5	S4
66			Selasphorus	rufus	RUFOUS HUMMINGBIRD	x					G5	S4
67			Stellula	calliope	CALLIOPE HUMMINGBIRD	x					G5	S4?
68	Coraciiformes	Alcedinidae	Ceryle	alcyon	BELTED KINGFISHER	x					G5	S4
69	Piciformes	Picidae	Melanerpes	lewis	LEWIS'S WOODPECKER	x			Sensitive	SC	G5	S4
70			Sphyrapicus	nuchalis	RED-NAPED SAPSUCKER	x					G5	S4
71			Sphyrapicus	thyroideus	WILLIAMSON'S SAPSUCKER	x					G5	S4
72			Picoides	pubescens	DOWNY WOODPECKER	x					G5	S4
73			Picoides	villosus	HAIRY WOODPECKER	x					G5	S4
74			Picoides	albolarvatus	WHITE-HEADED WOODPECKER		x		Sensitive		G5	S3
75			Picoides	arcticus	BLACK-BACKED WOODPECKER		x		Sensitive		G5	S3
76			Colaptes	auratus	NORTHERN FLICKER	x					G5	S5
77	Passeriformes	Tyranidae	Contopus	sordidulus	WESTERN WOOD-PEWEE	x					G5	S4
78			Empidonax	traillii	WILLOW FLYCATCHER	x				SC	G5	S4
79			Empidonax	oberholseri	DUSKY FLYCATCHER	x					G5	S4
80			Empidonax	wrightii	GRAY FLYCATCHER	x					G5	S4
81			Sayornis	saya	SAY'S PHOEBE	x					G5	S4?
82			Myiarchus	cinerascens	ASH-THROATED FLYCATCHER	x					G5	S4?
83			Tyrannus	verticalis	WESTERN KINGBIRD	x					G5	S5
84			Tyrannus	tyrannus	EASTERN KINGBIRD	x					G5	S4
85		Alaudidae	Eremophila	alpestris	HORNED LARK	x					G5	S5
86		Hirundinidae	Tachycineta	bicolor	TREE SWALLOW			x			G5	S5
87			Tachycineta	thalassina	VIOLET-GREEN SWALLOW	x					G5	S5
88			Stelgidopteryx	serripennis	N. ROUGH-WINGED SWALLOW	x					G5	S4
89			Riparia	riparia	BANK SWALLOW	x			Sensitive		G5	S4
90			Petrochelidon	pyrrhonata	CLIFF SWALLOW	x					G5	S5
91			Hirundo	rustica	BARN SWALLOW	x					G5	S5
92		Corvidae	Cyanocitta	stelleri	STELLER'S JAY	x					G5	S5
93			Gymnorhinus	cyanocephalus	PINYON JAY	x					G5	S3S4?
94			Nucifraga	columbiana	CLARK'S NUTCRACKER	x					G5	S4
95			Pica	pica	BLACK-BILLED MAGPIE	x					G5	S5
96			Corvus	brachyrhyncos	AMERICAN CROW	x					G5	S5
97			Corvus	corax	COMMON RAVEN	x					G5	S4
98		Paridae	Parus	atricapillus	BLACK-CAPPED CHICKADEE	x					G5	S5
99			Parus	gambeli	MOUNTAIN CHICKADEE	x					G5	S4
100		Aegithalidae	Psaltriparus	minimus	BUSHTIT	x					G5	S5
101		Sittidae	Sitta	canadensis	RED-BREASTED NUTHATCH	x					G5	S5
102			Sitta	carolinensis	WHITE-BREASTED NUTHATCH	x					G5	S4
103			Sitta	pygmaea	PYGMY NUTHATCH		x		Sensitive		G5	S4?
104		Certhiidae	Certhia	americana	BROWN CREEPER	x					G5	S4

Appendix A: Terrestrial Vertebrate Wildlife Species List

	Order	Family	Genus	species	Common name	Observed? 2000-2002	Past	Exp.	Status State	Federal	Rank Global	State
105		Troglodytidae	Salpinctes	obsoletus	ROCK WREN	x					G5	S5
106			Catherpes	mexicanus	CANYON WREN	x					G5	S4
107			Troglodytes	aedon	HOUSE WREN	x					G5	S4
108			Troglodytes	troglodytes	WINTER WREN	x					G5	S4
109			Cistothorus	palustris	MARSH WREN	x					G5	S5
110		Regulidae	Regulus	satrapa	GOLDEN-CROWNED KINGLET	x					G5	S4
111			Regulus	calendula	RUBY-CROWNED KINGLET	x					G5	S4
112		Muscicapidae	Sialia	mexicana	WESTERN BLUEBIRD	x					G5	S4
113			Sialia	currucoides	MOUNTAIN BLUEBIRD	x					G5	S4
114			Myadestes	townsendi	TOWNSEND'S SOLITAIRE	x					G5	S4
115			Catharus	guttatus	HERMIT THRUSH	x					G5	S4
116			Turdus	migratorius	AMERICAN ROBIN	x					G5	S5
117			Ixoreus	naevius	VARIED THRUSH	x					G5	S4
118		Mimidae	Mimus	polyglottos	NORTHERN MOCKINGBIRD	x					G5	S4
119			Oreoscoptes	montanus	SAGE THRASHER			x			G5	S4
120		Bombycillidae	Bombycilla	cedrorum	CEDAR WAXWING	x					G5	S5
121		Laniidae	Lanius	ludovicianus	LOGGERHEAD SHRIKE	x			Sensitive		G4G5	S4
122			Lanius	excubitor	NORTHERN SHRIKE	x					G5	S4N
123		Sturnidae	*Sturnus*	*vulgaris*	*EUROPEAN STARLING*	x					G5	SE
124		Vireonidae	Vireo	cassinii	CASSIN'S VIREO			x			G5	S4?
125			Vireo	gilvus	WARBLING VIREO	x					G5	S5
126		Emberizidae	Vermivora	celata	ORANGE-CROWNED WARBLER	x					G5	S5
127			Dendroica	petechia	YELLOW WARBLER	x					G5	S4
128			Dendroica	coronata	YELLOW-RUMPED WARBLER	x					G5	S5
129			Dendroica	nigrescens	BLACK-THROATED GRAY WARBLER	x					G5	S5
130			Oporornis	tolmiei	MACGILLIVRAY'S WARBLER	x					G5	S4
131			Geothlypis	trichas	COMMON YELLOWTHROAT	x					G5	S5
132			Wilsonia	pusilla	WILSON'S WARBLER	x					G5	S5
133			Icteria	virens	YELLOW-BREASTED CHAT	x			Sensitive	SC	G5	S4?
134			Piranga	rubra	WESTERN TANAGER	x					G5	S4
135			Pheucticus	melanocephalus	BLACK-HEADED GROSBEAK	x					G5	S5
136			Passerina	amoena	LAZULI BUNTING	x					G5	S4
137			Pipilo	chlorurus	GREEN-TAILED TOWHEE			x			G5	S4
138			Pipilo	maculatus	SPOTTED TOWHEE	x					G5	S5
139			Spizella	passerina	CHIPPING SPARROW	x					G5	S4
140			Spizella	breweri	BREWER'S SPARROW	x					G4	S4
141			Pooecetes	gramineus	VESPER SPARROW	x					G5	S4
142			Chondestes	grammacus	LARK SPARROW	x					G5	S4?
143			Passerculus	sandwichensis	SAVANNAH SPARROW	x					G5	S5
144			Passerella	iliaca	FOX SPARROW			?			G5	S4
145			Melospiza	melodia	SONG SPARROW	x					G5	S5
146			Melospiza	lincolnii	LINCOLN'S SPARROW			?			G5	S4
147			Zonotrichia	leucophrys	WHITE-CROWNED SPARROW	x					G5	S5
148			Zonotrichia	atricapilla	GOLDEN-CROWNED SPARROW	x					G5	S5N
149			Junco	hyemalis	DARK-EYED JUNCO	x					G5	S5
150			Agelaius	phoenicaulis	RED-WINGED BLACKBIRD	x					G5	S5
151			Agelaius	tricolor	TRICOLORED BLACKBIRD	x			Sensitive	SC	G3	S2

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						Observed?			Status		Rank	
	Order	Family	Genus	species	Common name	2000-2002	Past	Exp.	State	Federal	Global	State
152			Sturnella	neglecta	WESTERN MEADOWLARK	x					G5	S4
153			Xanthocephalus	xanthocephalus	YELLOW-HEADED BLACKBIRD	x					G5	S5
154			Euphagus	cyanocephalus	BREWER'S BLACKBIRD	x					G5	S5
155			Molothrus	ater	BROWN-HEADED COWBIRD	x					G5	S5
156			Icterus	bullockii	BULLOCK'S ORIOLE	x					G5	S4
157		Fringillidae	Pinicola	enucleator	PINE GROSBEAK		x				G5	S2?
158			Carpodacus	cassinii	CASSIN'S FINCH			x			G5	S4
159			Carpodacus	mexicanus	HOUSE FINCH	x					G5	S5
160			Carduelis	pinus	PINE SISKIN	x					G5	S5
161			Carduelis	psaltria	LESSER GOLDFINCH	x					G5	S4
162			Carduelis	tristis	AMERICAN GOLDFINCH	x					G5	S4
163			Coccothraustes	vespertinus	EVENING GROSBEAK	x					G5	S5
164		Passeridae	*Passer*	*domesticus*	*HOUSE SPARROW*			x			G5	SE
MAMMALS:												
1	Insectivora	Soricidae	Sorex	preblei	PREBLE'S SHREW			?		SC	G4	S3
2			Sorex	vagrans	VAGRANT SHREW			x			G5	S4
3			Sorex	palustris	WATER SHREW			?			G5	S4
4			Sorex	merriami	MERRIAM'S SHREW			x			G5	S3
5		Talpidae	Scapanus	orarius	COAST MOLE			?			G5	S5?
6	Chiroptera	Vespertilionidae	Myotis	californicus	CALIFORNIA MYOTIS		x				G5	S4
7			Myotis	ciliolabrum	WESTERN SMALL-FOOTED MYOTIS		x		Sensitive	SC	G5	S4
8			Myotis	yumanensis	YUMA MYOTIS		x		Sensitive	SC	G5	S3
9			Myotis	lucifugus	LITTLE BROWN MYOTIS			x			G5	S4
10			Myotis	volans	LONG-LEGGED MYOTIS			?	Sensitive	SC	G5	S3
11			Myotis	thysanodes	FRINGED MYOTIS			?	Sensitive	SC	G5	S3
12			Myotis	evotis	LONG-EARED MYOTIS			x	Sensitive	SC	G5	S3
13			Lasionycteris	noctivagans	SILVER-HAIRED BAT		x		Sensitive	SC	G5	S4?
14			Pipistrellus	hesperus	WESTERN PIPISTRELLE	x					G5	S4
15			Eptesicus	fuscus	BIG BROWN BAT	x					G5	S4
16			Lasiurus	cinereus	HOARY BAT			?			G5	S4?
17			Euderma	maculata	SPOTTED BAT		x			SC	G4	S1
18			Corynorhinus	townsendii	PALE WESTERN BIG-EARED BAT		x		Sensitive	SC	G4	S4
19			Antrozous	pallidus	PALLID BAT		x		Sensitive		G5	S3S4
20	Lagomorpha	Leporidae	Brachylagus	idahoensis	PYGMY RABBIT			x	Sensitive	SC	G5	S2?
21			Sylvilagus	nuttalii	MOUNTAIN COTTONTAIL	x					G5	S4
22			Lepus	townsendii	WHITE-TAILED JACKRABBIT		x		Sensitive		G5	S4?
23			Lepus	californicus	BLACK-TAILED JACKRABBIT	x					G5	S4
24	Rodentia	Sciuridae	Tamias	minimus	LEAST CHIPMUNK	x					G5	S4
25			Tamias	amoenus	YELLOW-PINE CHIPMUNK			?			G5	S4
26			Marmota	flaviventris	YELLOW-BELLIED MARMOT	x					G5	S4
27			Spermophilus	townsendii	TOWNSEND'S GROUND SQUIRREL			?			G5	S4
28			Spermophilus	beldingii	BELDING'S GROUND SQUIRREL			?			G5	S5
29			Spermophilus	beecheyi	CALIFORNIA GROUND SQUIRREL			?			G5	S5
30			Spermophilus	lateralis	GOLDEN-MANTLED GRD. SQUIRREL	x					G5	S4
31			Glaucomys	sabrinus	NORTHERN FLYING SQUIRREL		x				G5	S4
32		Geomyidae	Thomomys	talpoides	NORTHERN POCKET GOPHER	x					G5	S4

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						Observed?			Status		Rank	
	Order	Family	Genus	species	Common name	2000-2002	Past	Exp.	State	Federal	Global	State
33		Heteromyidae	Perognathus	parvus	GREAT BASIN POCKET MOUSE			x			G5	SU
34			Dipodomys	ordii	ORD'S KANGAROO RAT	x					G5	S4
35		Castoridae	Castor	canadensis	BEAVER	x					G5	S5
36		Muridae	Reithrodontomys	megalotis	WESTERN HARVEST MOUSE			x			G5	S4
37			Peromyscus	maniculatus	DEER MOUSE	x					G5	G5
38			Peromyscus	crinitus	CANYON MOUSE			x			G5	S4
39			Peromyscus	truei	PINON MOUSE			?			G5	S4?
40			Onychomys	leucogaster	NORTHERN GRASSHOPPER MOUSE			x			G5	S4?
41			Neotoma	cinerea	BUSHY-TAILED WOODRAT	x					G5	S5
42			Microtus	montanus	MONTANE VOLE			?			G5	S5
43			Microtus	longicaudus	LONG-TAILED VOLE			x			G5	S5
44			Lemmiscus	curtatus	SAGEBRUSH VOLE	x		x			G5	S4
45			Ondatra	zibethicus	MUSKRAT	x		?			G5	S5
46			*Mus*	*musculus*	*HOUSE MOUSE*			?			G5	SE
47		Dipodidae	Zapus	princeps	WESTERN JUMPING MOUSE			?			G5	S4
48		Erethizontidae	Erethizon	dorsatum	PORCUPINE	x					G5	S5
49	Carnivora	Canidae	Canis	latrans	COYOTE	x					G5	S5
50		Ursidae	Ursus	americanus	BLACK BEAR	x					G5	S4
51		Procyonidae	Procyon	lotor	RACCOON	x					G5	S5
52		Mustelidae	Mustela	erminea	ERMINE			?			G5	S5
53			Mustela	frenata	LONG-TAILED WEASEL			x			G5	S5
54			Mustela	vison	MINK			x			G5	S5
55			Taxidea	taxus	AMERICAN BADGER	x					G5	S4
56			Spilogale	gracilis	WESTERN SPOTTED SKUNK			x			G5	S4
57			Mephitis	mephitis	STRIPED SKUNK			x			G5	S5
58			Lutra	canadensis	NORTHERN RIVER OTTER	x					G5	S4?
59		Felidae	Felis	concolor	MOUNTAIN LION	x					G5	S4?
60			Lynx	rufus	BOBCAT	x					G5	S4
61	Artiodactyla	Cervidae	Cervus	elaphus	ELK	x					G5	S5
62			Odocoileus	hemionus	MULE DEER	x					G5	S5
63		Antilocapridae	Antilocapra	americana	PRONGHORN	x					G5	S4
64		Bovidae	Ovis	canadensis	BIGHORN SHEEP	x				SC	G4G5	S2
65			*Ovis*	*aries*	*AUDAD SHEEP (Feral)*	x						SE
66		Suidae	*Sus*	*scrofa*	*FERAL HOG*			?				SE

APPENDIX B. PINE CREEK RANCH PLANT SPECIES LIST.

Draft May 2002.

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
Native Trees, Shrubs, and Vines									
1	Betulaceae	Alnus	incana	mountain alder	N	P	T	1	
2	Betulaceae	Alnus	rhombifolia	white alder	N	P	T		1
3	Betulaceae	Betula	occidentalis	water birch	N	P	T	1	
4	Cupressaceae	Juniperus	occidentalis	western juniper	N	P	T	1	1
5	Pinaceae	Pinus	ponderosa	ponderosa pine	N	P	T	1	1
6	Pinaceae	Pseudotsuga	menziesii	Douglas fir	N	P	T	1	1
7	Rosaceae	Prunus	emarginata	bittercherry	N	P	T	1	
8	Rosaceae	Prunus	virginiana	chokecherry	N	P	T	1	1
9	Salicaceae	Populus	tremuloides	aspen	N	P	T	1	1
10	Salicaceae	Populus	balsamifera ssp. trichocarpa	black cottonwood	N	P	T	1	1
11	Ulmaceae	Celtis	reticulata	hackberry	N	P	T	1	1
12	Anacardiaceae	Toxicodendron	rydbergii	poison-ivy	N	P	S	1	1
13	Berberidaceae	Mahonia	repens	creeping Oregon grape	N	P	S	1	
14	Caprifoliaceae	Sambucus	nigra ssp. cerulea	blue elderberry	N	P	S	1	1
15	Caprifoliaceae	Symphoricarpus	albus	snowberry	N	P	S	1	1
16	Chenopodiaceae	Atriplex	canescens	saltbush	N	P	S		1
17	Chenopodiaceae	Atriplex	confertifolia	shadscale	N	P	S		1
18	Chenopodiaceae	Eurotia	lanata	winterfat	N	P	S		1
19	Chenopodiaceae	Grayia	spinosa	spiny hopsage	N	P	S		1
20	Chenopodiaceae	Sarcobatus	vermiculatus	black greasewood	N	P	S	1	1
21	Compositae	Artemisia	arbuscula	low sagebrush	N	P	S		1
22	Compositae	Artemisia	rigida	stiff sagebrush	N	P	S	1	1
23	Compositae	Artemisia	tridentata	big sagebrush	N	P	S	1	1
24	Compositae	Chrysothamnus	viscidiflorus	green rabbitbrush	N	P	S	1	1
25	Compositae	Ericameria	nauseosa	gray rabbitbrush	N	P	S	1	1
26	Compositae	Gutierrezia	sarothrae	matchbrush	N	P	S	1	1
27	Compositae	Haplopappus	macronema	discoid goldenwwed	N	P	S		1
28	Compositae	Haplopappus	resinosus	gnarled goldenweed	N	P	S	1	
29	Compositae	Tetradymia	canescens	gray horsebrush	N	P	S	1	1
30	Cornaceae	Cornus	sericea ssp. Sericea	creek dogwood	N	P	S	1	1
31	Ericaceae	Phyllodoce	ssp.	heather	N	P	S		1
32	Ericaceae	Vaccinium	membranaceum	thin-leaved huckleberry	N	P	S		1
33	Ericaceae	Vaccinium	scoparium	grouseberry	N	P	S		1
34	Grossulariaceae	Ribes	aureum	golden currant	N	P	S	1	1
35	Grossulariaceae	Ribes	cereum	wax currant	N	P	S	1	1
36	Grossulariaceae	Ribes	oxyacanthoides	Umatilla gooseberry	N	P	S		1
37	Grossulariaceae	Ribes	inerme	whitestem gooseberry	N	P	S		1
38	Grossulariaceae	Ribes	niveum	snow gooseberry	N	P	S	1	
39	Hydrangeaceae	Philadelphus	lewisii	mockorange	N	P	S	1	1
40	Labiatae	Salvia	dorrii	purple sage	N	P	S	1	1
41	Polemociaceae	Leptodactylon	pungens	prickly phlox	N	P	S		1
42	Polygonaceae	Eriogonum	heracleiodes	Wyeth buckwheat	N	P	S	1	1
43	Polygonaceae	Eriogonum	microthecum	slenderbush buckwheat	N	P	S	1	1
44	Rosaceae	Amelanchier	alnifolia	serviceberry	N	P	S	1	1
45	Rosaceae	Cercocarpus	ledifolius	curl-leaf mountain mahogany	N	P	S	1	1
46	Rosaceae	Crataegus	columbiana	Columbia hawthorn	N	P	S		1
47	Rosaceae	Crataegus	douglasii	Douglas' hawthorn	N	P	S		1
48	Rosaceae	Holodiscus	discolor	ocean-spray	N	P	S	1	1
49	Rosaceae	Holodiscus	dumosus	dwarf ocean-spray	N	P	S	1	1
50	Rosaceae	Peraphyllum	ramosissimum	squaw apple	N	P	S		1
51	Rosaceae	Purshia	tridentata	bitterbrush	N	P	S	1	1

Appendix B. Plant Species List

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
52	Rosaceae	Rosa	woodsii var. ultramontana	Woods' rose	N	P	S	1	1
53	Salicaceae	Salix	amygdaloides	peach-leaf willow	N	P	S	1	
54	Salicaceae	Salix	exigua	coyote willow	N	P	S	1	
55	Salicaceae	Salix	lasiolepis	arroyo willow	N	P	S	1	
56	Salicaceae	Salix	lucida ssp. caudata	greenleaf willow	N	P	S	1	
57	Salicaceae	Salix	melanopsis	dusky willow	N	P	S	1	
58	Salicaceae	Salix	monochroma	onecolor willow	N	P	S	1	
59	Ranunculaceae	Clematis	ligusticifolia	western clematis	N	P	V	1	1

Native Graminoids

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
1	Cyperaceae	Carex	amplifolia	bigleaf sedge	N	P	G	1	
2	Cyperaceae	Carex	angustata	wide-fruit sedge	N	P	G		1
3	Cyperaceae	Carex	geyeri	elk sedge	N	P	G		1
4	Cyperaceae	Carex	hystricina	porcupine sedge	N	P	G	1	
5	Cyperaceae	Carex	nebrascensis	Nebraska sedge	N	P	G		1
6	Cyperaceae	Carex	sp.	sedge species	N	P	G	1	
7	Cyperaceae	Carex	stipata	sawbeak sedge	N	P	G		1
8	Cyperaceae	Cyperus	squarrosus	flatsedge	N	P	G		1
9	Cyperaceae	Eleocharis	palustris	creeping spike-rush	N	P	G	1	1
10	Cyperaceae	Schoenoplectus	americanus	American bulrush	N	P	G	1	
11	Cyperaceae	Schoenoplectus	tabernaemontani	softstem bulrush	N	P	G		1
12	Cyperaceae	Scirpus	acutus	hardstem bulrush	N	P	G		1
13	Cyperaceae	Scirpus	olneyi	Olney's bulrush	N	P	G		1
14	Juncaceae	Juncus	balticus	baltic rush	N	P	G		1
15	Juncaceae	Juncus	bufonius	toadrush	N	P	G		1
16	Juncaceae	Juncus	ensifolius	swordleaf rush	N	P	G	1	
17	Juncaceae	Juncus	torreyi	Torrey's rush	N	P	G		1
18	Juncaceae	Juncus	tenuis	field rush	N	P	G	1	
19	Poaceae	Achnatherum	hymenoides	Indian ricegrass	N	P	G		1
20	Poaceae	Achnatherum	thurberianum	Thurber's needlegrass	N	P	G	1	1
21	Poaceae	Agrostis	stolonifera	redtop	N	P	G	1	
22	Poaceae	Bromus	ciliatus	fringed brome	N	P	G		1
23	Poaceae	Danthonia	californica	California oatgrass	N	P	G	1	
24	Poaceae	Distichlis	spicata	alkali saltgrass	N	P	G		1
25	Poaceae	Elymus	trachycaulus	slender wheatgrass	N	P	G		1
26	Poaceae	Elymus	glaucus	blue wildrye	N	P	G	1	
27	Poaceae	Elymus	elymoides	bottlebrush squirreltail	N	P	G	1	1
28	Poaceae	Festuca	idahoensis	Idaho fescue	N	P	G	1	1
29	Poaceae	Glyceria	striata	tall mannagrass	N	P	G	1	
30	Poaceae	Hesperostipa	comata	needle-and-thread	N	P	G	1	1
31	Poaceae	Koeleria	macrantha	prairie Junegrass	N	P	G	1	1
32	Poaceae	Leymus	cinereus	basin wildrye	N	P	G	1	1
33	Poaceae	Muhlenbergia	asperifolia	rough-leaved dropseed	N	P	G		1
34	Poaceae	Phragmites	australis	common reed	N	P	G	1	1
35	Poaceae	Poa	secunda	Sandberg's bluegrass	N	P	G	1	1
36	Poaceae	Pseudoroegneria	spicata	bluebunch wheatgrass	N	P	G	1	1
37	Poaceae	Puccinellia	lemmonii	alkali grass	N	P	G		1
38	Poaceae	Sporobolus	airodes	alkali sacaton	N	P	G		1
39	Poaceae	Sporobolus	cryptandrus	sand dropseed	N	P	G	1	1
40	Poaceae	Vulpia	microstachys	annual fescue	N	A	G		1
41	Sparganiaceae	Sparganium	emersum	simplestem bur-reed	N	P	G		1
42	Typhaceae	Typha	latifolia	cat-tail	N	P	G	1	1

Native Forbs

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
1	Aizoaceae	Mollugo	verticillata	carpetweed	N	A	F		1
2	Alismataceae	Sagittaria	cuneata	arumleaf arrowhead	N	P	F		1
3	Amaranthaceae	Amaranthus	albus	tumble pigweed	N	A	F	1	1

Appendix B. Plant Species List

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
4	Amaranthaceae	Amaranthus	retroflexus	pigweed amaranth	N	A	F	1	1
5	Apacynaceae	Apocynum	androsaemifolium	spreading dogbane	N	P	F	1	1
6	Apacynaceae	Apocynum	cannibinum	hemp dogbane	N	P	F		1
7	Asclepiadaceae	Asclepias	fascicularis	narrow-leaved milkweed	N	P	F	1	1
8	Asclepiadaceae	Asclepias	speciosa	showy milkweed	N	P	F	1	1
9	Boraginaceae	Amsinckia	menziesii var. intermedia	common fiddleneck	N	A	F	1	
10	Boraginaceae	Amsinckia	tesselata	tesselate fiddleneck	N	A	F	1	1
11	Boraginaceae	Cryptantha	affinis	slender cryptantha	N	A	F		1
12	Boraginaceae	Cryptantha	celosoides	cockscomb cryptantha	N	P	F		1
13	Boraginaceae	Cryptantha	pterocarya	winged cryptantha	N	A	F		1
14	Boraginaceae	Cryptantha	rostellata	beaked cryptantha	N	P	F		
15	Boraginaceae	Lithospermum	ruderale	Columbia puccoon	N	P	F	1	1
16	Boraginaceae	Myosotis	laxa	small-flowered forget-me-not	N	A	F		1
17	Cactaceae	Opuntia	fragilis	brittle cactus	N	P	F	1	1
18	Cactaceae	Opuntia	polyacantha	prickly pear	N	P	F		1
19	Cactaceae	Pediocactus	simpsonii	hedgehog-cactus	N	P	F	1	1
20	Capparidaceae	Cleome	platycarpa	golden cleome	N	A	F	1	1
21	Chenopodiaceae	Chenopodium	leptophyllum	narrowleaf goosefoot	N	A	F	1	
22	Chenopodiaceae	Monolepsis	nuttalliana	patata	N	A	F		1
23	Compositae	Achillea	millefolium	yarrow	N	P	F	1	1
24	Compositae	Agoseris	glauca	pale agoseris	N	P	F	1	
25	Compositae	Agoseris	heterophylla	annual agoseris	N	A	F	1	1
26	Compositae	Anaphalis	margaritacea	pearly-everlasting	N	P	F	1	
27	Compositae	Antennaria	dimorpha	low pussy-toes	N	P	F	1	1
28	Compositae	Antennaria	luzuloides	woodrush pussytoes	N	P	F	1	
29	Compositae	Antennaria	microphylla	littleleaf pussytoes	N	P	F	1	
30	Compositae	Arnica	cordifolia	heart-leaved arnica	N	P	F	1	
31	Compositae	Artemisia	ludoviciana	western mugwort	N	P	F		1
32	Compositae	Aster	modestus	few-flowered aster	N	P	F		1
33	Compositae	Balsomorhiza	sagittata	arrow-leaf balsamroot	N	P	F	1	1
34	Compositae	Balsomorhiza	serrata	serrate balsamroot	N	P	F	1	
35	Compositae	Bidens	cernua	beggars-ticks	N	A	F		1
36	Compositae	Blepharipappus	scaber	blepharipappus	N	A	F	1	1
37	Compositae	Chaenactis	douglasii	hoary chaenactis	N	P	F	1	1
38	Compositae	Chaenactis	nevii	John Day chaenactis	N	P	F		1
39	Compositae	Cirsium	undulatum	wavy-leaved thistle	N	B	F	1	1
40	Compositae	Conyza	canadensis	horseweed	N	A	F	1	1
41	Compositae	Conyza	canadensis	horseweed	N	P	F	1	1
42	Compositae	Coreopsis	atkinsoniana	Columbia coreopsis	N	A	F		1
43	Compositae	Crepis	acuminata	long-leaved hawksbeard	N	P	F		1
44	Compositae	Crepis	atrabarba	slender hawksbeard	N	P	F		1
45	Compositae	Crepis	intermedia	gray hawksbeard	N	P	F		1
46	Compositae	Crepis	occidentalis	western hawksbeard	N	P	F	1	1
47	Compositae	Crocidium	multicaule	spring gold	N	A	F		1
48	Compositae	Erigeron	annuus	annual fleabane	N	A	F		1
49	Compositae	Erigeron	filifolius	thread-leaf fleabane	N	P	F		1
50	Compositae	Erigeron	linearis	linear-leaved daisy	N	P	F		1
51	Compositae	Erigeron	philadelphicus	Philadelphia fleabane	N	P	F		1
52	Compositae	Erigeron	pumilus	Shaggy fleabane	N	P	F		1
53	Compositae	Eriophyllum	lanatum	wooly sunflower	N	P	F		1
54	Compositae	Eupatorium	occidentale	western eupatorium	N	P	F		1
55	Compositae	Gaillardia	aristata	blanket flower	N	P	F	1	1
56	Compositae	Gnaphalium	palustre	lowland cudweed	N	A	F	1	
57	Compositae	Grindelia	nana	low gumweed	N	A	F		1
58	Compositae	Grindelia	squarrosa	resin-weed	N	B	F	1	
59	Compositae	Haplopappus	armerioides	thrift goldenweed	N	P	F		1
60	Compositae	Haplopappus	stenophyllus	narrow-leaf goldenweed	N	P	F		1
61	Compositae	Helianthus	annuus	common sunflower	N	A	F	1	1
62	Compositae	Helianthus	cusickii	Cusick's sunflower	N	P	F	1	1
63	Compositae	Helianthus	nuttalii	Nuttall's sunflower	N	P	F		1

Appendix B. Plant Species List

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
64	Compositae	Heterotheca	oregana	Oregon goldaster	N	P	F		1
65	Compositae	Hieracium	albiflorum	white hawkweed	N	P	F		1
66	Compositae	Hieracium	cynoglossoides	houndstongue hawkweed	N	P	F	1	
67	Compositae	Hulsea	nana	dwarf alpinegold	N	P	F	1	
68	Compositae	Hymenopappus	filifolius	Columbia cut-leaf	N	P	F		1
69	Compositae	Iva	axillaris	poverty-weed	N	P	F		1
70	Compositae	Iva	xanthifolia	tall marsh-elder	N	A	F		1
71	Compositae	Lactuca	biennis	tall blue lettuce	N	A	F		1
72	Compositae	Lagophylla	ramosissima	slender hareleaf	N	A	F		1
73	Compositae	Layia	glandulosa	tidytips	N	A	F		1
74	Compositae	Machaerantha	canescens	hoary aster	N	A	F		1
75	Compositae	Madia	gracilis	common tarweed	N	A	F		1
76	Compositae	Nothocalais	troximoides	false agoseris	N	P	F	1	1
77	Compositae	Packera	cana	wooly groundsel	N	P	F	1	1
78	Compositae	Senecio	serra	butterweed groundsel	N	P	F	1	1
79	Compositae	Solidago	canadensis	Canada goldenrod	N	P	F	1	1
80	Compositae	Solidago	gigantea	smooth goldenrod	N	P	F		1
81	Compositae	Solidago	occidentalis	western goldenrod	N	P	F	1	1
82	Compositae	Stephanomeria	minor	narrow-leaved skeletonweed	N	P	F		1
83	Compositae	Uropappus	lindleyi	Lindley's silverpuffs	N	A	F	1	
84	Compositae	Xanthium	strumarium	common cocklebur	N	A	F	1	1
85	Crassulaceae	Sedum	lanceolatum	lanceleaved stonecrop	N	P	F	1	1
86	Crassulaceae	Sedum	stenopetalum	wormleaf stonecrop	N	P	F	1	1
87	Cruciferae	Arabis	cusickii	Cusick's rockcress	N		F	1	
88	Cruciferae	Arabis	holboellii	Holboell's rockcress	N		F	1	
89	Cruciferae	Arabis	sparsiflora or lemmonii	rockcress	N		F	1	
90	Cruciferae	Cardamine	pennsylvanica	Pennsylvania bittercress	N	P	F		1
91	Cruciferae	Descurainia	pinnata	tansy mustard	N	A	F		1
92	Cruciferae	Descurainia	incana	mountain tansy mustard	N	A	F	1	1
93	Cruciferae	Erysimum	capitatum	prairie rocket	N	B	F		1
94	Cruciferae	Erysimum	inconspicuum	small wallflower	N	B	F	1	1
95	Cruciferae	Idahoa	scapigera	scalepod	N	A	F	1	
96	Cruciferae	Lesquerella	occidentalis	western bladderpod	N	P	F		1
97	Cruciferae	Phoenicaulis	cheiranthoides	daggerpod	N	P	F	1	
98	Cruciferae	Physaria	oregona	Oregon twinpod	N	P	F	1	
99	Cruciferae	Thelypodium	laciniatum	thickleaved thelypody	N	B	F	1	1
100	Cruciferae	Thysanocarpus	curvipes	sand fringepod	N	A	F	1	
101	Ericaceae	Pterospora	andromedea	woodland pinedrops	N	A	F		1
102	Euphorbiaceae	Chamaesyce	serpyllifolia	thyme-leaf spurge	N	A	F		1
103	Euphorbiaceae	Euphorbia	glyptosperma	ridge-seeded spurge	N	A	F		1
104	Gentianaceae	Centaurium	exaltum	western centaury	N	A	F		1
105	Geraniaceae	Geranium	viscosissimum	sticky purple geranium	N	P	F		1
106	Hydrophyllaceae	Hydrophyllum	capitatum	ballhead waterleaf	N	P	F	1	1
107	Hydrophyllaceae	Phacelia	hastata	whiteleaf phacelia	N	P	F	1	1
108	Hydrophyllaceae	Phacelia	linearis	narrow-leafed phacelia	N	A	F	1	1
109	Hydrophyllaceae	Phacelia	lutea	yellow phacelia	N	A	F		1
110	Hydrophyllaceae	Phacelia	ramosissima	branched phacelia	N	P	F		1
111	Iridaceae	Iris	missouriensis	iris	N	P	F	1	
112	Iridaceae	Olsyinium	douglasii v. inflatum	grass widow	N	P	F	1	1
113	Labiatae	Agastache	urticifolia	nettle-leaved horse-mint	N	P	F	1	1
114	Labiatae	Mentha	arvensis	field mint	N	P	F	1	
115	Labiatae	Mentha	spicata	spearmint	N	P	F	1	1
116	Labiatae	Prunella	vulgaris	self-heal	N	P	F		1
117	Labiatae	Scutellaria	angustifolia	narrow-leaved skullcap	N	P	F	1	1
118	Leguminosae	Astragalus	conjunctus	stiff milkvetch	N	P	F		1
119	Leguminosae	Astragalus	diaphanous	John Day milkvetch	N	A	F		1
120	Leguminosae	Astragalus	filipes	basalt milkvetch	N	P	F	1	1
121	Leguminosae	Astragalus	misellus	pauper milkvetch	N	P	F		1
122	Leguminosae	Astragalus	purshii	wooly-pod milkvetch	N	P	F	1	1
123	Leguminosae	Astragalus	whitneyii	balloon milkvetch	N	P	F		1

Appendix B. Plant Species List

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
124	Leguminosae	Dalea	ornata	western prairie-clover	N	P	F	1	1
125	Leguminosae	Glycyrrhiza	lepidota	licorice	N	P	F	1	
126	Leguminosae	Lathyrus	rigidus	stiff peavine	N	P	F	1	
127	Leguminosae	Lupinus	caudatus	tailcup lupine	N	P	F	1	1
128	Leguminosae	Lupinus	lepidus	Pacific lupine	N	P	F	1	
129	Leguminosae	Lupinus	saxosus	rock lupine	N	P	F	1	1
130	Leguminosae	Vicia	americana	American vetch	N	P	F	1	
131	Lemnaceae	Lemna	minor	water lentil	N	P	F		1
132	Lemnaceae	Spirodela	polyrhiza	great duckweed	N	P	F		1
133	Liliaceae	Allium	acuminatum	Hooker's onion	N	P	F		1
134	Liliaceae	Allium	tolmiei	Tolmie's onion	N	P	F	1	1
135	Liliaceae	Brodiaea	douglasii	Douglas' brodiaea	N	P	F		1
136	Liliaceae	Calochortus	macrocarpus	sagebrush mariposa	N	P	F	1	1
137	Liliaceae	Camassia	quamash	camas	N	P	F		
138	Liliaceae	Erythronium	grandiflorum	pale fawn-lily	N	P	F		1
139	Liliaceae	Fritillaria	pudica	yellow bell	N	P	F	1	1
140	Liliaceae	Smilacina	racemosa	western Solomon-plume	N	P	F	1	1
141	Liliaceae	Veratrum	californicum	California false hellebore	N	P	F		1
142	Liliaceae	Zigadenus	paniculatus	panicled death-camas	N	P	F		1
143	Linaceae	Linum	perenne	wild blue flax	N	P	F	1	
144	Loasaceae	Mentzelia	albicaulis	small-flowered blazing-star	N	A	F		1
145	Loasaceae	Mentzelia	laevicaulis	blazing-star	N	P	F	1	1
146	Malvaceae	Sphaeralcea	coccinea	red globemallow	N	P	F		1
147	Malvaceae	Sphaeralcea	munroana	white-stemmed globemallow	N	P	F	1	1
148	Onagraceae	Camissonia	tanacetifolia	tansy-leaved evening-primrose	N	A	F		1
149	Onagraceae	Clarkia	pulchella	deer horn	N	A	F	1	1
150	Onagraceae	Clarkia	rhomboidea	common clarkia	N	A	F		1
151	Onagraceae	Epilobium	minutum	small-flowered willow-herb	N	A	F		1
152	Onagraceae	Epilobium	ciliatum	Watson's willow-herb	N	A	F	1	1
153	Onagraceae	Oenothera	caespitosa	desert evening-primrose	N	A	F		1
154	Onagraceae	Oenothera	elata ssp. Hirsutissima	Hooker's evening-primrose	N	A	F	1	1
155	Orchidaceae	Habenaria	dilatata	white bog-candle	N	P	F		1
156	Orobanchaceae	Orobanche	fasciculata	Clustered broomrape	N	P	F		1
157	Orobanchaceae	Orobanche	uniflora	naked broomrape	N	P	F	1	
158	Paeoniaceae	Paeonia	brownii	Brown's peony	N	P	F	1	1
159	Plantaginaceae	Plantago	major	common plantain	N	P	F		1
160	Polemoniaceae	Collomia	grandiflora	large-flowered collomia	N	A	F	1	1
161	Polemoniaceae	Collomia	linearis	narrow-leaved collomia	N	A	F		1
162	Polemoniaceae	Navarretia	divaricata	mountain navarretia	N	A	F		1
163	Polemoniaceae	Phlox	gracilis	slender phlox	N	A	F	1	
164	Polemoniaceae	Phlox	hoodii	Hood's phlox	N	P	F	1	
165	Polemoniaceae	Phlox	hoodii	moss phlox	N	P	F	1	1
166	Polemoniaceae	Phlox	viscida	sticky phlox	N	P	F	1	1
167	Polemoniaceae	Polemonium	micranthum	annual polemonium	N	A	F	1	1
168	Polygonaceae	Eriogonum	baileyi	Bailey's buckwheat	N	A	F		1
169	Polygonaceae	Eriogonum	compositum	northern buckwheat	N	P	F	1	1
170	Polygonaceae	Eriogonum	elatum	tall buckwheat	N	P	F	1	1
171	Polygonaceae	Eriogonum	sphaerocephalum	round-headed eriogonum	N	P	F	1	1
172	Polygonaceae	Eriogonum	strictum	strict buckwheat	N	P	F	1	1
173	Polygonaceae	Eriogonum	umbellatum	sulfur-flower buckwheat	N	P	F		1
174	Polygonaceae	Eriogonum	vimineum	broom buckwheat	N	A	F	1	1
175	Polygonaceae	Polygonum	amphibium	water smartweed	N	P	F		1
176	Polygonaceae	Polygonum	coccineum	water smartweed	N	P	F		1
177	Polygonaceae	Polygonum	hydropiper	smartweed	N	A	F		1
178	Polygonaceae	Polygonum	sawatchense	sawatch knotweed	N	P	F		1
179	Polygonaceae	Rumex	venosus	veiny dock	N	P	F	1	
180	Portulacaceae	Claytonia	perfoliata	miner's lettuce	N	A	F	1	1
181	Portulacaceae	Lewisia	rediviva	bitterroot	N	P	F	1	1
182	Potamgetonaceae	Potamogeton	natans	broad-leaved pondweed	N	P	F	1	
183	Primulaceae	Dodecatheon	conjugens	Bonneville shootingstar	N	P	F	1	

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	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
184	Ranunculaceae	Aconitum	columbianum	Columbian monkshood	N	P	F		1
185	Ranunculaceae	Actaea	rubra	western baneberry	N	P	F		1
186	Ranunculaceae	Aquilegia	formosa	red columbine	N	P	F	1	1
187	Ranunculaceae	Delphinium	nuttallianum	Nuttall's larkspur	N	P	F		1
188	Ranunculaceae	Delphinium	occidentale	western larkspur	N	P	F		1
189	Ranunculaceae	Ranunculus	aquatilis	water buttercup	N	P	F	1	
190	Ranunculaceae	Ranunculus	glaberrimus	sagebrush buttercup	N	P	F	1	1
191	Ranunculaceae	Ranunculus	sceleratus	celery-leaved buttercup	N	A	F	1	1
192	Ranunculaceae	Ranunculus	uncinatus	hooked buttercup	N	P	F	1	
193	Rhamnaceae	Ceanothus	sanguineus	redstem ceanothus	N	P	F		1
194	Rhamnaceae	Ceanothus	velutinus	mountain balm	N	P	F		1
195	Rosaceae	Geum	triflorum	old man's whiskers	N	P	F	1	1
196	Rosaceae	Potentilla	glandulosa	sticky cinquefoil	N	P	F	1	1
197	Rosaceae	Potentilla	gracilis	cinquefoil	N	P	F	1	
198	Rosaceae	Sanguisorba	occidentalis	annual burnet	N	A	F	1	
199	Rubiaceae	Galium	aparine	bedstraw	N	A	F	1	1
200	Rubiaceae	Galium	boreale	northern bedstraw	N	P	F		1
201	Rubiaceae	Galium	watsonii	shrubby bedstraw	N	P	F		1
202	Saxifragaceae	Heuchera	cylindrica	alumroot	N	P	F	1	1
203	Saxifragaceae	Lithophragma	glabrum	bulbous woodlandstar	N	P	F	1	1
204	Saxifragaceae	Lithophragma	parviflorum	smallflower woodlandstar	N	P	F	1	
205	Saxifragaceae	Saxifraga	integrifolia	wholeleaf saxifrage	N	P	F	1	
206	Scrophulariaceae	Castilleja	applegatei	wavy-leaved paintbrush	N	P	F		1
207	Scrophulariaceae	Castilleja	linariaefolia	narrow-leaved paintbrush	N	P	F		1
208	Scrophulariaceae	Castilleja	xanthotricha	yellow-hairy indian painbrush	N	P	F	1	1
209	Scrophulariaceae	Collinsia	parviflora	small-flowered blue-eyed mary	N	A	F	1	
210	Scrophulariaceae	Mimulus	cusickii	Cusick's monkeyflower	N	A	F	1	1
211	Scrophulariaceae	Mimulus	floribundus	purple-stemmed monkeyflower	N	A	F		1
212	Scrophulariaceae	Mimulus	guttatus	yellow monkeyflower	N	P	F	1	1
213	Scrophulariaceae	Mimulus	moschatus	musk flower	N	P	F		1
214	Scrophulariaceae	Mimulus	nanus	dwarf purple monkeyflower	N	A	F		1
215	Scrophulariaceae	Mimulus	washingtonensis	Washington monkeyflower	N	A	F		1
216	Scrophulariaceae	Orthocarpus	sp.	owl-clover	N	A	F		1
217	Scrophulariaceae	Penstemon	deustus	hot-rock penstemon	N	P	F	1	1
218	Scrophulariaceae	Penstemon	eriantherus	fuzzytongue penstemon	N	P	F	1	1
219	Scrophulariaceae	Penstemon	richardsonii	Richardson's penstemon	N	P	F	1	1
220	Scrophulariaceae	Penstemon	speciosus	royal penstemon	N	P	F	1	1
221	Scrophulariaceae	Veronica	americana	American brooklime	N	P	F	1	1
222	Scrophulariaceae	Veronica	anagallis-aquatica	water speedwell	N	P	F	1	1
223	Scrophulariaceae	Veronica	peregrina	purslane speedwell	N	A	F		1
224	Scrophulariaceae	Veronica	serpyllifolia	thyme-leaf speedwell	N	P	F	1	
225	Solanaceae	Datura	stramonium	stramonium	N	P	F		1
226	Solanaceae	Solanum	triflorum	cut-leaved nightshade	N	A	F		1
227	Umbelliferae	Angelica	dawsonii	Dawson's angelica	N	P	F	1	
228	Umbelliferae	Cicuta	douglasii	western water hemlock	N	P	F	1	1
229	Umbelliferae	Heracleum	lanatum	cow parsnip	N	P	F	1	1
230	Umbelliferae	Lomatium	cous	cous biscuitroot	N	P	F	1	
231	Umbelliferae	Lomatium	dissectum	fern-leaved lomatium	N	P	F	1	
232	Umbelliferae	Lomatium	gormanii	Gorman's lomatium	N	P	F	1	
233	Umbelliferae	Lomatium	grayi	Gray's lomatium	N	P	F	1	1
234	Umbelliferae	Lomatium	bicolor v. leptocarpum	slender-fruited lomatium	N	P	F	1	
235	Umbelliferae	Lomatium	macrocarpum	large-fruited lomatium	N	P	F	1	1
236	Umbelliferae	Lomatium	minus	John Day valley desert-parsley	N	P	F	1	
237	Umbelliferae	Lomatium	nudicaule	bare-stem biscuitroot	N	P	F	1	
238	Umbelliferae	Lomatium	triternatum	nine-leaved lomatium	N	P	F	1	1
239	Umbelliferae	Osmorhiza	occidentalis	western sweet-cicely	N	P	F	1	1
240	Umbelliferae	Perideridia	gairdneri	yampah	N	P	F	1	1
241	Urticaceae	Urtica	dioica	stinging nettle	N	P	F	1	1
242	Valerianaceae	Plectritis	macrocera	white plectritis	N	A	F	1	1
243	Violaceae	Viola	nephrophylla	northern bog violet	N	P	F	1	

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	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
244	Violaceae	Viola	nuttallii	yellow prairie violet	N	P	F	1	1

Native Lycopods, Ferns, and Horsetails:

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form		
1	Polypodiaceae	Cheilanthes	gracillima	lace lip-fern	N	P	C	1	
2	Polypodiaceae	Cystopteris	fragilis	brittle bladder-fern	N	P	C	1	1
3	Equisetaceae	Equisetum	arvense	common horsetail	N	A	C	1	
4	Equisetaceae	Equisetum	hyemale	common scouring-rush	N	P	C		1
5	Equisetaceae	Equisetum	pratense	shady horsetail	N	A	C		1
6	Equisetaceae	Equisetum	variegatum	variegated horsetail	N	P	C		1
7	Marsileaceae	Marsilea	vestita	pepperwort	N		C		1
8	Polypodiaceae	Polystichum	sp.	sword-fern	N	P	C		
9	Selaginellaceae	Selaginella	sp. (densa &/or wallacei)	lesser club-moss	N	P	C	1	

Introduced Trees and Shrubs

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
1	Aceraceae	Acer	negundo	box-elder	I	P	T	1	1
2	Eleagnaceae	Eleagnus	angustifolia	Russian olive	I	P	T	1	1
3	Leguminosae	Robinia	pseudo-acacia	black locust	I	P	T	1	1
4	Moraceae	Morus	alba	white mulberry	I	P	T	1	1
5	Rosaceae	Pyrus	communis	pear	I	P	T	1	
6	Rosaceae	Pyrus	malus	apple	I	P	T	1	
7	Salicaceae	Populus	alba	white poplar	I	P	T	1	
8	Salicaceae	Populus	nigra v. italica	Lombardy poplar	I	P	T	1	
9	Ulmaceae	Ulmus	pumila	Siberian elm	I	P	T	1	1
10	Rosaceae	Rosa	canina	dog rose	I	P	S		1
11	Rosaceae	Rosa	eglanteria	sweetbriar	I	P	S	1	1
12	Rosaceae	Rubus	discolor	Himalayan blackberry	I	P	S	1	
13	Rosaceae	Rubus	laciniatus	evergreen blackberry	I	P	S	1	
14	Solanaceae	Lycium	barbarum	matrimony vine	I	P	S	1	

Introduced Graminoids

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
1	Poaceae	Aegilops	cylindrica	jointed goatgrass	I	A	G	1	
2	Poaceae	Agropyron	cristatum	crested wheatgrass	I	P	G	1	1
3	Poaceae	Agropyron	repens	quack grass	I	P	G		1
4	Poaceae	Arrhenatherum	elatius	tall oatgrass	I	P	G		1
5	Poaceae	Avena	fatua	wild oats	I	A	G	1	
6	Poaceae	Bromus	briziformis	rattlesnake grass	I	A	G		1
7	Poaceae	Bromus	commutatus	hairy brome	I	A	G		1
8	Poaceae	Bromus	diandrus	ripgut brome	I	A	G	1	
9	Poaceae	Bromus	japonicus	Japanese brome	I	A	G	1	1
10	Poaceae	Bromus	hordeaceus	soft brome	I	A	G	1	1
11	Poaceae	Bromus	rubens	foxtail brome	I	A	G		1
12	Poaceae	Bromus	tectorum	cheatgrass	I	A	G	1	1
13	Poaceae	Coleanthus	subtilis	moss-grass	I	A	G		1
14	Poaceae	Crypsis	alopecuroides	Helechloa	I	A	G		1
15	Poaceae	Dactylis	glomerata	orchard-grass	I	P	G	1	1
16	Poaceae	Echinochloa	crus-galli	barnyardgrass	I	P	G	1	1
17	Poaceae	Eragrostis	cilianensis	candy grass	I	A	G	1	
18	Poaceae	Eremopyrum	triticeum	annual wheatgrass	I	A	G	1	
19	Poaceae	Hordeum	murinum	charming barley	I	P	G	1	1
20	Poaceae	Hordeum	jubatum	foxtail barley	I	P	G	1	
21	Poaceae	Hordeum	vulgare	cultivated barley	I	A	G		1
22	Poaceae	Lolium	pratense	meadow fescue	I	P	G	1	
23	Poaceae	Panicum	capillare	witchgrass	I	P	G		1
24	Poaceae	Pascopyrum	smithii	western wheatgrass	I	P	G	1	
25	Poaceae	Pennisetum	glaucum	yellow bristlegrass	I	A	G		1
26	Poaceae	Phalaris	arundinacea	reed canarygrass	I	P	G	1	1

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	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
27	Poaceae	Phleum	pratense	common timothy	I	P	G	1	1
28	Poaceae	Poa	bulbosa	bulbous bluegrass	I	P	G	1	1
29	Poaceae	Poa	compressa	Canada bluegrass	I	P	G	1	1
30	Poaceae	Poa	pratensis	Kentucky bluegrass	I	P	G	1	1
31	Poaceae	Polypogon	monospeliensis	rabbitfoot grass	I	A	G		1
32	Poaceae	Secale	cereale	cereal rye	I	A	G	1	
33	Poaceae	Setaria	viridis	green bristlegrass	I	A	G		1
34	Poaceae	Taeniatherum	caput-medusae	medusahead	I	A	G	1	1
35	Poaceae	Thinopyrum	ponticum	rush wheatgrass	I	P	G	1	1
36	Poaceae	Triticum	asperum	cultivated wheat	I	A	G	1	1
37	Poaceae	Vulpia	myuros	foxtail fescue	I	A	G	1	

Introduced Forbs

	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
1	Boraginaceae	Asperugo	procumbens	madwort	I	A	F		1
2	Boraginaceae	Cynoglossum	officinale	common hounds-tongue	I	B	F	1	
3	Caryophyllaceae	Cerastium	glomeratum	sticky chickweed	I	A	F	1	1
4	Caryophyllaceae	Holosteum	umbellatum	jagged chickweed	I	A	F	1	1
5	Caryophyllaceae	Saponaria	officinalis	bouncing bet	I	P	F	1	1
6	Chenopodiaceae	Bassia	hyssopifolia	bassia	I	A	F		1
7	Chenopodiaceae	Chenopodium	album	lambsquarter	I	A	F	1	1
8	Chenopodiaceae	Chenopodium	botrys	Jerusalem-oak	I	A	F		1
9	Chenopodiaceae	Kochia	scoparia	mock cypress	I	A	F		1
10	Chenopodiaceae	Salsola	kali	Russian thistle	I	A	F	1	1
11	Compositae	Acroptilon	repens	Russian knapweed	I	P	F	1	1
12	Compositae	Ambrosia	tomentosa	skeletonleaf bursage	I	P	F	1	
13	Compositae	Anthemis	cotula	mayweed chamomile	I	A	F	1	1
14	Compositae	Arctium	minus	common burdock	I	P	F	1	1
15	Compositae	Centaurea	cyanus	bachelor's buttons	I	P	F		1
16	Compositae	Centaurea	diffusa	diffuse knapweed	I	P	F	1	
17	Compositae	Centaurea	maculosa	spotted knapweed	I	P	F	1	
18	Compositae	Centaurea	solstitialis	yellow star-thistle	I	B	F	1	1
19	Compositae	Cichorium	intybus	chicory	I	P	F	1	1
20	Compositae	Cirsium	arvense	Canada thistle	I	P	F	1	1
21	Compositae	Cirsium	vulgare	bull thistle	I	B	F	1	1
22	Compositae	Lactuca	serriola	prickly lettuce	I	A	F	1	1
23	Compositae	Onopordum	acanthium	Scotch thistle	I	B	F	1	
24	Compositae	Sonchus	asper	prickly sow-thistle	I	A	F	1	1
25	Compositae	Tanacetum	vulgare	common tansy	I	A	F		1
26	Compositae	Taraxacum	officinale	dandelion	I	P	F	1	
27	Compositae	Tragopogon	dubius	yellow salsify	I	A	F	1	1
28	Convolvulaceae	Convolvulus	arvensis	field morning-glory	I	P	F	1	1
29	Cruciferae	Alyssum	alyssoides	pale allysum	I	A	F	1	1
30	Cruciferae	Camelina	microcarpa	littlepod falseflax	I	A	F	1	1
31	Cruciferae	Capsella	bursa-pastoris	shepherd's-purse	I	A	F		1
32	Cruciferae	Cardaria	draba	whitetop	I	P	F	1	
33	Cruciferae	Chorispora	tenella	blue mustard	I	A	F	1	1
34	Cruciferae	Draba	verna	spring whitlow-grass	I	A	F	1	1
35	Cruciferae	Lepidium	perfoliatum	clasping pepperweed	I	A	F	1	1
36	Cruciferae	Rorippa	nasturtium-aquaticum	water-cress	I	P	F	1	1
37	Cruciferae	Sisymbrium	altissimum	tumblemustard	I	A	F	1	1
38	Cruciferae	Sisymbrium	loeselii	small tumbleweed mustard	I	A	F	1	
39	Dipsaceae	Dipsacus	sylvestris	teasel	I	B/P	F	1	1
40	Geraniaceae	Erodium	cicutarium	filaree	I	A	F	1	1
41	Hypericaceae	Hypericum	perforatum	St.John's-wort	I	P	F	1	1
42	Labiatae	Lamium	amplexicaule	common hen-bit	I	A	F	1	
43	Labiatae	Marrubium	vulgare	horehound	I	P	F	1	1
44	Labiatae	Mentha	piperita	peppermint	I	P	F		1
45	Labiatae	Nepeta	cararia	catnip	I	P	F		1

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	Family	Genus	Species	Common Name	Nat / Int	Ann/ Per	Form	Observed	Expected
46	Leguminosae	Medicago	lupulina	black medic	I	A	F	1	1
47	Leguminosae	Medicago	sativa	alfalfa	I	P	F	1	1
48	Leguminosae	Melilotus	officinalis	white sweet-clover	I	B	F	1	1
49	Leguminosae	Trifolium	pratense	red clover	I	P	F		1
50	Leguminosae	Trifolium	repens	white clover	I	P	F	1	1
51	Liliaceae	Asparagus	officinalis	asparagus	I	P	F	1	
52	Malvaceae	Malva	neglecta	cheeseweed	I	P	F	1	1
53	Onagraceae	Epilobium	angustifolium	fireweed	I	A	F		1
54	Plantaginaceae	Plantago	lanceolata	English plantain	I	P	F	1	1
55	Polygonaceae	Rumex	acetosella	sheep sorrel	I	P	F	1	
56	Polygonaceae	Rumex	crispus	curly dock	I	P	F	1	1
57	Portulacaceae	Portulaca	oleracea	common purslane	I	A	F		1
58	Ranunculaceae	Ceratocephala	testiculatus	hornseed buttercup	I	A	F	1	1
59	Ranunculaceae	Ranunculus	cymbalaria	shore buttercup	I	P	F		1
60	Rosaceae	Potentilla	fruticosa	shrubby cinquefoil	I	P	F		1
61	Scrophulariaceae	Linaria	dalmatica	Dalmatian toadflax	I	P	F		1
62	Scrophulariaceae	Verbascum	blattaria	moth mullein	I	B	F	1	
63	Scrophulariaceae	Verbascum	thapsus	common mullein	I	B	F	1	1
64	Solanaceae	Hyoscyamus	niger	black henbane	I	A	F		1
65	Solanaceae	Nicotiana	acuminata	wild tobacco	I	A/P	F		1
66	Solanaceae	Nicotiana	attenuata	coyote tobacco	I	A/P	F		1
67	Solanaceae	Physalis	longifolia	ground-cherry	I	P	F		1
68	Solanaceae	Solanum	dulcamara	bittersweet	I	P	F	1	1
69	Umbelliferae	Anthriscus	scandicina	bur chervil	I	A	F	1	1
70	Umbelliferae	Conium	maculatum	poison hemlock	I	P	F	1	1
71	Umbelliferae	Daucus	carota	Queen Anne's lace	I	B	F		1
72	Umbelliferae	Pastinaca	sativa	parsnip	I	P	F		1
73	Valerianaceae	Valerianella	locusta	European corn-salad	I	A	F		1
74	Zygophyllaceae	Tribulus	terrestris	puncture-vine	I	A	F	1	1

APPENDIX C. GENERAL REGULATIONS 2002.

PINE CREEK RANCH

These regulations will be modified as deemed necessary.

The Confederated Tribes of Warm Springs purchased Pine Creek Ranch in 1999 with Bonneville Power Administration Wildlife and Watershed Mitigation funds, and expanded the property in 2001 with acquisition of the Wagner Ranch. The ranch will be managed in perpetuity for the benefit of fish and wildlife habitat.

In accordance with provisions of the Northwest Power Act and a memorandum of agreement (MOA) between BPA and the Confederated Tribes, certain activities will be either allowed or restricted. The primary elements of the MOA relevant to these regulations are listed below:

Public Access

The public shall have reasonable access to the Project. The Tribe may regulate access, provided that access and transportation regulations shall apply equally to tribal members and non-tribal members. The Tribe will not provide public access or use that will result in adverse impacts to wildlife, the reduction of wildlife habitat values, or the destruction of other natural resource values for which the properties are managed, or impede the increase in HEP value of improvement HU's. Nothing in this Agreement limits the authority or ability of the Tribe to manage the properties for public safety and wildlife habitat conservation, or to preserve and protect cultural, historic, and religious sites, and to carry out and protect the federally guaranteed rights of the Tribe and its members. Nothing in this Agreement limits or diminishes any treaty retained right or privilege of the Tribe or its members afforded under federal law as a result of the status of the Tribe or Tribal members, provide that treaty reserved rights will be exercised consistent with this Agreement.

Access is conditioned upon visitors agreeing to comply with these regulations and applicable Oregon and Federal law. Visitors will comply with any directions or instructions given them by Pine Creek Ranch employees in the administration of their duties. Visitors will not trespass onto neighboring lands. Users failing to comply with these regulations and applicable law are subject to exclusion from the Pine Creek Ranch, payment of damages, and prosecution under applicable law.

Visitors to the Pine Creek Ranch assume the risk inherent with the activities they undertake, whether hunting, horseback riding, hiking, or any other activity. By assuming this risk they agree not to make a claim against or sue the Confederated Tribes or their employees for injuries or damages that they incur as a result of the inherent risks of their visit to Pine Creek Ranch.

Protection of Tribal Rights

Fishing, hunting, gathering and Tribal cultural and religious activities on the Project according to Tribal custom and law are not prohibited by this Agreement. Tribal members shall be subject to tribal regulation of wildlife harvest. All other hunters will be subject to state and federal regulations.

Commercial Use

All commercial uses – including but not limited to guiding, firewood or other wood products removal, or antler collecting – are prohibited, with exception of prescribed management purposes. All other uses are prohibited unless specifically authorized by ranch management.

Advisory Committee:

A working group made up of the individuals listed below created the Pine Creek Ranch Access Management Plan:

Joseph Jones, Oregon Museum of Science and Industry
Russ Morgan and Bob Krein, Oregon Department of Fish and Wildlife
Terry Luther and Mark Berry, Confederated Tribes of Warm Springs
Scott Cooke, Bureau of Land Management
John Laing, National Park Service
Todd Hoodenpyl, Oregon State Police
Dan Greenfield, rancher, Wheeler County
Ted Molinari, landowner, Wheeler County

The Confederated Tribes are sincerely appreciative of the efforts the planning team made in developing this plan.

Appendix C. General Regulations 2002

Access

Public access is allowed by permit only. Individuals or groups wishing to access Pine Creek Ranch are required to sign in and out at the register. Groups of 6 or more may visit by prior arrangement only. Some areas may be restricted seasonally or permanently to protect unique biological, cultural, geological or other values.

The ranch may be accessed from public roads, the John Day River, or public lands. Park out of the roadway on gravel pull-outs. Neighboring private lands may be used to access the ranch only with landowner permission. Neighboring landowners may not charge fees to access Pine Creek Ranch. Individuals who pay to access or hunt neighboring lands may not access Pine Creek Ranch through those lands, and may immediately lose permission to access Pine Creek Ranch.

Vehicular Access

Vehicles are not permitted away from Highway 218, Clarno Rd, or Pine Creek Rd, except for management purposes on ranch roads. The general public is not allowed to operate ATVs or mountain bikes on Pine Creek Ranch. For big game hunting purposes, non-motorized carts and mountain bikes will be allowed on specified roads and trails (see map).

Horses and Other Pack Animals

Horses and other pack animals are not permitted on Pine Creek Ranch except for management purposes and by permitted big game hunters (see hunting regulations)

Dogs

Dogs must be kept under voice and sight control. Dogs may not run at large during bird breeding seasons (Apr. 1 – July 31).

Camping

All campers will observe a leave no-trace policy. Nothing should be left behind when vacating a campsite, and all trash must be packed out. State & BLM fire restrictions will be enforced, and additional restrictions may be imposed.

VEHICLE ACCESS CAMP:

A primitive campsite at Robinson Canyon is available by permit for educational groups, researchers, volunteers, or management activities. No potable water, electric hookups, or waste disposal are available. No RVs or campers longer than 30'. During big-game seasons, up to 5 campsites may be provided for permitted hunters at Robinson Canyon. Campers will be responsible for keeping a gate closed and locked while on the property.

BACKCOUNTRY (UPLAND) CAMPS:

Backcountry camping is allowed. Sites must be at least one mile or farther from public roads. Human waste must be buried.

RIVER CAMPS:

No camping above the mean high water mark within ¼ mile of the John Day River, except on BLM land. All River Camps are subject to BLM Wild and Scenic river regulations, including the use of a portable toilet system and a fire pan.

Fossil and Rock Collecting

Fossil and rock collecting is prohibited on Pine Creek Ranch, and paleontological resources are protected by applicable law. Researchers may submit proposals to ranch management.

Cultural Resources

State, federal and tribal laws prohibit the disturbance or removal of cultural resources. Violators are subject to severe criminal and civil penalties. Cultural resources include but are not limited to foods, pottery, basketry, bottles, weapons, weapon projectiles, tools, structures, pit houses, rock paintings, rock carvings, graves, human skeletal materials, or any portion or piece of the foregoing items. Visitors are required to report suspicious activities to ranch management.

Hunting

Hunting is allowed by permit, and firearms may only be brought onto the ranch for hunting. See Hunting Regulations.

Fishing

No access to Pine Creek is permitted for fishing. Pine Creek supports a spawning run of threatened summer steelhead. Fishermen may access the John Day River on Pine Creek Ranch property (see map).

Research and Educational Use

Natural sciences research and educational activities are encouraged. Researchers should contact ranch management prior to submitting proposals. Educational groups may visit Pine Creek Ranch by permit, with restrictions applied as necessary.

APPENDIX D. HUNTING REGULATIONS 2002.

Hunters are responsible for following these regulations and all provisions of the Pine Creek Ranch General Regulations.

A valid Oregon hunting license or tribal identification card and appropriate tag or stamp is required. All hunters will be subject to the same regulations, and all hunting will be in accordance with tribal, state and federal laws and regulations.

Hunting of any species not specifically designated in these regulations or ranch permits is prohibited.

The property north of Highway 218 and west of Cove Creek is part of the Camp Hancock and National Park Service Safety Zone and is closed to all hunting (see map). Additional safety zones are in place around residences.

Access Restrictions

The ranch may be accessed from public roads, the John Day River, or public lands. No public motor vehicle use is allowed on the ranch. Park out of the roadway on gravel pull-outs only.
Neighboring private lands may be used to access the ranch only with landowner permission. Neighboring landowners may not charge fees to access Pine Creek Ranch. Individuals who pay to access or hunt neighboring lands may not access Pine Creek Ranch through those lands, and may immediately lose permission to access Pine Creek Ranch.

Big game permit holders may use up to two horses or other pack animals. All feed must be weed-free. Mountain bikes or non-motorized game carts may be used by big game permit holders, but must remain on designated roads (see map), except to retrieve harvested game. Permit holders may be accompanied by un-armed non-permit holders.

Harvest Reporting

All harvested birds or game must be reported. Hunters accessing the ranch from Highway 218 must report harvest when checking-out. Hunters who accessed from the John Day River may report harvest by mail, and must report within one week.

Predator Hunting

No access for predator hunting is permitted. Predator control will be managed by ranch personnel or designated representatives, if deemed necessary by ranch management.

Feral Swine

Feral swine are known to occur near Pine Creek Ranch, but have not been observed on ranch property. Hunters with permits to access the ranch may also hunt feral swine if any are encountered. Hunters may not access the ranch with firearms for the purpose of feral swine hunting. All sightings of feral swine must be reported. Feral swine have been classified as a predatory animal, and no tag is necessary for their harvest under state regulations.

Bird Hunting, 2002-2003

Access for bird hunting is by foot only. Hunters accessing the ranch from Highway 218 must sign-in prior to hunting and report harvest when signing-out after the hunt. Hunters accessing from the John Day River do not need to sign-in, but must report harvest.

The first full week and second weekend of each bird season will be reserved for youth hunters age 12-17. Youth hunters must possess a valid Hunters Safety card and must be accompanied by an adult who will not be allowed to carry a weapon.

Hunt:	Youth Only	OPEN DATES:
Mourning Dove	1st 9 days	Remainder of season
Chukar:	1st 9 days	Remainder of season
Rooster Pheasant:	1st 9 days	Remainder of season
Valley California Quail:	1st 9 days	Remainder of season
Mountain Quail are PROTECTED: Know Your Target!		
Duck and Merganser	1st 9 days	Remainder of season
Goose	1st 9 days	Remainder of season

Appendix D. Hunting Regulations 2002

Big Game Hunting

Game Units

There are two big game management units on Pine Creek Ranch: the E. Biggs Unit and the S. Fossil Unit, separated by Highway 218.

Application Procedures

Permits will be allocated by lottery. To apply, hunters must submit a photocopy of their tag in advance of the July 31 application deadline, along with name, mailing address, and phone number. If any permits are remaining after the application deadline, they will be available on a first-come, first-served basis. Interested hunters (Tribal or Non-tribal) should apply to: Pine Creek Ranch, 39067 Highway 218, Fossil, OR 97830; Phone: (541) 489-3477, Email: pinecreek@bendnet.com

Party applicants

Party applications will be limited to three people per party. Party applicants must designate a leader, and only the leader's name will be used in the lottery. If the leader is drawn, the party will receive permits. Parties will not be divided.

Check-in Procedures

Permits will be mailed to successful applicants, along with property maps and regulations. Hunters will receive two permits: One must be displayed in their vehicle, and the other must remain in their possession. Hunters must display their permit, license, and tag on demand of anyone on the property. Permitted hunters must sign-in at the check-station on Highway 218, and must sign-out when leaving the area. Permitted hunters intending to access from the John Day River must sign-in at the register on Highway 218, or contact the office, and must sign-out

Camping

All campers will observe a leave no-trace policy. Nothing should be left behind when vacating a campsite, and all trash must be packed out. State & BLM fire restrictions will be enforced, and additional restrictions may be imposed.

VEHICLE ACCESS CAMP:

A primitive campsite at Robinson Canyon is available by permit for educational groups, researchers, volunteers, or management activities. No potable water, electric hookups, or waste disposal are available. No RVs or campers longer than 30'. During big-game seasons, up to 5 campsites may be provided for permitted hunters at Robinson Canyon. Campers will be responsible for keeping a gate closed and locked while on the property.

BACKCOUNTRY (UPLAND) CAMPS:

Backcountry camping is allowed. Sites must be at least one mile or farther from public roads. Human waste must be buried.

RIVER CAMPS:

No camping above the mean high water mark within ¼ mile of the John Day River, except on BLM land. All River Camps subject to BLM Wild and Scenic river regulations, including the use of a portable toilet system and a fire pan.

BIG GAME HUNT DATES AND NUMBER OF PERMITS IN 2002

SEASON (HUNT #)	HARVEST	UNIT	# OF PERMITS	DATES
General Bow	1 Buck &/or 1 Elk	Either	10 tribal, 10 non-tribal	Aug 24 – Sep 22
Buck Deer Rifle (145)	1 Buck	S Fossil	15 tribal, 15 non-tribal	Sep 28 – Oct 9
Buck Deer Rifle (143)	1 Buck	E. Biggs	5 tribal, 5 non-tribal	Sep 28 – Oct 9
Antlerless Deer Rifle (643A)	1 Antlerless Deer	E. Biggs	5 tribal*, 5 non-tribal	Oct 12 – Oct 20
*Tribal antlerless deer permits are reserved for ceremonial hunters.				
Elk 1st Bull Rifle (245B1)	1 Bull	S. Fossil	10 tribal, 10 non-tribal	Oct 23 – Oct 27
Elk 2nd Rifle (245B2)	1 Elk	S. Fossil	10 tribal, 10 non-tribal	Nov 2 – Nov 10
Elk Extended Rifle (R. Mt. Elk 1st)	1 Elk	E. Biggs	3 tribal, 3 non-tribal	Oct 23 – Nov 24
Elk Antlerless Rifle (245D1)	1 Antlerless Elk	S. Fossil	4 tribal, 4 non-tribal	Nov 16 – Nov 24
Elk Antlerless Rifle (245D2)	1 Antlerless Elk	S. Fossil	4 tribal, 4 non-tribal	Nov 30 – Dec 8
Elk Antlerless Rifle (245D3)	1 Antlerless Elk	S. Fossil	4 tribal, 4 non-tribal	Dec 14 – Dec 22

APPENDIX E. 2001 BASELINE HABITAT EVALUATION PROCEDURE (HEP) REPORT

Pine Creek Ranch

Mark Berry
Habitat Manager
Pine Creek Ranch
39067 Highway 218
Fossil, OR 97830

Introduction

Habitat Evaluation Procedure (HEP) is used extensively within the Northwest Power Planning Council's (NPPC) Columbia River Basin Fish and Wildlife Program. Wildlife managers use this procedure to determine habitat lost through the construction of the federal hydro-electric projects and gained through NPPC mitigation program.

The wildlife habitat impacts of constructing John Day Dam on the Columbia River were assessed in 1989 using HEP methods (Rasmussen & Wright, 1989). The project directly impacted 27,455 acres of wildlife habitat. Ten evaluation species were selected, and Habitat Suitability Index (HSI) models for each of the target species were used to determine lost habitat quality and quantity for representative habitat cover types (Table 1). A Habitat Unit (H.U.) is an acre of idealized habitat, and HUs are calculated by multiplying HSI values (ranging from 0.0 to 1.0) times the acreage of a given cover type.

Table 1. HEP indicator species selected in John Day Pool loss assessment, with acreages of cover types lost to flooding, and total Habitat Units (H.U.s) lost for each species.

Species:	Cover Types (acres flooded)			Total H.U.s lost
Western Meadowlark	Shrub/Steppe/Grass (12,647)			5,059
Yellow Warbler	Riparian Shrub (1,085)			1,085
Mink	Riparian Shrub (1,085)	Emergent (511)		1,437
California Quail	Shrub/Steppe/Grass (12,647)			6,324
Great Blue Heron	Sand/Gravel (3,983)			3,186
Mallard	Riparian Herbaceous (1,178)	Island (6,708)	Emergent (511)	7,399
Spotted Sandpiper	Sand/Gravel (3,983)			3,186
Canada Goose	Riparian Herbaceous (1,178)	Island (6,708)	Agriculture (2,062)	8,010
Black-capped Chickadee	Riparian Tree (1,086)			869
Lesser Scaup	Open Water			Gain 14,398

In 2001, a HEP team evaluated the baseline habitat conditions on the 24,304-acre Pine Creek Ranch, which is intended to partially mitigate for habitat losses at John Day Dam. The baseline Habitat Units (HU) will be provided as credit to the Bonneville Power Administration (BPA) for protection of habitats within the project.

The 2001 HEP team consisted of the following members and agencies: Mark Berry, Confederated Tribes of Warm Springs (CTWS); Terry Luther, CTWS; Paul Ashley, Washington Dept. of Fish and Wildlife (WDFW); Donna Allard, United States Fish and Wildlife Service (USFWS); Ray Entz, Kalispel Natural Resource Department (KNRD); Darren Holmes, KNRD; Roy Finley, KNRD; Neil Lockwood, KNRD; Susan Barnes, Oregon Department of Fish and Wildlife (ODFW), and Ken Rutherford, ODFW.

Methods:

Cover Types:

Pine Creek Ranch was selected as an off-site mitigation project for John Day Pool partially because it includes habitats similar to those that were inundated by John Day Pool. A large portion of the ranch is upland bunchgrass steppe habitat, which is similar to the Shrub/Steppe/Grass cover type, 12, 647 acres of which were lost under John Day

Pool. There also are clear differences between the habitat types on Pine Creek Ranch and those lost under John Day Pool. Especially notable is the lack of large riparian areas with associated islands, sand/gravel bars, riparian forests, and emergent herbaceous vegetation; and the presence of large areas of western juniper, which did not occur at John Day Pool. Cover types on Pine Creek Ranch were mapped by the CTWS in 2000 using Landsat imagery and ERDAS software, with acreages of each cover type calculated (Table 2).

Table 2. Cover Types on Pine Creek Ranch.

Cover Type	Acres	Comparable John Day Pool Cover Types
Grassland	2,635	Shrub/Steppe/Grass
Agriculture[1]	242	Shrub/Steppe/Grass
Scattered Juniper	6,464	Shrub/Steppe/Grass
Moderate Juniper	7,746	None
Dense Juniper	4,968	None
Burned Grassland[2]	399	Shrub/Steppe/Grass
Burned Scat. Juniper[2]	1,373	Shrub/Steppe/Grass
Burned Mod. Juniper[2]	1,001	Shrub/Steppe/Grass
Burned Dense Juniper[2]	297	Shrub/Steppe/Grass
Riparian	21	Riparian Shrub
TOTAL:	25,146	

[1] Agriculture cover type includes floodplain fields previously managed for agriculture, but now managed as grasslands.
[2] Areas burned in the July, 2000 Two Horse Fire were mapped separately based upon their prior cover type.

Model Selection:

In an ideal application of HEP to wildlife mitigation, the same cover types would exist at the mitigation site that were lost in the original action, and the same HSI models would be applied at each location. When this is not possible, it is appropriate to apply the same number of HSI models in each cover type.

For the Shrub/Steppe/Grass cover type at John Day Pool, the Western Meadowlark and California Quail models were applied. The Western Meadowlark model was applied at Pine Creek Ranch to all appropriate cover types, but the existing California Quail HSI model was developed for use primarily in an agricultural setting and could not be practicably applied at Pine Creek Ranch. For this reason, a Mule Deer model originally developed by Paul Ashley and Matthew Berger (1999) was modified for use at Pine Creek Ranch. The Mule Deer model was also applied to Moderate and Dense Juniper cover types, which were not included in the original loss assessment.

The riparian habitats along Pine Creek are comparable to the Riparian Shrub cover type at John Day Pool, and the Yellow Warbler and Mink HSI models were used in this cover type.

Models for Western Meadowlark, Mule Deer, Yellow Warbler, and Mink are presented in Appendix A.

The remaining HSI models used at John Day Pool (Great Blue Heron, Mallard, Spotted Sandpiper, Canada Goose, Black-capped Chickadee, and Lesser Scaup) were applied to cover types not present at Pine Creek Ranch.

Site Selection:

Upland cover types on Pine Creek Ranch, especially categories of varying juniper density, occur in a patchy manner, and grade into one another. To avoid biases potentially introduced by field selection of transect locations, the tribal GIS was used to generate a list of coordinates for points located centrally within cover type patches. A subset of these computer-generated sites was selected with consideration for ease of access (all sites within 1 mile of a ranch road), while maintaining a range of aspects, elevation, and geographic position reflective of the distribution of the cover type. Nine sites were selected in each of the predominant cover types on the property: Grassland, Scattered Juniper, Moderate Juniper, and Dense Juniper. Five sites were selected in the Agriculture Cover Type, and one in each of the four Burned cover types. Riparian transect sites were selected from a set of pre-existing riparian photo-monitoring points, and were spread across the length of the creek on the property.

Field Methods:

Field work was conducted between May 21 and May 30, 2001.

Field crews navigated to study sites using handheld Garmin brand GPS units. Transect starting points were marked with rebar, and GPS coordinates were noted on data sheets. Transect azimuths were randomly selected from a random number list. If the selected bearing caused the transect to leave the cover type, a second random bearing was selected. This could occur either before starting, or during, measurement of a transect.

Transect lengths were varied between cover types, and ranged from 200 feet in uniform agricultural fields to 1,000' in juniper. Transects are divided into 100-foot sampling units (n), and transect length is determined based upon variation between sampling units. The sample size is determined through use of the following equation:

$$n = \frac{t^2 s^2}{B^2}$$

where: t = t value at the 95 percent (0.05) confidence interval for the appropriate degrees of freedom (df); s = standard deviation; and B = bounds (± 10 percent).

On each transect, data were collected as necessary for the HSI model(s) to be applied in the cover type. Tables 3 and 4 present a summary of the data collection protocols in upland and riparian transects, respectively.

Table 3. Summary of upland transects field data collection protocol. For more information on variables, see HSI models in Appendix A.

Upland Transects		Western Meadowlark	Mule Deer
Every 25'	Read a 0.5 m2 plot frame for:		

		% cover herbaceous vegetation	V1	
		& of herb. veg. composed of grass	V2	
		Avg. height of herbaceous veg	V3	
		% cover of palatable herb. veg.		V5
	Use a laser range finder to measure:			
		Feet to nearest perch	V4	
Every 2’	Record a point-intercept			
		Shrub Species	V5	V1, V2, V4
		Shrub Height		V3, V10

Table 4. Summary of riparian transects field data collection protocol. For more information on variables, see HSI models in Appendix A.

Riparian Transects			**Yellow Warbler**	**Mink**
Every 5’	Record a point-intercept			
		Percent deciduous shrub crown cover	V1	
		Shrub height	V2	
		Shrub species. (% hydrophytic)	V3	
		% tree, shrub, or persistent emergent herbaceous veg		V1
At 100’ & 300’	100 m paired side transects, Every 2 m on side transect, record point-intercept			
		% tree &/or shrub canopy closure within 100 m of water		V4
Estimate	Entire Transect	% of year with surface water		V2
Every 5’	Record Width of Riparian Habitat		Calculation of Area	

Data Analysis:

Field data were entered into spreadsheets and tabulated as necessary to calculate HSI variables.

Additional variable results were calculated from GIS data as needed. For example, the Mule Deer model required calculations for several landscape variables. Each cover type was divided into eight aspect classes using GIS software, and the percent of each was used to calculate V7 according to the model. Presence of winter wheat or alfalfa within 1 mile (V6) was estimated to be true for 10% of the property, this variable was therefore entered as 10% of its maximum value in all calculations. Road density (V8) was similarly averaged across cover types, and received a score of 0.8. Topographic diversity (V9), was considered to be best described on the property by Category E: Mountainous terrain with slopes greater than 25%, and thus received a score of 0.7.

For each model, the number of acres within each cover type was multiplied by the average HSI within the cover type, yielding the number of H.U.s for the cover type. H.U.s were subsequently summed across cover types to give total H.U.s for each species.

Results:

Average HSI for each model in each cover type, along with the number of acres of the cover type and the resulting number of HUs, are summarized in Table 5.

Western Meadowlark habitat on Pine Creek Ranch is generally of high quality according to our field measurements and the HSI model, with average HSI per cover type ranging from a high of 0.87 in agricultural fields, to a low of 0.28 in burned areas of moderate and high density juniper.

Mule Deer habitat generally received lower HSI values, ranging from 0.28 in scattered juniper to 0.11 in agricultural fields. Generally, mule deer habitat quality on the ranch, according to the HSI model, was most limited by the availability of preferred forage shrub species. Palatable herbaceous forage, as well as cover and landscape variables, were generally at least adequate, and often received high scores, while the number of preferred shrub species, and percent cover of preferred shrub species, typically received low scores. These preferred shrub species (such as bitterbrush, Purshia tridentata) are widely distributed on the property, but typically at low density.

Yellow Warbler habitat along Pine Creek received a relatively high HSI score, of 0.63, while Mink habitat received a low average HSI of 0.31.

The total Habitat Units from this baseline HEP on Pine Creek Ranch are 14,057.

Table 5. Baseline Average HSIs and HUs by Species and Cover Type.

Cover Type	Acres	Western Meadowlark		Mule Deer		Yellow Warbler		Mink	
		HSI	HUs	HSI	HUs	HSI	HUs	HSI	HUs
Grassland	2,635	0.78	2,054	0.20	528	NA	0	NA	0
Agriculture[1]	242	0.87	210	0.11	27	NA	0	NA	0
Scattered Juniper	6,464	0.66	4,249	0.28	1,793	NA	0	NA	0
Moderate Juniper	7,746	NA	0	0.23	1,785	NA	0	NA	0
Dense Juniper	4,968	NA	0	0.23	1,151	NA	0	NA	0
Burned Grassland[2]	399	0.81	322	0.20	81	NA	0	NA	0
Burned Scat. Juniper[2]	1,373	0.63	868	0.24	323	NA	0	NA	0
Burned Mod. Juniper[2]	1,001	0.28	283	0.22	220	NA	0	NA	0
Burned Dense Juniper[2]	297	0.28	84	0.20	58	NA	0	NA	0
Riparian	21	NA	0	NA	0	0.63	14	0.31	7
TOTAL:	25,146		8,070		5,966		14		7

Discussion:

Long-term management of Pine Creek Ranch for fish and wildlife habitat is expected to increase the numbers of Habitat Units in future HEP surveys. These changes may take place over the next several decades.

Western Meadowlark habitat should increase through management that favors restoration of native grassland habitats, through fire management and/ or mechanical control of juniper. Encroachment by western juniper and invasion by annual grasses such as cheatgrass (Bromus tectorum) and medusahead (Taeniatherum caput-medusae), are the major obstacles to recovery of native grassland habitats on Pine Creek Ranch. It should be noted that the Western Meadowlark HSI model does not consider differences between native bunchgrass and annual grass habitats, other than by looking at average plant heights and cover estimates. This model may therefore return high habitat values from dense annual grasses, areas generally considered by wildlife biologists to be of low habitat and watershed value. While meadowlarks may use areas dominated by annual grasses, it should not be assumed that these areas have equivalent values for other wildlife species.

Mule deer habitat units are likely to increase through an improvement in habitat quality rather than quantity, since the entire ranch is currently considered mule deer habitat. Recovery of preferred forage shrubs would be the most likely route to improvements in mule deer habitat. These shrubs, which include bitterbrush (Purshia tridentata) and mountain mahogany (Cercocarpus ledifolius), currently may be limited by competition with western juniper. In some stands of medium-sized juniper, decadent bitterbrush is common, with no regeneration occurring.

Yellow warbler and mink habitat is likely to both increase in quantity, and improve in quality, as watershed recovery allows expansion of the riparian area on Pine Creek. The total habitat units for riparian habitat species on the ranch will always remain low compared to those for upland species, however.

Acknowledgements:

The Confederated Tribes of Warm Springs would like to acknowledge all of the members of the field HEP team for their hard work under hot conditions, and the knowledge and skills they brought to the project. The Tribes would like to extend an additional thanks to Paul Ashley of WDFW and Susan Barnes of ODFW for their assistance in preparing for the field work.

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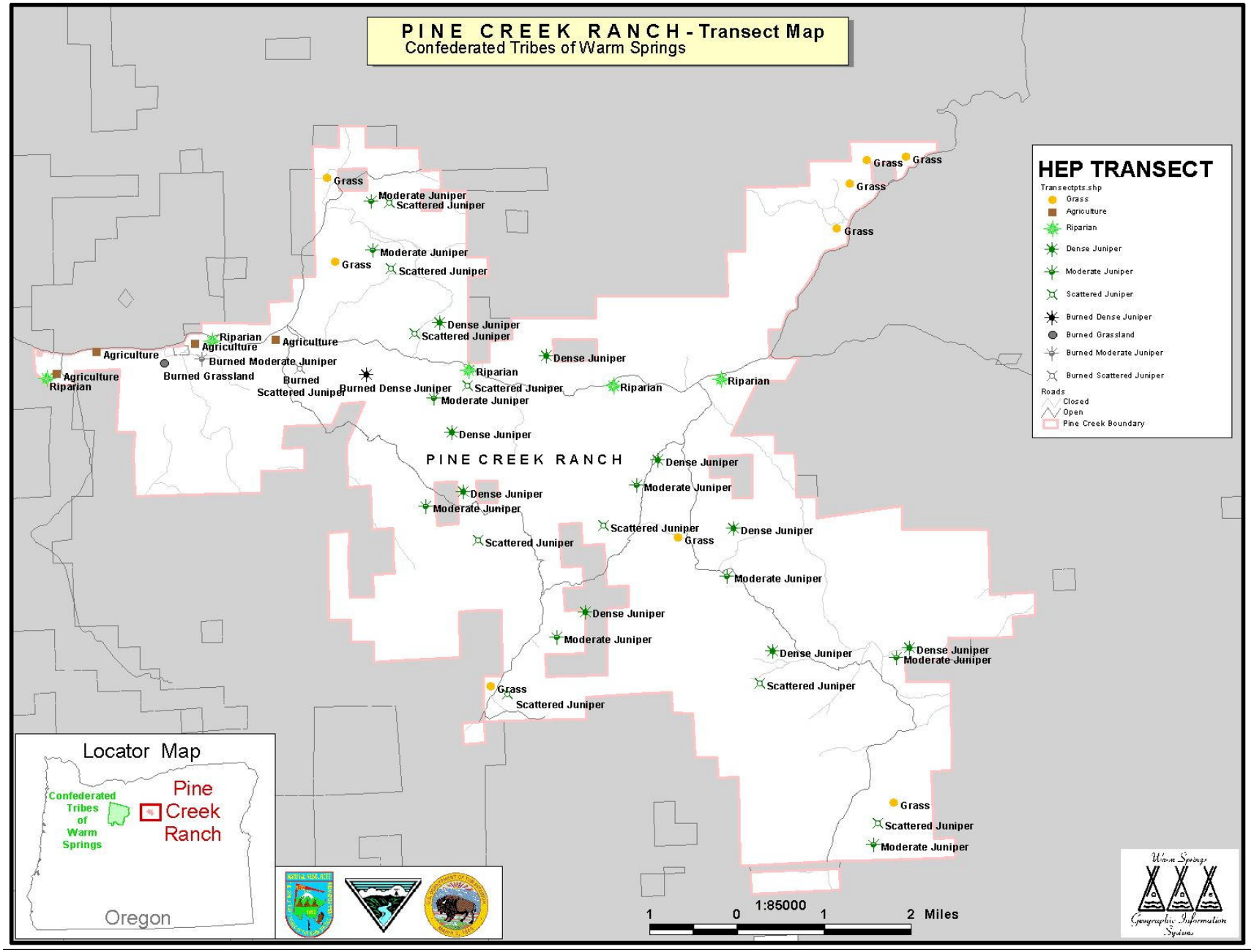
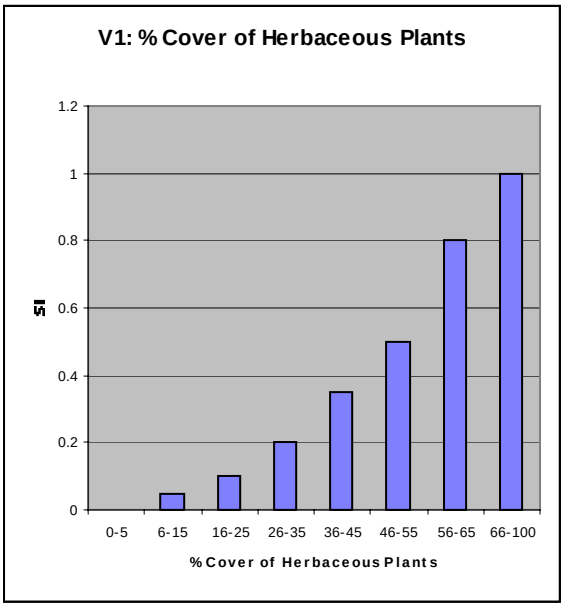
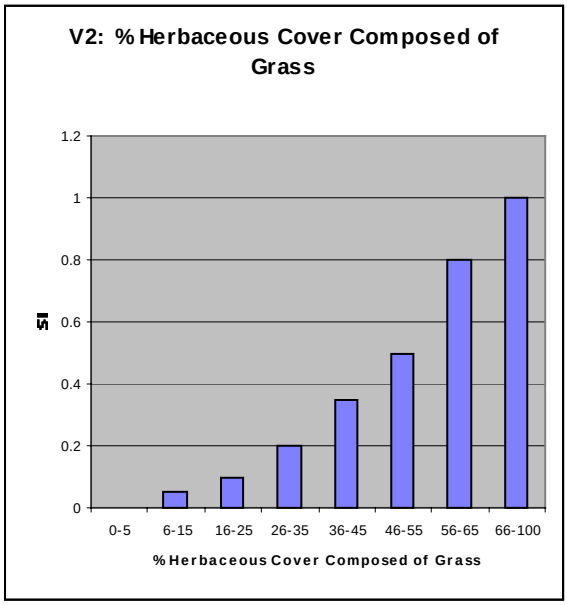

PINE CREEK RANCH - Transect Map
Confederated Tribes of Warm Springs
HEP TRANSECT
Transectpts.shp
Grass
Agriculture
Riparian
Dense Juniper
Moderate Juniper
Scattered Juniper
Burned Dense Juniper
Burned Grassland
Burned Moderate Juniper
Burned Scattered Juniper
Roads
Closed
Open
Pine Creek Boundary
PINE CREEK RANCH
Locator Map
Confederated Tribes of Warm Springs
Pine Creek Ranch
Oregon
1 0 1 2 Miles
1:85000
Warm Springs Geographic Information Systems

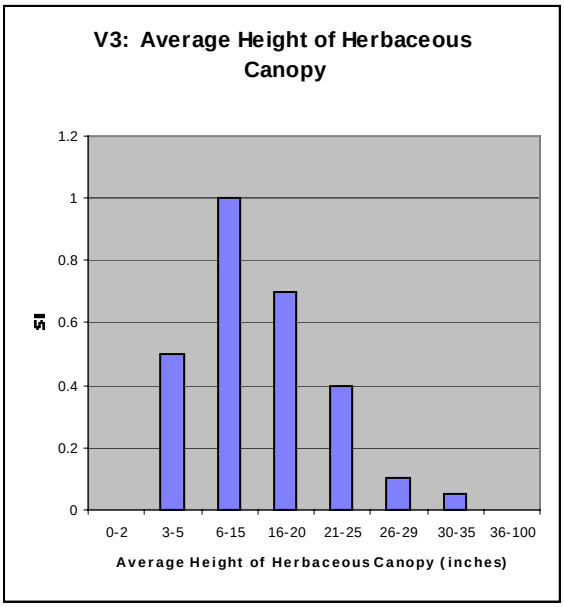
APPENDIX A. PINE CREEK RANCH HSI MODELS

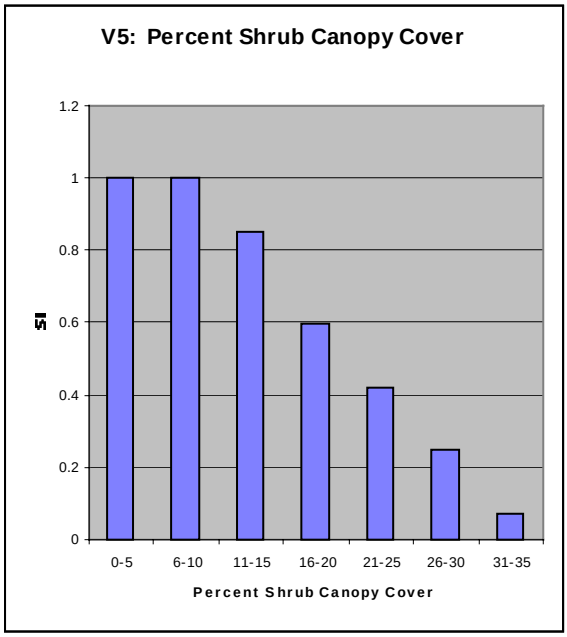
1. Western Meadowlark:

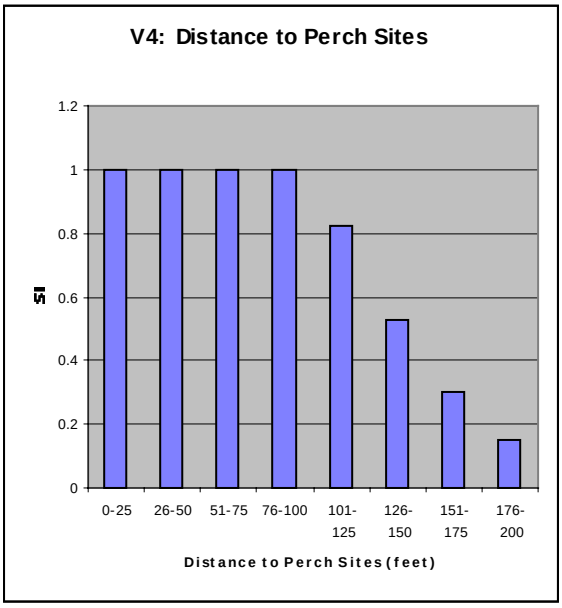
In this model, Western Meadowlark habitat is assumed to be optimal with a high cover of herbaceous plants, composed primarily of grass, of a moderate height (7 to 14"), with perches available within 100', and lacking dense shrub cover. The following histograms were created for this report, based on line graphs in an unpublished HSI model listed as "Modified from Schroeder and Sousa, 1982".







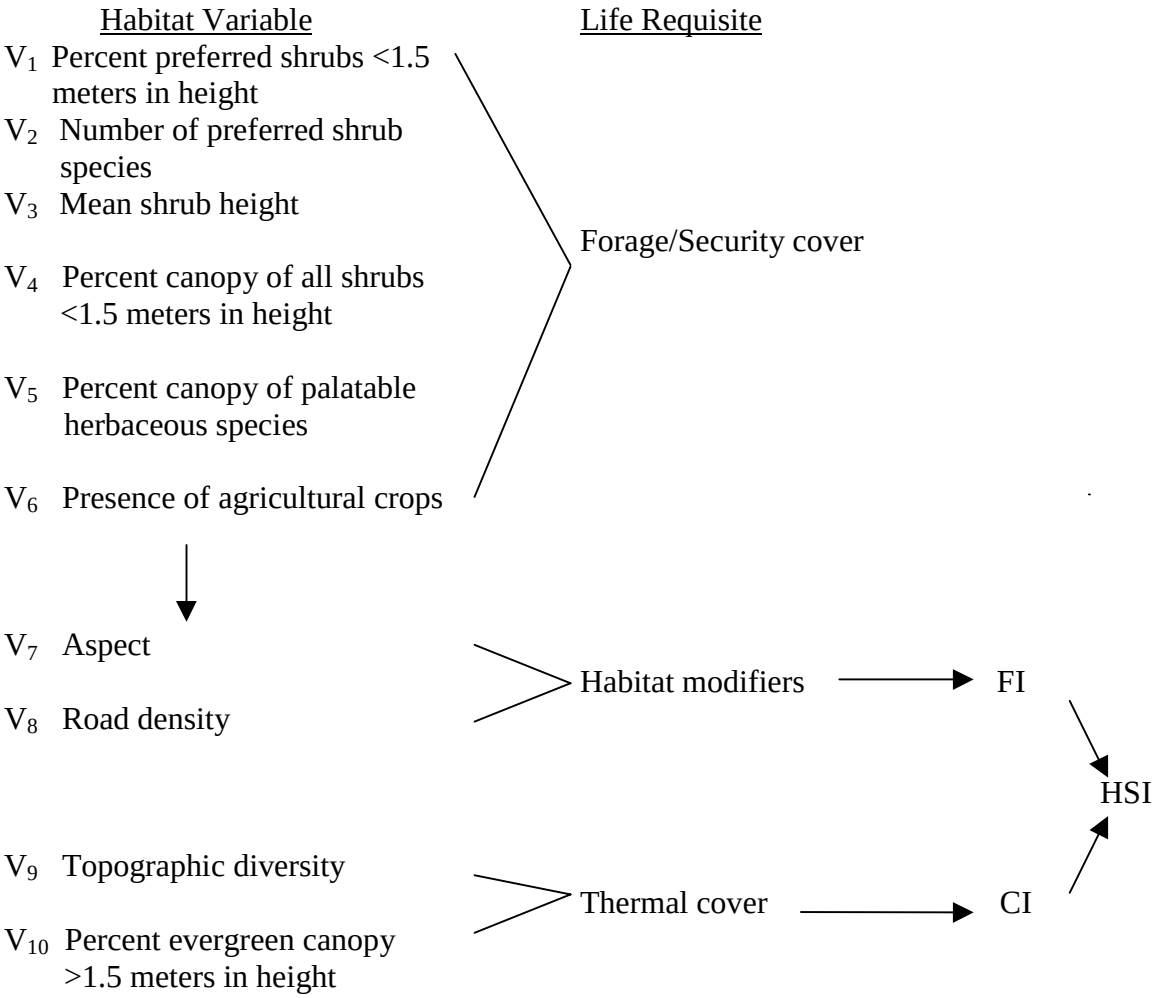


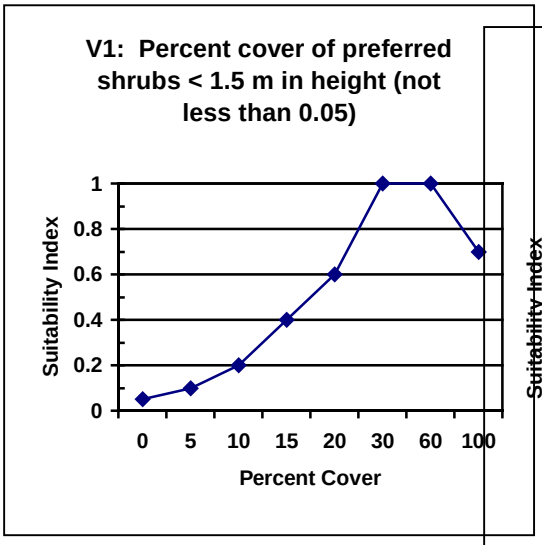


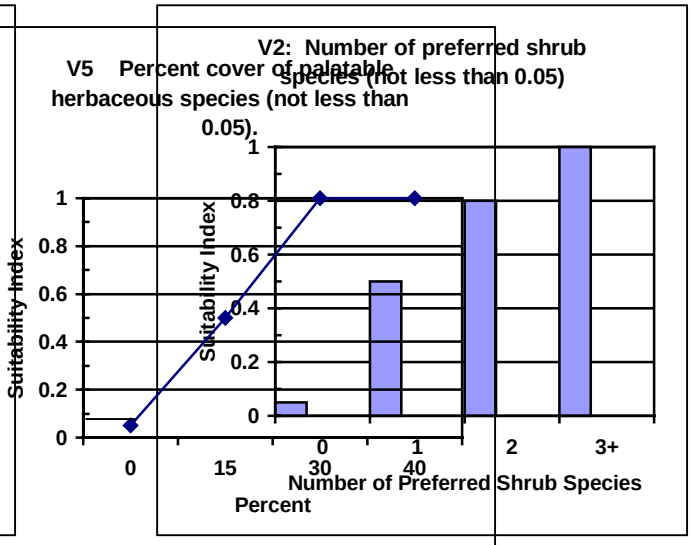
$$HSI = (V1 \times V2 \times V3 \times V4)^{\frac{1}{2}} \times V5$$

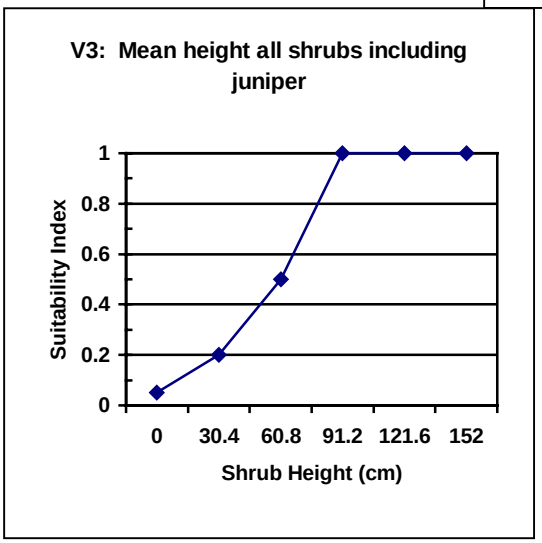
2. Mule Deer: PINE CREEK MULE DEER HEP MODEL (5 May 01)

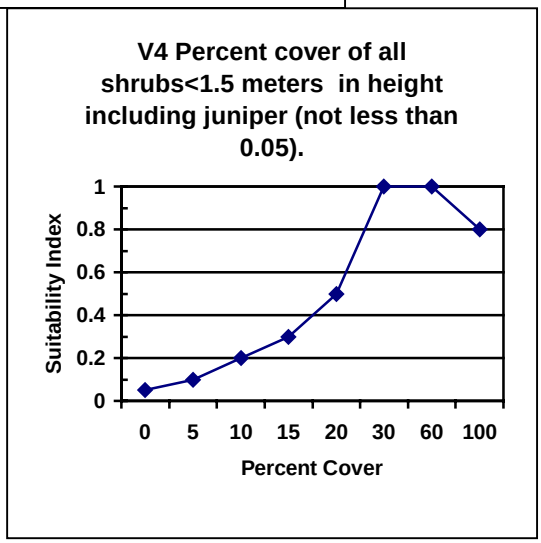
This HEP model was adapted from the Winter Habitat Suitability Model developed by Ashley and Berger (1999). This model was modified by Paul Ashley (WDFW), and reviewed by Terry Luther and Mark Berry (CTWS), to meet habitat conditions found at the Pine Creek mitigation project site. Unlike the original model, this model considers annual forage and cover requirements of mule deer. Minimum suitability indices for food variables are 0.05 because it is assumed that mule deer forage habitat is available within 1.6 km (1 mi) of juniper stands (thermal and hiding cover) for at least a portion of the year. Water is assumed not to be a limiting factor. The relationship between habitat variables, life requisites, and the HSI is illustrated below.







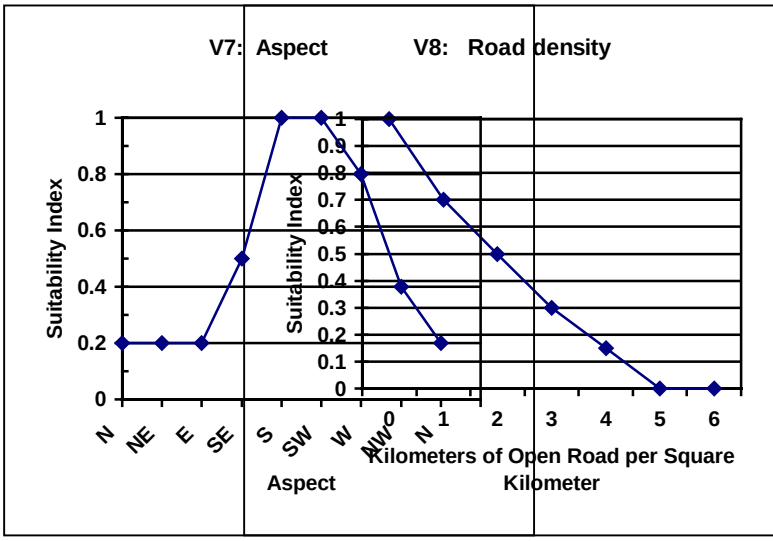




V_6: Presence of suitable agricultural crops within 1.6 kilometers (1 mile) of study area.

Yes: 0.1

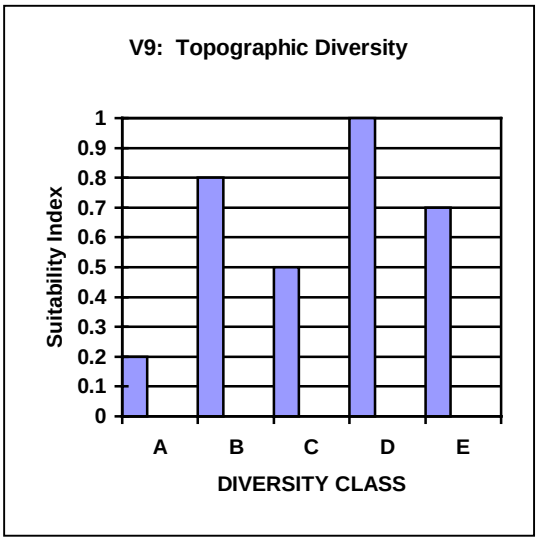
No: 0.0

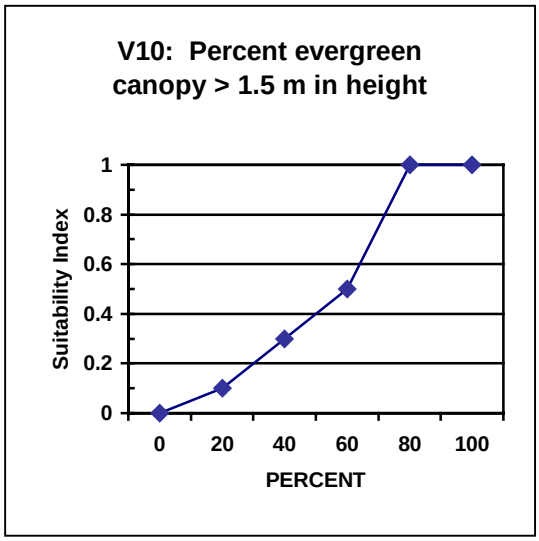


$$\text{Food HSI} = (((V1x\ V2\ x\ V3\ x\ V4\ x\ V5)^{1/5}) + V6)\ x\ V7)^{\wedge .625}\ x\ V8$$

Steps in calculating WFI with a hand calculator:

1. Obtain geometric mean of V1,V2, V3, V4, and V5
2. Add V6
3. Multiply sum obtained in step two by V7
4. Take the 1.66 root (^.6 on your computer)of product from step 3
5. Multiply result from step 4 by V8 to obtain HSI for food





V_9 Topographic diversity.

A: Level terrain less than 5 percent slope.
B: Level terrain broken by drainages.
C: Rolling terrain 5 to 25 percent slope.
D: Rolling terrain with rims, ridges, and/or drainages.
E: Mountainous terrain with slopes greater than 25 percent.

The cover index equation for shrub-steppe habitat emphasizes topographic diversity. The SI for woody evergreen vegetation greater than 1.5 meters (5 feet) in height is additive. The CI for shrub-steppe is described below. If the HSI is greater than 1.0, round down to 1.0.

Cover HSI = (V9 x .8) + V10

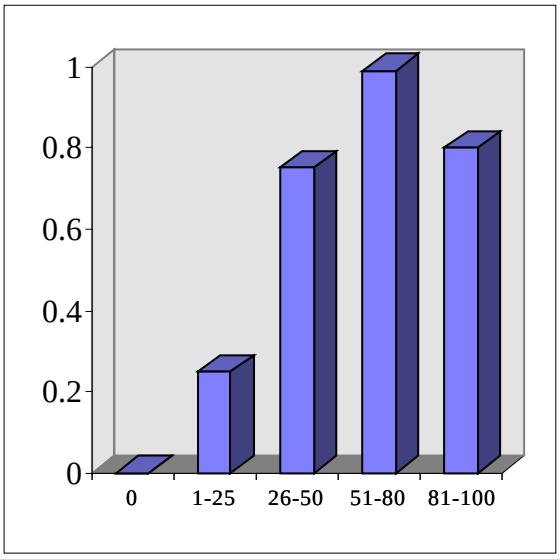
HSI determination: The calculation of a Habitat Suitability Index for mule deer considers the life requisite values obtained for food, habitat modifiers, and cover. The HSI is equal to whichever is lower; the food index (FI) or cover index (CI).

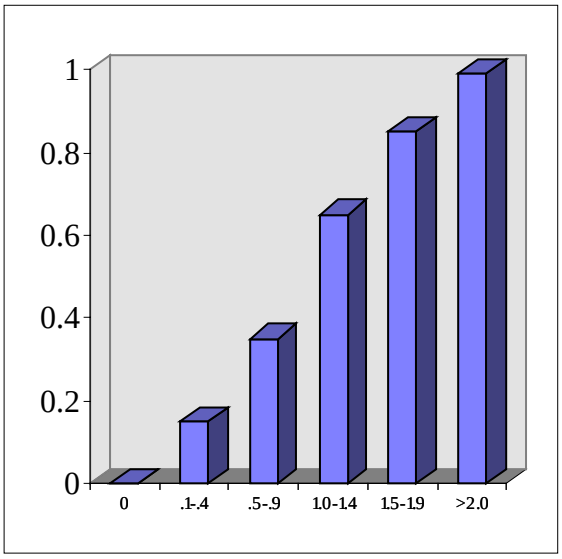
3. Yellow Warbler:

It is assumed that optimal habitats contain 100% hydrophytic deciduous shrubs and that habitats with no hydrophytic shrubs will provide marginal suitability. Shrub densities between 60 and 80% crown cover are assumed to be optimal. As shrub densities approach zero cover suitability also approaches zero. Totally closed shrub canopies are assumed to be of only moderate suitability, due to the probable restrictions on movement of the warbles in those conditions. Shrub heights of 2 m or greater are assumed to be optimal, and suitability will decrease as the heights decrease.

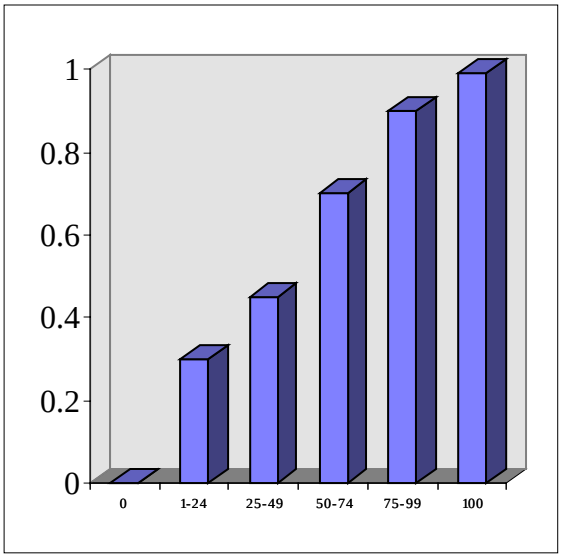
This HSI model was modified into a histogram from the HSI Models: yellow warbler, FWS/OBS-82/10.27 by R.L. Schroeder, 1982. From Baseline HEP Sivert-Duramus, WA, report by Darren Holmes, Kalispel Natural Resources Department, March, 2001.

Yellow Warbler HSI Model





V1 Percent deciduous shrub crown cover **V2** Average height of deciduous shrub canopy



V3 Percent of deciduous shrub canopy comprised of hydrophytic shrubs

Yellow warbler variable definitions -

V1 - Yellow warbler. Percent deciduous shrub crown is the percent of the ground shaded by a vertical projection of the canopies of woody deciduous vegetation that is less than 5 m in height.

V2 - Yellow warbler. Average height of deciduous shrub canopy is the average height from the ground to the top of those shrubs which comprise the uppermost shrub canopy.

V3 - Yellow warbler. Percent of deciduous shrub canopy comprised of hydrophytic shrubs is the relative percent of the amount of hydrophytic shrubs as compared to all shrubs based on variable 2.

4. Mink:

Model Overview, from Allen: FWS/OBS-82/10.61 REVISED, MAY 1984

"The year-round habitat requirements of mink can be satisfied within wetland, riverine, or lacustrine cover types if sufficient vegetation or cover is present to support an adequate prey base. Although not totally restricted to wetland or wetland-associated habitats, the mink is dependent on aquatic organisms as a food source for a large portion of the year. Transient use of upland habitats may occur, particularly during the fall and winter months, when terrestrial prey plays an increasingly important role in the mink's diet. The majority of mink activity (foraging., establishment of dens, and litter rearing) occurs in close proximity to open water. This model assumes that sufficient vegetative cover must be interspersed with, or adjacent to, relatively permanent surface water to provide the maximum potential as mink habitat. It is assumed, in this model, that quality food and cover for the mink can be described by the same set of habitat characteristics. The reproductive habitat requirements of the mink are assumed to be identical to its cover habitat requirements."

The model varies depending upon the cover type, on Pine Creek Ranch we used the model for "Deciduous scrub / shrub wetland", < 405 ha.

HSI = V2 x ((V1 + V4)/2)