Iskuulpa Watershed Management Plan

**A Five-Year Plan for Protecting and Enhancing Fish and Wildlife Habitats in
the Iskuulpa Watershed**

**Confederated Tribes of the Umatilla Indian Reservation
Wildlife Program**

Bonneville Power Administration

2003

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INTRODUCTION

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) propose to protect, enhance, and mitigate wildlife and wildlife habitat and watershed resources in the Iskuulpa Watershed. The Iskuulpa Watershed Project was approved as a Columbia River Basin Wildlife Fish and Mitigation Project by the Bonneville Power Administration (BPA) and Northwest Power Planning Council (NWPPC) in 1998.

Iskuulpa will contribute towards meeting BPA's obligation to compensate for wildlife habitat losses resulting from the construction of the John Day and McNary Hydroelectric facilities on the Columbia River. By funding the enhancement and operation and maintenance of the Iskuulpa Watershed, BPA will receive credit towards their mitigation debt.

Project Location

The 24,200-acre Iskuulpa Watershed is located approximately 20 miles east of Pendleton, Oregon. The legal description of the project area is: Township 1 North, Range 35 East, all or portions of Sections 2 - 4, 11, 14, 16, 21 - 23, 26 and 28; Township 2 North, Range 35 East, all or portions of Sections 1- 3, 8 - 16, and 21 - 24; and Township 2 North, Range 36 East, portions of Section nineteen (see Project Location and Area Maps, Pages X and X).

The confluence of Iskuulpa Creek at the Umatilla River occurs at approximately River Mile (RM) 78 of the Umatilla River. The US Geological Survey Hydrologic Unit Code for Iskuulpa Watershed is 170701030301.

PURPOSE AND NEED

Purpose

The purpose of the Iskuulpa Watershed management plan update is to provide programmatic and site-specific standards and guidelines on how the Iskuulpa Watershed will be managed over the next three years. This plan provides overall guidance on both short and long term activities that will move the area towards the goals, objectives, and desired future conditions for the planning area. The plan will incorporate managed and protected wildlife and wildlife habitat, including operations and maintenance, enhancements, and access and travel management.

Need

The development of dams for hydropower, navigation, flood control, and irrigation in the Columbia River Basin resulted in widespread inundation of riparian, riverine, and upland wildlife habitats (NPPC 1994). The 1980 Power Act established and charged the Northwest Power Planning Council with the task of developing a comprehensive fish and wildlife mitigation program to protect, mitigate, and enhance fish and wildlife habitat in the Columbia Basin (Power Act 1980, Section 4 (H)(1)(A), page 12; NPPC 1994, Section 2, page 2-1). This program, initially adopted in 1982, was amended in 1984, 1987, 1991-1993, 1994, and 2000.

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Consistent with Section 1003(7) of the Power Council Fish and Wildlife Program, BPA is authorized and obligated to fund implementation of projects that will help reach the Power Council wildlife mitigation goals and objectives. The 1997 Final Environmental Impact Statement for the Wildlife Mitigation Program (Bonneville Power Administration, 1997), states as follows:

“Bonneville Power Administration (BPA) is responsible for mitigating wildlife habitat loss caused by the development of the Federal Columbia River Power System. BPA meets this responsibility by funding projects submitted to and recommended by the Northwest Power Planning Council. “

Wildlife Loss Assessments

The *Wildlife Impact Assessments for the John Day and McNary Projects* (Rasmussen and Wright, 1990a and b), provide estimated losses of 36,555 and 23,545 Habitat Units resulting from the John Day and McNary Hydroelectric facilities, respectively. Habitat losses included mainland, island, and river habitats. Mainland habitats, totaling an estimated 20,858 acres for the John Day facility and 12,898 acres for the McNary facility, consisted of shrub/steppe grassland, riparian hardwood, riparian shrub, riparian herb, emergent wetland, sand dune, sand/gravel/cobble/mud, disturbed/bare/riprap, and open water cover types. Approximately 6,708 acres of island habitats associated with the John Day facility and 2,741 acres associated with the McNary facility were impacted.

Northwest Power Planning Council Goals and Objectives

In its 2000 Program, the Northwest Power Planning Council (NPPC or Council) adopted the following vision for its Fish and Wildlife Mitigation Program:

“The vision for this program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem and providing the benefits from fish and wildlife valued by the people of the region. This ecosystem provides abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act. Wherever feasible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin. In those places where this is not feasible, other methods that are compatible with naturally reproducing fish and wildlife populations will be used. Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem. Actions taken under this program must be cost-effective and consistent with an adequate, efficient, economical and reliable electrical power supply.

This is a habitat-based program, rebuilding healthy, naturally producing fish and wildlife populations by protecting and restoring habitats and the biological systems within them, including anadromous fish migration corridors.”

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Figure 2. Project Area.

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The NPPC also established four biological objectives for the Fish and Wildlife Program. They are:

1. A Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife.
2. Mitigation across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem.
3. Sufficient populations of fish and wildlife for abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest.
4. Recovery of the fish and wildlife affected by the development and operation of the hydrosystem that are listed under the Endangered Species Act
5. With specific regards to the NPPC's commitment and obligation to mitigate for wildlife habitat losses, objectives are to:
 6. Quantify wildlife losses caused by the construction, inundation, and operation of the hydropower projects.
 7. Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses.
 8. Coordinate mitigation activities throughout the basin and with fish mitigation and restoration efforts, specifically by coordinating habitat restoration and acquisition with aquatic habitats to promote connectivity of terrestrial and aquatic areas.
 9. Maintain existing and created habitat values.
 10. Monitor and evaluate habitat and species responses to mitigation actions.

Specific project objectives are related to protection and enhancement of wildlife habitats and are expressed in terms of habitat units (HU's). Habitat units were developed in the US Fish and Wildlife Service's Habitat Evaluation Procedures (HEP) and are designed to track habitat gains and/or losses associated with mitigation and/or development projects. Habitat Units for a given species are a product of habitat quantity (expressed in acres) and habitat quality indices (H.S.I.'s). These indices are based on quantifiable habitat features such as vegetation height, cover, arrangement, or other parameters, which are known to provide life history requisites for mitigation species. Habitat Suitability Indices range from 0 to 1, with an HSI of 1 providing optimum habitat conditions for the selected species. One acre of optimum habitat provides one Habitat Unit.

The objective of continued management of the Iskuulpa Wildlife Mitigation Area, including protection and enhancement of upland and wetland/wetland associated cover types, is

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to provide and maintain 4,568 HU's of protection credit and generate 350 HU's of enhancement credit by the year 2011.

GUIDING POLICIES

Bonneville Power Administration Direction for Development and Implementation of Columbia River Basin Wildlife Mitigation Projects

The Bonneville Power Administration has set forth a standard project planning process that has been applied to this Management Plan. The process includes eight steps and requires that a given management plan addresses each step commensurate with project scale and complexity. The process is summarized as follows:

1. Define area of interest;
2. Involve stakeholders;
3. Develop statement of desired future condition;
4. Characterize historical and present site conditions and trends;
5. Establish project goals;
6. Develop and implement action plans for achieving goals;
7. Monitor conditions and evaluate results; and
8. Adapt management according to new information.

For a complete description of this process consult the Department of Energy's Wildlife Program Mitigation Program Final Environmental Impact Statement (DOE/EIS-0246) and Record of Decision (ROD, June, 1997).

Confederated Tribes of the Umatilla Indian Reservation Policy Direction

Policies guiding development of this Plan are also provided by Confederated Tribes of the Umatilla Indian Reservation. Principle guiding policies and goals and objectives related to the management of natural and cultural resources are provided by the CTUIR General Council, Board of Trustees, Fish and Wildlife Committee, Natural Resources Commission, Cultural Resources Commission, and the Department of Natural Resources Fish and Wildlife Program.

General Council and Board of Trustees

The General Council consists of Tribal members of the CTUIR over the age of eighteen. While the Board of Trustees provides formal policy direction, the General Council provides input into this plan through responses to scoping efforts conducted by the CTUIR Department of Natural Resources Fisheries and Wildlife Program.

The Board of Trustees, elected by and held accountable to the General Council, is the governing body of the Confederated Tribes of the Umatilla Indian Reservation. The Board of Trustees serves the General Council by representing the CTUIR to Federal, State, and local governments, managing the affairs of the Confederated Tribes, and developing Tribal policy and law.

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CTUIR Fish and Wildlife, Natural Resource, and Cultural Resource Commissions

Established and maintained by the Board of Trustees, the Commissions consist of five members each and implement the policies and programs of the Umatilla Indian Reservation for the management of wildlife, other natural resources, and cultural resources.

The Fish and Wildlife Committee's duties include the issuance of rules and regulations such as the establishment seasons and harvest limits for Tribal members and for Non-member sport and recreation seasons. It is empowered to engage in programs and actions that protect, promote, and enhance wildlife resources of the Tribe. For example, the Committee may adopt regulations identifying and protecting specific wildlife species and their habitat on or off the Reservation due to special considerations including but not limited to, the threat of extinction on the reservation, specific activities threatening populations, nesting areas, or special habitats.

The Cultural and Natural Resource Commissions are responsible for reviews and makes recommendations relating to the enactment, enforcement, or administration of all laws, codes, and ordinances affecting the cultural and natural resources of the Umatilla Indian Reservation.

These Commissions, particularly the Wildlife and Cultural Resources Commission, will provide reviews and necessary policy recommendations throughout the development and implementation of this plan.

Relationship of This Plan to Other Plans and Decisions

The Iskuulpa Watershed Management Plan is tiered to the CTUIR Wildlife Mitigation Plan (Childs, 1997), Power Act, Northwest Power Planning Council Fish and Wildlife Program, and BPA's Regional Programmatic Wildlife Mitigation Program Environmental Impact Statement and Record of Decision (BPA, 1997).

Common Elements and Assumptions

This section identifies major assumptions, elements, or components of applicable resource management on the Iskuulpa Watershed that will apply to all potential management strategies developed by the CTUIR and BPA. Other assumptions and elements of individual management strategies identified during the management plan development process will be more fully developed through public input and further review by the Bonneville Power Administration.

CTUIR Responsibilities and Obligations

The CTUIR is a sovereign entity with rights reserved in the Treaty of Walla Walla, 1855. These rights include, among others, the authority to co-manage wildlife and wildlife habitat in the area ceded by the CTUIR to the United States of America.

Obligations of the CTUIR in regard to ownership and management of the property is more fully described in the formal CTUIR/BPA Memorandum of Agreement for Disbursal of Wildlife Mitigation Funds and Wildlife Mitigation Crediting. In relevant part, Section 8,

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subsection A states: “The CTUIR shall protect, mitigate, and enhance the Properties acquired in fee and conservation easement Properties as wildlife habitat on behalf of BPA permanently...”

Federal and State Laws and Regulations

The overall framework for developing management strategies for the Iskuulpa Watershed is embedded in the Pacific Northwest Electric Power Planning and Conservation Act, P.L. 96-501 (Act). The Act directs BPA to protect, mitigate, and enhance fish and wildlife affected by the development and operation of federal hydroelectric projects on the Columbia River and its tributaries. Consistent with the purposes of this act, the program adopted the Pacific Northwest Electric Power and Conservation Planning Council (Council) under subsection 4(h) of the Act, and other environmental laws. BPA has authority pursuant to sections 2 (e) and (f) of the Bonneville Project Act, 16 U.S.C. 832a (e), (f) to transfer real properties to the CTUIR.

Furthermore, both Federal and State laws and regulations administered by various governmental agencies apply to the Iskuulpa Watershed. Compliance with the Federal Endangered Species Act and Cultural and Historic Properties laws including but not limited to, the Native American Graves Protection and Repatriation Act and the Archaeological Resources Protection Act, and State land use regulations all apply to the property.

Cultural Resources Protection

Section 106 of the National Historic Preservation Act requires federal agencies having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking to take into account the effect of the undertaking on any district, site, building structure, or object that is included in or eligible for inclusion in to the National Register of Historic Places.

The Native American Graves and Repatriation Act requires that federal agencies consult with Native American tribes when activities and operations encounter cultural items or when cultural items are inadvertently discovered. The Archeological Resources Protection Act prohibits the purposeful excavation and removal of archeological resources on federal land without a permit from the federal land manager. The American Indian Religious Freedom Act requires federal agencies to protect the integrity of Native American religions on lands under federal jurisdiction.

For all wildlife mitigation projects, cultural resource management planning will be integrated with wildlife management plans as a means of avoiding impacts to cultural and historic resources. Cultural/historic resource surveys shall be completed by the CTUIR Cultural Resources Program before ground-disturbing activities are undertaken. Sites identified during the survey which are on or eligible for the National Register will be protected. Under Section 106 of the National Historic Preservation Act, BPA is responsible for funding all necessary activities associated with protection of cultural resources.

Threatened, Endangered, and Sensitive Species

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In 1994, The NPPC Fish and Wildlife Program identified the principle to “*Protect high quality native or other habitat or species of special concern, whether at the project site or not, including endangered, threatened, and/or sensitive species.*” The Iskuulpa Watershed provides habitats that meet part or all of the life history needs of both federal endangered and threatened species and State of Oregon Sensitive Species.

The northern bald eagle (*Haliaeetus leucocephalus*) (Threatened), the only federally listed species known to occur in Iskuulpa, utilizes the area as feeding habitat during winter and migration periods. Other federally listed species occur in the general area, but are not known to use Iskuulpa. These include the endangered gray wolf (*Canis lupus*), the threatened Canada lynx (*Lynx canadensis*), and the candidate species yellow-billed cuckoo (*Coccyzus americanus*), Columbia spotted frog (*Rana luteiventris*), and Washington ground squirrel (*Spermophilus washingtoni*).

The threatened Middle Columbia River Steelhead (*Oncorhynchus mykiss*) and Columbia River bull trout (*Salvelinus confluentus*) are known from Iskuulpa Creek. Bull trout sightings are rare, but steelhead are the most abundant fish in the creek.

The state of Oregon maintains a sensitive species, with species occurrence listed by county. A list of state sensitive species in Umatilla County is shown in Table 1.

Table 1. Umatilla County species on Oregon sensitive species list.

Sensitive Species	State Status	Occurrence on Iskuulpa
Pacific Lamprey (<i>Lampetra tridentate</i>)	Vulnerable	Occurs
Western Toad (<i>Bufo boreas</i>)	Vulnerable	Unknown
Woodhouse's Toad (<i>bufo woodhousii</i>)	Vulnerable	Unknown
Northern Goshawk (<i>Accipiter gentillis</i>)	Critical	Occurs
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	Vulnerable	Occurs
Ferruginous Hawk (<i>Buteo regalis</i>)	Critical	Unknown
Swainson's Hawk (<i>Buteo swainsoni</i>)	Vulnerable	Unknown
Lewis's Woodpecker (<i>Melanerpes lewis</i>)	Critical	Unknown
Flammulated Owl (<i>Otus flammeolus</i>)	Critical	Unknown
White-headed Woodpecker (<i>Picoides alvolarvatus</i>)	Critical	Unknown
American three-toed Woodpecker (<i>Picoides dorsalis</i>)	Critical	Unknown
Western Bluebird (<i>Sialia mexicana</i>)	Vulnerable	Occurs
Great Gray Owl (<i>Strix nebulosa</i>)	Vulnerable	Unknown. Known from USFS nearby
Pallid Bat (<i>Antrozous pallidus</i>)	Vulnerable	Unknown
Townsend's Big-eared Bat (<i>Corynorhinus townsendii</i>)	Critical	Unknown
American Marten (<i>Martes americana</i>)	Vulnerable	Unknown

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Fisher (<i>Martes pennanti</i>)	Critical	Unknown
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“Critical” species are those for which listing as threatened or endangered is pending, or for which listing as threatened or endangered may be appropriate if immediate conservation actions are not taken. “Vulnerable” species are those for which listing as threatened or endangered is not believed to be imminent and can be avoided through continued or expanded protective measures and monitoring.

Wetland Protection

The Iskuulpa Watershed Land Use and Wildlife Management Plan will adhere to State and Federal regulations for all activities in or near wetlands, whether for maintenance or improvement, including: 1) Clean Water Act, Section 404; 2) Protection of Wetlands, Executive Order 11990.

Public Access

The CTUIR/BPA MOA states that: “the general public shall have reasonable access to the Properties. The CTUIR may regulate access consistent with its laws, customs, and management plan objectives, provided that road and trail access and transportation restrictions shall apply equally to tribal members and non-tribal members. Nothing in this Agreement limits the right or ability of the CTUIR to manage the Properties to preserve and protect cultural, historic, and religious sites.”

Federal law protects treaty rights of members of the CTUIR. The MOA also recognizes in Section 12 that: “Hunting, gathering, and Tribal cultural and religious activities on the Properties according to Tribal custom and law are not prohibited by this Agreement. Nothing in this Agreement shall be construed to limit or diminish any right or privilege of the CTUIR or its members provided by Federal law.”

PLAN ORGANIZATION

The remaining sections of this management plan are organized as follows: 1) Key Issues, 2) Affected Environment, including existing conditions and desired future conditions; 3) Proposed Management Activities, including enhancements, operations and maintenance, and access and travel management; 4) Monitoring and Evaluation, including biological, habitat, and access and travel management compliance, 5) Five Year Action Plan with accompanying budget.

KEY ISSUES

IDENTIFICATION OF KEY ISSUES

The purpose of this section is to focus the analysis on key elements relevant to the resource conditions, management goals and objectives, and values of the Iskuulpa Watershed. The NPPC Fish and Wildlife Program planning assumptions, over-arching objectives, and scientific principles served as a framework for issue development.

Planning Assumptions:

- There is an obligation to provide fish and wildlife mitigation where habitat has been permanently lost due to hydroelectric development;
- This is a habitat-based program, rebuilding healthy, naturally producing fish and wildlife populations by protecting, mitigating, and restoring habitats and the biological systems within them; and
- Management actions must be taken in an adaptive, experimental manner because ecosystems are inherently variable and highly complex. This includes using experimental designs and techniques as part of management actions, and integrating monitoring and research with those management actions to evaluate their effects on the ecosystem.

Issues were also included or modified as a result of CTUIR Policy direction and formal solicitation of input through the scoping document as described in “Coordination and Public Involvement.” Four issues were subsequently incorporated into this plan for evaluation and development of management proposals. Considerations for issue prioritization included:

- The purpose and need of this management plan and;
- public values and uses.

Following are the four key issues utilized to develop and/or modify proposed management activities:

Crediting Habitat Units to BPA

The Iskuulpa Watershed Project includes three classes of land ownership; 1) fee lands, 2) CTUIR Tribal Trust lands, and 3) CTUIR-member allotments. The Iskuulpa Watershed Project has emphasized two strategies for acquiring, protecting, and enhancing habitat, including fee acquisitions and leasing Bureau of Indian Affairs-administered grazing allotments and resting them from livestock use. The 1997 Memorandum of Agreement between BPA and the CTUIR differentiates how BPA receives mitigation credit for acquired and leased lands. For fee lands acquired through the NPPC’s Fish and Wildlife Mitigation Program, BPA receives full credit for acquisition, protection and enhancement. For leased lands (e.g. grazing leases), the CTUIR/BPA MOA states as follows:

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“G. For Squaw Creek leases, BPA shall receive full credit for protecting HU’s (habitat units) of rangeland species affected by grazing, and full credit for habitat improvements to all habitats in the leased area. For all other non-Interim Agreement leases, BPA shall receive full credit for improvement HU’s. If an acre by acre crediting method is used, BPA shall receive 1 acre of credit for every 3 acres of improvements when the activities needed to bring about the improvements are complete.”

Species with habitat parameters affected by grazing include western meadowlark, yellow warbler, mink, and blue grouse and crediting for the benefits of acquiring grazing leases will be restricted to these species. Parameters addressed in habitat models for the great blue heron, downy woodpecker, and black-capped chickadee are focused primarily on the structure and/or arrangement of tree stands, and are not therefore directly affected by livestock grazing. A map of landownership and credited lands is displayed in Figure 3.

The management objective is to enhance habitats and provide approximately 350 units of enhancement credits in 10 years. Protection and enhancement HU’s generated by this project contribute towards the 1994 Columbia Basin Fish and Wildlife Program goal of fully mitigating for wildlife losses from hydropower in the Columbia River Basin (11.1)

Issue 1: Wildlife and Wildlife Habitat Mitigation

The Iskuulpa Watershed Project was developed by the BPA and CTUIR to offset habitat losses related to the John Day and McNary hydroelectric projects. As part of the agreement between the CTUIR and BPA, BPA will receive credit against the losses for protecting and enhancing habitat values at Iskuulpa. The amount of credit BPA receives for a given project is determined through the use of a habitat assessment methodology and accounting tool referred to as the Habitat Evaluation Procedures (HEP), as developed by the US Fish and Wildlife Service.

Issue 2: Plant Community Changes

Plant communities in the Iskuulpa Watershed have been reduced in structural and species diversity due to prior livestock grazing, timber harvest, disruption of natural fire regimes, and the invasion of noxious weeds and competing and unwanted vegetation.

The NWPPC, in its Program scientific principles, recognizes the value of restoring and maintaining diversity. In their current simplified state, plant communities in Iskuulpa Watershed do not address the NPPC goals of promoting regional/landscape biodiversity and protecting natural ecosystems and species diversity. Additionally, these simplified communities are producing less than their potential in terms of habitat value and units.

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Figure 3. Land Ownership and Credited Lands in the Iskuulpa Watershed Project.

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Issue 3: Threatened, Endangered, and Sensitive Species

The following species are federally listed endangered (E) and threatened (T) and candidate (C) species for Umatilla County, Oregon:

Steelhead, *Oncorhynchus mykiss*, (T)
Bull trout, *Salvelinus confluentus*, (T)
Gray wolf, *Canis lupis*, (T)
Canada lynx, *Felis lynx canadensis*, (T)
Bald eagle, *Haliaeetus leucocephalus*, (T)
Washington Ground Squirrel, *Spermophilus washingtoni* (C)
Columbia Spotted Frog, *Rana luteiventris* (C)

Steelhead

NMFS listed summer Middle Columbia River Ecologically Significant Unit (ESU) steelhead (*Oncorhynchus mykiss*) in 1999. Summer steelhead spawning and rearing occurs throughout Iskuulpa Creek. Since 1994 a 6.7 mile index reach of Iskuulpa Creek has been surveyed three times annually by CTUIR Fisheries personnel. A graph of the survey results is presented in Figure 4. Since 2001, 64.8% (35 of 54) of the observed adult summer steelhead in Iskuulpa Creek were wild fish.

Figure 4.

In 1994, approximately 10 miles of fish habitat and population surveys were completed in Iskuulpa Creek by CTUIR Wildlife Technicians. The population sampling consisted of electro-fishing 189 habitat units. Habitat units were defined as relatively homogeneous lengths

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of stream classified by channel bedform, water surface slope, and flow characteristics (i.e. pools, riffles, glides, and other). Results for sampled units were extrapolated to the 1,443 habitat units surveyed. In the 189 sampled units, 3,464 natural rainbow/steelhead (96.9%), 105 re-introduced chinook (2.9%), and 5 re-introduced coho (0.2%) were captured. The expanded population estimate was 37,611 total salmonids

Bull trout: The U.S. Fish and Wildlife Service (USFWS) listed bull trout as Threatened in 1998. Cold-water habitat is considered essential for this species. CTUIR Fisheries staff have recorded observations of bull trout in Iskuulpa Creek as shown in Table 2. Bull trout use of Iskuulpa Creek is thought to be limited due to high summer temperatures (measured as high as 80.2 Fahrenheit), low summer baseflows (measured at less than 1 cubic foot per second), and extensive channel de-watering that occurs. Population sampling results as displayed above support the position that bull trout abundance in Iskuulpa is extremely limited.

Table 2. Bull trout observations in Iskuulpa Creek.

Observation Date	Observation Method	Reach	Approximate River Mile
10/26/92	Electro-fished	2	0.5
6/8/94	Pipe Trap	2	0.6
6/21/94	Visual	2	.75
7/12/94	Visual	3	6.6

Gray Wolf: Historic range for the gray wolf overlaps the project area, but no confirmed records of gray wolf exist for the project area. The success of gray wolf re-introduction programs in Idaho has, however, resulted in a multitude of gray wolf sightings in northeastern Oregon in recent years. Adequate sources of big game are important for this carnivore, and the Umatilla Basin provides habitat for Rocky Mountain Elk, mule deer, and white-tailed deer. The project area provide year-round range for mule and white-tailed deer, and primarily winter range for Rocky Mountain elk, who generally prefer to summer at higher elevations. Suitable habitat is present, and adequate prey densities are likely suitable on a seasonal (primarily winter) basis. Additionally, riparian areas are natural and likely corridors for animal movement and dispersal.

Canada lynx: Suitable habitats for this species include boreal forests ranging from 4,900 – 6,500-feet in elevation. Watershed elevations range up to 4,200 feet in Iskuulpa. Riparian areas are again natural and likely corridors for animal movement and dispersal, and forest habitats occur throughout the watershed.

Bald eagle: There are no documented nests or of bald eagles within the project area or Umatilla Indian Reservation bounds. Winter migrants are observed on an annual basis using the Umatilla River corridor and associated hillslopes between December and March, with highest sighting frequencies generally occurring in February. Availability of winter carrion influences use of hillslopes and upland habitats.

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Washington ground squirrel: The Washington Ground Squirrel is currently designated as a candidate species. Washington ground squirrels are found within the shrub-steppe habitat of the Columbia Basin, and recent studies indicate silty loam soils, particularly Warden soils, are important to the species (Rickart and Yensen, 1991; Betts 1999). Habitat for the species was inventoried for the Umatilla and Willow Creek Basin Assessment for Shrub Steppe Grasslands (Kagan, Morgan, and Blakely, 2000), and no ground squirrels or suitable habitat were identified for the Iskuulpa Watershed.

Columbia Spotted Frog: Spotted frogs may occur in areas up to 9,850 feet in elevation. They are highly aquatic, and are generally associated with cool, permanent water sources such as slow moving streams, rivers, marshes, springs, pools, and the margins of small lakes, usually with abundant aquatic vegetation. Spotted frogs prefer areas with thick algae and emergent vegetation, but may disperse into forests, grasslands, and shrublands. Breeding occurs from March to April in lower elevations, and May to June in higher elevations. Columbia spotted frogs lay their eggs in shallows of a permanent water source. Eggs are deposited in spherical clusters which are allowed to float freely. There are no records of Columbia spotted frogs in the project area, but suitable habitat likely exists in riparian zones, particularly where springs provide consistent water sources with suitable temperatures.

Issue 4: Public Use/Access and Travel Management

In the Draft Fish and Wildlife Program, the NPPC identified and adopted the following principle:

***Principle 8. Ecosystem function, habitat structure and biological performance are affected by human actions.** As humans, we often view ourselves as separate and distinct from the natural world. However, we are integral parts of ecosystems. Our actions have a pervasive impact on the structure and function of ecosystems, while at the same time, our health and well being are tied to these conditions. These actions must be managed in ways that protect and restore ecosystem structures and conditions necessary for the survival and recovery of fish and wildlife in the basin. Success depends on the extent to which we choose to control our impacts so as to balance the various services potentially provided by the Columbia River Basin.*

Additionally, the CTUIR/BPA Memorandum of Agreement (MOA) between the states that the general public will have reasonable access to the Wildlife Area.

The issue therefore becomes a question of how we balance human uses of the Iskuulpa Watershed with the need to provide secure habitats that address the purpose and need of this plan.

The term “access and travel management” refers to the means by which members of the public travel the Project Area to enjoy permitted uses. Different types of use and access have the potential to result in varying effects and intensities of effects on wildlife and their habitat. Access

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and travel management includes consideration for both motorized and non-motorized transportation, and their compatibility with the primary purpose of the wildlife area.

Motorized vehicle use generates audio and visual disturbance that can reduce use of habitats by wildlife. Motor vehicle use can cause erosion and bare soil conditions that result in physical damage to existing plant communities, create sites for the establishment of noxious weeds and competing and unwanted vegetation. In streams, road crossings are typically located at pool tail-outs, where Threatened summers steelhead spawning is common. Motor vehicles can therefore disturb adult steelhead off redds, or impact redds by compacting the substrate and causing egg or fry mortality. Motor vehicle use also increases the potential for accidental fire starts.

Road closures are an effective method for protecting wildlife and wildlife habitat, preventing physical degradation of habitat and reducing audio/visual disturbance. This is particularly important during critical periods such as nesting.

Affected Environment

Existing watershed conditions are a product of physical and biological watershed components and anthropogenic influences (human management activities). This section will present physical characteristics of the watershed including location, climate, temperature and precipitation, topography, soils, hydrology, fire-occurrence rates, important anthropogenic influences, and existing, selected biological aspects of the watershed. Biological components will include vegetation communities and selected fish and wildlife species. Desired future conditions for biological aspects will also be presented.

PROJECT LOCATION

The Iskuulpa Watershed Project area is located approximately 20 miles east of Pendleton, Oregon. The legal description of the project area is: Township 1 North, Range 35 East, all or portions of Sections 2 - 4, 11, 14, 16, 21 - 23, 26 and 28; Township 2 North, Range 35 East, all or portions of Sections 1- 3, 8 - 16, and 21 - 24; and Township 2 North, Range 36 East, portions of Section nineteen (see Project Location and Area Maps, Figures 1 and 2).

The confluence of Iskuulpa Creek at the Umatilla River occurs at approximately River Mile (RM) 78 of the Umatilla River. The US Geological Survey Hydrologic Unit Code for Iskuulpa Watershed is 17070103.

CLIMATE

The following climate description is excerpted from *Plant Associations of the Blue and Ochoco Mountains* (Johnson and Clausnitzer, 1992).

“The relief of the Blue Mountains creates several localized climatic affects. The diversity of landscapes between mountain ranges, rolling topography and deep, dissected canyons influences local climatic patterns. The major influence to the regional climate is provided by the Cascade Mountains lying nearly 200 miles to the west. This mountain range forms a barrier against potential modifying effects of warm, moist fronts emanating out of the Pacific Ocean. As a result, the overall climate of the Blue Mountains is labeled Temperate Continental – cool summer phase (Trewartha, 1968). Mean temperature is less than 72 degrees F in the warmest month and 50 F for more than 3 months. Light precipitation, low relative humidity, rapid evaporation, abundant sunshine, and wide temperature and precipitation fluctuations are characteristic of this climate.

A break in the Cascadian barrier is provided by the Columbia River Gorge. This topographic feature and the associated Columbia River provide an opportunity for marine climatic conditions to reach the northern Blue Mountains and strongly influence the vegetation. This climate is labeled Temperate Oceanic (Trewartha, 1968) and differs significantly from the Temperate Continental climate in providing greater cloudiness, increased precipitation and higher relative humidities with less fluctuation in winter temperatures. The oceanic influence provides the environment for vegetation more common to the western Cascades to occupy portions of the northern and northwestern

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Blue Mountains. Examples of this vegetation are grand fir/sword fern-ginger, grand fir/oak fern and grand fir/false bugbane.

The high percentage of cloud days attributed to the temperate Oceanic climate, versus the high percentage of clear, winter days and nights of Temperate Continental climates, has dramatically influenced the kind of vegetation found in the northern Blue Mountains. Daubenmire (1956) determined that the oceanic climate promoted the grasslands and rhizomatous shrublands characteristically found in the foothills, slopes and ridgetops of the Blue Mountains adjacent to the Palouse. The continental climate, on the other hand, promotes sagebrush and juniper so commonly found in the Great Basin to the south of the Blue and Ochoco Mountains”

The majority of annual precipitation falls as snow during winter. Late summer and early autumn provide the area with convectional storms resulting from masses of cool air crossing the Cascades and passing over the Blue and Ochoco Mountains at high elevations. The hot, dry surface air violently mixes with this cool, moist upper air mass to provided lightening storms. These events have provided a cyclic, annual abundance of natural fires. The fires historically burned extensively and provided the renovating and rejuvenating force behind the development and composition of Blue Mountain and Ochoco Mountain vegetation. “

TEMPERATURE AND PRECIPITATION

Temperature and precipitation records are available from two point sources near the project area. Data was recorded at Meacham, Oregon, located approximately 2 miles southeast of the watershed, for the period 1951-75. These records represent temperature and precipitation conditions in the upper portion of the study area (elevations > 3,800 feet), while lower elevations may be more closely represented by data collected at Pendleton, Oregon, approximately 20 miles to the west. Obviously a continuum of precipitation levels would occur along the elevational gradient, but the best available information is provided by these two points.

At Meacham, the average winter temperature for the period was 29 F, with an average daily minimum of 23 F, and an average daily maximum of 73 F. Lowest temperatures occur in January, and the highest temperatures in August. The total annual precipitation for the period was 33 inches, with 30 percent measured between April and September. The average seasonal snowfall was 146 inches.

At Pendleton, the average winter temperature for the period 1951-1981 was 36 F, with an average daily minimum of 29 F, and an average daily maximum of 71 F. Lowest temperatures occur in January, and the highest temperatures in August. The total annual precipitation at Pendleton for the period was 12 inches, with 30 percent measured between April and September. The average seasonal snowfall was 18 inches.

TOPOGRAPHY

The project is located on the west slope of the Blue Mountains within the Umatilla River Subbasin. The Iskuulpa Watershed orientation is from south to north. Elevations within the

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project area range from approximately 1,660 feet at its confluence with the Umatilla River to approximately 4,200 feet on Gibbon Ridge. Slopes are generally moderate to steep (Table 3).

Table 3. Slope Classes for the Iskuulpa Watershed.

Slope Class (%)	Percent of Watershed
< 5	8.1
6 - 24	53.9
> 25	38.0
Total	100.0

Topography of the Iskuulpa Watershed is typical of the Blue Mountain foothills, with broad flat ridges dissected by steep canyons with a variety of aspects. Aspect classes are distributed in the watershed as shown in Table 4.

Table 4. Aspect Classes for the Iskuulpa Watershed.

Aspect Class	Aspect Degrees	Percent of Watershed
N	337.6 – 22.5	10.3
NE	22.6 – 67.5	15.4
E	67.6 – 112.5	12.8
SE	112.6 – 157.5	10.7
S	157.6 – 202.5	8.1
SW	202.6 – 247.5	14.8
W	247.6 – 292.5	13.8
NW	292.6 – 337.5	13.2
Flat		.8
Total		100.0

Aspect and elevation are important physical facts as they combine to provide similar or compensating environmental factors (temperature and moisture) that contribute to site productivity and the suitability of a site for a given plant community. As a combination of these factors is repeated across the landscape, a predictable plant community will occupy those sites given time and varying frequencies of disturbance (Johnson and Clausnitzer 1992).

SOILS

The following soil description is excerpted from *Plant Associations of the Blue and Ochoco Mountains* (Johnson and Clausnitzer, 1992).

Soils of the Blue Mountains are quite variable and may range from those on thin, rocky, low-productivity ridgetops to deep ash accumulations in very productive forested sites. Soil differences result from variations in climate, topography, parent material,

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vegetation, and time. Perhaps the greatest influence on Blue Mountain soils has come from ash deposited primarily from Mt. Mazama and Glacier Peak approximately 6,000 and 12,000 years ago respectively (Fryxell, 1965). Perhaps of equal impact, especially in the dissected basalt plateau, has been the deposition of loess from central Washington. Continued weathering of basalts and other rock types has resulted in a mixing of wind-borne ash and loess with rocky colluvium in many areas. Consequently, soils fall under one of the following broad categories:

- 1. Residual – derived in place from predominately bedrock or colluvial rock materials.*
- 2. Ash-Loess – derived from deposited and accumulated ash and/or loess over older buried soil material.*
- 3. Mixed – derived from colluvium, ash and/or loess mixed well in surface layers over older buried soil material (Johnson and Simon, 1987).*

Of the varied geologic material available for soil formation, basalt and andesite are the most common in the Blue Mountains (Johnson and Clausnitzer, 1994). Residual soils formed from these material differ from the volcanic ash and loessial soils in several respects: 1) finer textured in the upper profile, 2) increased structure, 3) higher coarse fragments, 4) lower water-holding capacity, and 5) higher bulk densities. Other materials may provide locally important substrates that impart characteristic attributes to soils.

In the Blue Mountains, the productivity or expression of plant communities is closely related to ash and loess content in soils (Johnson and Clausnitzer, 1994). Ash soils possess properties of 1) high water holding capacity, 2) high water infiltration rates, 3) low compactability, 4) high detachability, and 5) high amounts of nutrients in upper surface layers. Under undisturbed conditions, these soils support good vegetative cover which protects the ash from erosion (USDA, 1985).

Other soil properties that appear important to plant community distribution and productivity include rock fragment content, depth of surface soil material, rooting depth, and presence of clay concentrations. All of these properties have some influence on water holding capacity which is especially critical where summer precipitation is often limited. Rock fragments of all sizes detract from the total soil volume and can substantially reduce the water storage capacity of soils. Rock fragment sizes affect the movement of water through the soil. Size and percentage of rock fragments can be used as indicators of dryness of sites. Total soil depth may be misleading when determining productivity differences between sites because soil water and nutrients are held most abundantly in only upper portions of the soil. Depth of surface soil material and rooting depth are used to indicate this zone of more available soil and water. Rooting beyond these levels into subsurface water sources is also indicated in some types. The last property to demonstrate soil moisture capability is clay content. Clay layers tend to hold large quantities of water, although some of this water may be unavailable to plants. On otherwise rocky, dry soils, clay may ameliorate site conditions making it possible for less drought tolerant plants and communities to exist.

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Loess also provides many important qualities to soils. Loessial deposits are usually 1) high in base saturation (can hold a large amount of nutrients), 2) have a high content of weathered minerals and thus are high in nutrient reserve, and 3) generally have excellent physical properties.

Soils mapped in the Iskuulpa subbasin are highly variable, reflecting both parent material and soil development. Upland soils have formed over dissected basalt and andesitic bedrock, and tend to be shallow on steep slopes and moderately deep to deep on benches and flats of uplands. Riparian flood plain soils are formed in deep alluvium and colluvium. Ash is a major component of all soils and is most apparent in deeper soils of forested areas.

Soil complexes mapped for the subbasin include Waha-Rockly and Albee-Bocker-Anatone, as well Tolo-Klicker Association and Umatilla-Kahler-Gwin Associations, which are described in greater detail in Appendix E.

Soils characteristics interact with other environmental factors (aspect, slope position, and precipitation) to define the distributional limits of plant communities and their individual species (Johnson and Clausnitzer, 1986).

HYDROLOGY

Within its elevation range, the main hydrologic influence for the Iskuulpa Watershed is rainfall with a chance of large flow events due to rain-on-snow in the upper elevations. The combination of relatively shallow soils, a perpendicular orientation to storm front movement, and the elongated, trellis flow pattern can result in erratic fluctuations in stream flow.

Streamflow Regime

Stream flow exerts a strong influence on channel morphology, aquatic habitat, and riparian vegetation. Iskuulpa Creek possesses a perennial flow regime with variations in streamflow dominated primarily by snowmelt run-off. Iskuulpa's larger tributaries, Little Iskuulpa and Bachelor Canyon, possess intermittent regimes. All three streams have segments of subsurface flow. In mainstem Iskuulpa, the greatest number of subsurface flow segments occurs in Reach 5.

A US Geological Survey stream-flow gauging station was installed at RM 2 in Iskuulpa Creek in 1998. Data for water discharge for the 1999 - 2001 water years (October 1 – September 30) is available for the 32.6 square miles of drainage area located above the gauging station (Table 5).

Regression equations based on other gauging stations in the vicinity have been utilized to estimate flow discharge for specific return intervals on Iskuulpa Creek. The most reliable of these equations are published in *Magnitude and Frequency of Floods in Eastern Oregon* (Harris and Hubbard, 1983). The equations used to calculate the return flow discharges shown in Table 6 are for the North Central Region of Eastern Oregon and include data from 43 gauging stations. The stations range from areas southeast of Bend, Oregon to Hood River, Oregon and over to

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Walla Walla, Washington. The large area of coverage and the variability in the stream types and flow regimes explains the high range of error for calculated flow estimates.

Table 5. Water Discharge Data for the Iskuulpa Gaging Station 14020520.

Summary Statistics	1999	2000	2001	2002	Mean
Annual Mean (cfs)	33.3	35.5	19.0		29.3
Highest Daily Mean (cfs)	830	285	132		415.7
Lowest Daily Mean (cfs)	.89	.91	.86		.89
10-Day Minimum (cfs)	.96	.94	.92		.94
Annual Runoff (Acre/Feet)	24,140	25,750	13,760		21,216.7
Annual Runoff (inches)	13.89	24.81	7.9		15.5

Table 6. Flow discharge calculations for Squaw Creek.

Return Interval	Discharge (cfs)	Standard Error			Range of Error	
		Log Units	%+	%-		
2-year	147.14	0.342	120	55	323.70	66.21
5-year	344.40	0.279	90	47	654.35	182.53
10-year	503.26	0.281	91	48	961.23	261.70
25-year	781.65	0.293	96	49	1532.03	398.64
50-year	1005.00	0.315	107	52	2080.34	482.40
100-year	1321.48	0.34	119	54	2894.04	607.88

Experience in the Umatilla River basin has shown that calculated discharges are significantly lower than actual discharge. Analyzing data collected for 64 years from the Umatilla River above Meacham Creek near Gibbon, Oregon produced a 100-year return interval discharge of 5880 cfs. Using USGS regression equations, a calculated 100-year flow event for the same site is 3677 cfs. The actual flow at this site was a 60% positive error from the calculated value. Actual discharges in Squaw Creek may be closer to the upper limit of the error range shown in Table 5 for each return interval; applying a positive error of 60% yields a discharge of 2,113 CFS.

WATER QUALITY

Water quality data is somewhat limited for the Squaw Creek. Water temperature data are available from thermographs deployed annually at River Miles 2 and 9. Temperature data from 2002 provide an indication of diurnal fluctuations in temperature in Iskuulpa Creek (Figures 5 and 6).

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Figure 5. 2002 Temperature Data for River Mile 2.0, Iskuulpa Creek.

Figure 6. 2002 Temperature Data for River Mile 9.0, Iskuulpa Creek.

STREAM MORPHOLOGY

Fish habitat surveys conducted in 1984 provide surrogate information for developing a preliminary morphological description of the mainstem of Iskuulpa Creek. Approximately 11.8 stream miles of the mainstem were surveyed. The morphological description summary is based on the Rosgen (1996) stream classification, and is intended to be useful in identifying areas of sediment supply, stream reaches sensitive to disturbance, potential channel response to changes in flow regime, fish habitat potential, and potential for natural recovery (Rosgen, 1996). General characteristics of Rosgen stream-types likely occurring in Iskuulpa Creek are summarized in Table 7. Figure 7 contains a map of stream reach breaks in Iskuulpa Creek.

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Table 7. Stream Type Management Interpretations (Rosgen 1996).

Stream Type	Sensitivity to increases in: 1) streamflow magnitude, 2) streamflow timing, 3) sediment.	Recovery Potential	Sediment Supply	Streambank Erosion Potential	Vegetation Controlling Influence
A3	Very High	Very Poor	Very High	Low	Negligible
A4	Extreme	Very Poor	Very High	Low	Negligible
A5	Extreme	Very Poor	Very High	Moderate	Negligible
A6	High	Poor	High	Low	Negligible
B3	Low	Excellent	Low	Low	Moderate
B4	Moderate	Excellent	Moderate	Low	Moderate
C4	Very High	Good	High	Very high	Very high

*Reach 3 contains a transition from the B-Type to C-Type. The original reach breaks in the habitat survey were not based the Rosgen classification system.

A-Stream Type: Numerous, non-fish-bearing tributaries contributing to the trellis pattern of Iskuulpa Watershed are typically A-type channels. These types are generally ephemeral, flowing only in response to precipitation, or intermittent, flowing seasonally or sporadically. A-type channels are characterized as entrenched channels with low width/depth ratios, low sinuosity, and steep slopes generally ranging from 4 – 10%, and sometimes exceeding 10%. In the Iskuulpa watershed, the dominant materials in A-type channels may include cobble, gravel, or residual soils for the A3, A4, and A5-Types. These types may provide relatively high sediment supply.

B-Stream Type: The “B” stream as described by Rosgen (1996) exists on moderately steep to gently sloped terrain, with the predominant landform seen as a narrow and moderately sloping basin. These types are moderately entrenched, have low channel sinuosity, and exhibit a “rapids”-dominated bed morphology. Bedform morphology, which may be influenced by debris constriction and local confinement, typically produces scour pools (pocket water) and characteristic rapids. Streambank erosion rates are normally low, as are rates of channel aggregation and degradation. Pool-to-pool spacing generally decreases with slope increases.

Reach 3, which includes a transition between channel types, includes what might best be categorized as a B4 channel, which includes moderately entrenched systems in narrow, moderately steep, colluvial valleys, with gravel-dominated channel materials, and width/depth ratios greater than 12. This type is considered to be relatively stable and is not a high sediment supply stream. Large, woody, debris is an important component for fisheries habitat when available.

Based on the dominance of the channel material by cobble, these reaches might be categorized as B3 stream types. Channel bed morphology in these types is dominated by cobble materials and characterized by a series of rapids with irregular spaced scour pools. The average pool-to-pool spacing for this type is 3-4 bank-full widths. Pool-to-pool spacing is generally 4-5 bank-full channel widths. Pool to pool spacing adjusts inversely to gradient. This type has a moderate width/depth ratio and sinuosity greater than 1.2. Channel materials are composed primarily of cobble with a few boulders, lesser amounts of gravel and sand. The bed and bank

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Figure 7. Stream Reach Breaks in Iskuulpa Creek

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materials are stable and contribute only small quantities of sediment during run-off events. Large woody debris is an important component of fisheries habitat in these stream types.

C-Stream Type: These types are located in narrow to wide valleys, constructed from alluvial deposition. They have a well-developed floodplain (slightly entrenched), are relatively sinuous with a channel slope of 2% or less, and a bed-form morphology indicative of a riffle/pool configuration. Primary features of this type are a sinuous, low-relief channel, well-developed floodplains built by the river, and point bars within the active channel. Channel aggradation/degradation and lateral extension processes are dependent on the stability of streambanks, upstream watershed conditions, and flow and sediment regime. Channels of this type can be significantly altered and rapidly de-stabilized when the effects of imposed changes in bank stability, watershed condition, or flow regime combine to cause an exceedence of a channel stability threshold.

The valley bottom below the confluence of Iskuulpa and Little Iskuulpa is composed of a deep layer of alluvial material that was moved from the upper watershed and tributaries. Depositional processes through this stream reach are influenced by a combination of roughness elements in the stream and gradient changes. The removal or addition of large material within the active floodplain greatly influences the spatial and temporal distribution of fluvial sediments.

Due to their high width/depth ratios, dominance of gravel as channel material, and low slopes, Reaches 1 and 2 might best be preliminarily categorized as a C4 stream type. Rosgen (1996) describes these types as follows:

These types have gentle gradients of less than 2%, a high width-depth ratio, and generally possess higher meander width ratio than C1, C2, C3 stream types. Streambanks are generally composed of unconsolidated, heterogeneous, non-cohesive, alluvial materials that are finer than the gravel-dominated bed material. Consequently, the stream is susceptible to accelerated bank erosion. Rates of lateral adjustment are influenced by the presence and condition of riparian vegetation. Sediment supply is moderate to high, unless stream banks are in a very low erodibility condition. This type, characterized by point bars and other depositional features, is very susceptible to shifts in both lateral and vertical stability caused by direct channel disturbance and changes in flow and sediment regimes of the contributing watershed.

Tributary Streams: Major tributaries, including Bachelor Canyon Creek and Little Iskuulpa Creek were not surveyed, but would probably best be categorized as B3 types, as they are located in narrow, moderately steep valleys, cobble-dominated channel materials with lesser amounts of boulder, gravel, and sand. The streambanks of these tributaries are also stable due to their coarse material.

Morphological attributes of surveyed stream reached of Iskuulpa Creek are summarized in the Table 8.

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Table 8. Summary of Morphological Attributes of Mainstem Iskuulpa Creek.

Attribute	Reach* 1	Reach 2	Reach 3	Reach 4	Reach 5
Segment Length (Mi)	.43	4.45	2.21	1.27	3.45
Width/Depth Ratio	78.4	26	30.8	25	31.4
Sinuosity	>1.2	>1.2	>1.2	>1.2	>1.2
Slope	.013	.012	.012	.013	.013
Pools/mile	46.5	62.9	42.5	44.1	32.2
% Area Pools	29.6	36.5	26.4	25.8	13.9
% Area Dry Units	0	2.3	0.4	1.7	35.5
Channel Material					
Bedrock	0	3.0	1.0	6.0	3.0
Boulders	.01	.01	4.0	10.0	9.0
Cobble	23.0	23.0	39.0	42.0	73.0
Gravel	60.0	60.0	46.0	37.0	39.0
Sand	12.0	12.0	9.0	6.0	5.0
Silt/clay	5.0	3.0	1.0	0.0	1.0
Rosgen Classification	C	C	C/B	B	B

*Reaches identified in course of fish habitat surveys.

FLOODPLAIN AND RIPARIAN CHARACTERISTICS

Floodplains interact with streamflow to influence both and near-stream (riparian) and instream habitat characteristics. The availability of floodplains to stream flow and the conditions of their plant communities are important for providing and maintaining diverse aquatic and riparian habitat characteristics.

Floodplain Connectivity

A road parallels Iskuulpa Creek for nearly 12 miles of the surveyed length. The first three miles are gravel-surfaced and the remaining 9 miles is native surface. The first three miles of road serves several residences and slightly constrains stream-flow movement towards the eastern side of the stream. The remaining 9 miles contains multiple stream-crossings, are capable of channelizing stream flow during flood events, and contributes to sediment production and delivery to streams. The road intercepts spring-flow at numerous points throughout its length.

Floodplain Forest and Large Woody Debris

Past harvest resulted in reductions in floodplain forest basal area, near-term large wood sources, and down large wood, effectively reducing the rate and frequency of large wood recruitment and contribution to floodplain and riparian habitats. In 1994, fish habitat surveys conducted in Iskuulpa Creek revealed large woody debris (defined as trees 0.5 m (19.5") in diameter and greater than 9 m (28.1') feet in length) rates of 4.1 pieces per mile for the surveyed area (Table 9).

Surveys of floodplain forests in Iskuulpa Creek conducted by the CTUIR Wildlife Program in 1999 and 2000 revealed live tree basal areas ranging from 22.5 – 90 square feet per acre, and a

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snag (dead tree) density of only 0.5 per acre, or one 1 snag per 2 acres. Similar floodplain forest communities in relatively undisturbed conditions can be expected to provide mean live tree basal

Table 9. 1994 Large woody debris counts.

Reach	Length	LWD Count	
1	0.43	1	0
2	4.45	21	2.3
3	2.21	5	.4
4	1.27	4	1.7
5	3.45	18	35.5
Total	11.81	49	n.a.

areas ranging from 117 to 220 square feet per acre (Johnson and Clausnitzer, 1992). Existing low levels of mature forest basal area and dead and dying trees indicate near-term large wood sources are lacking.

Riparian Shrub

Habitat surveys conducted in 1999 indicated total deciduous shrub canopy cover was slightly less than 24% in riparian zones. Hydrophytic shrubs constituted less than 10% of the total shrub cover.

FIRE OCCURRENCE RATES

A fire history analysis was conducted for Iskuulpa Creek Watershed and adjacent Blue Mountain foothills. The analysis area included approximately 67,840 acres (106 square miles) bounded on the north by the Umatilla River, on the east by Meacham Creek, on the south by Interstate-84, and on the west by Highway 337 (Old Emigrant Highway). The analyzed area was expanded beyond the Iskuulpa Watershed in an attempt to get a more representative fire occurrence rate.

The fire history analysis was conducted using Oregon Department of Forestry fire records for a 26-year period spanning from 1972 – 1998. During the period, 99 fires were recorded in the analysis area for an average of approximately four fires per year. Seventeen of 99 known fires (17.2%) were identified as lightening-caused, while the remaining 82 fires (82.8%) were human caused. Human-caused fires included railroad (23 fires), motor vehicles (14 fires), utilities (6 fires), lost agricultural burns (3 fires), and various other human-causes (36 fires).

Fourteen fires were recorded in Iskuulpa subbasin or on its boundary for the period. Fire sizes ranged from less than one-tenth acre to approximately 683 acres. Four of the fires were caused by lightening, with the largest growing to approximately 587 acres. Two of the fires were caused by utilities, two by vehicles, and six were classified as various other human causes. The largest fire, 683 acres, was caused by utilities.

IMPORTANT ANTHROPOGENIC INFLUENCES IN THE WATERSHED

Floodplain and Channel Manipulations – Reach 1 - 2

Railroad and highway grades are constructed across the top of the developed alluvial fan and perpendicular to Iskuulpa Creek approximately .75 miles upstream of its confluence with the Umatilla River (within Reach 2). Although the stream channel across this fan is a single channel that is well developed, its historic location and form on the fan was likely transient with the possibility of multiple braid-form due to frequent changes and shifts in bedload stores. Bridges constructed over Iskuulpa Creek for both the railroad and highway, have locked the location of the channel in one place.

Undoubtedly the highway bridge is able to pass a larger discharge with less hydraulic pressure than the railroad bridge due to the larger cross-sectional area. With frictional resistance taken into account, the highway bridge was calculated to pass 330% more flow than the railroad bridge. The calculated absolute discharge value of 3479.8 cfs for the highway bridge appears to be adequate to pass a 100-year flow event while the calculated discharge of 809.1 cfs for the railroad bridge would only pass an estimated 5-10 year flow event.

Additional problems exist with a situation where the most downstream of two structures is the most constrictive. During flow events that approach the capacity of the limiting structure, hydraulic head increases from that structure and moves upstream. Flow velocity is reduced at the structure and also moves upstream. This causes sediment and bedload being moved by higher velocities to drop out and be deposited above the structure. In this situation, much of the material is deposited under and adjacent to the upstream structure and increases the potential for overbank flow upstream of both structures. As material builds in elevation under the upper structure, its capacity is reduced; flow velocity is further reduced, hydraulic head increases, and the potential for overbank flow increases.

In order to address the identified problems of overbank flow and flood damage and restricted road access, the railroad bridge crossing on Squaw Creek needs to be raised in elevation with relation to the active floodplain. The purpose of raising the bridge is to provide a larger cross-sectional area and effective depth for passage of stream discharge. Removing material from the channel bottom will not alleviate the problem, as this changes a very short portion of the stream gradient and channel will quickly adjust by replacing the material with additional material.

Overbank flow above the two bridge crossings provides significant energy relief for the stream channel. A floodplain with healthy vegetation provides a relatively low elevation, near channel region that slows flow velocity and diverts flow energy in multiple directions without eroding. A floodplain with healthy soils also should provide a large storage area for overbank flow.

Creating large structures in the floodplain that concentrate flows and increase hydraulic head should be avoided at all cost. Efforts with the purpose to improve floodplain function should focus on breaking up stream energy, reducing overland flow velocities, and minimizing

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erosion. Dikes and levees above the bridges will not increase discharge capacity through the bridge crossings. Dike construction within the floodplain will protect the dwelling and roadways by providing additional ponding storage in the floodplain only during stream discharge events that do not exceed the dike elevation. Once the dikes are overtopped, flow velocities will be higher than before due to the increased hydraulic head and local gradient; erosion and scour would be much worse than before. The existing roadbeds currently act as dikes and already limit the floodplain significantly.

Floodplain and Channel Manipulations – Reach 3 - 5

From Reach 3 to Reach 5, the road reverts to a non-maintained, native-surface road (soil) with multiple, undeveloped stream crossings. The initial construction of this road, primarily for timber harvest, resulted in the removal of present (dead trees) and future (live tree) sources of large-wood supplies to the Iskuulpa Creek floodplain. Restoration and reforestation of flood plain terraces is recommended to address the deficient supply of large wood in the long term and to create intact, near channel areas that slow water velocities and divert stream energies during high flow events.

VEGETATIVE COMMUNITIES – EXISTING CONDITIONS

Vegetative communities will be described by the amount of forested, upland shrub, grassland, and riparian cover types, and their species composition and ecological condition. The basis for defining and mapping vegetation cover types in the study area was a 1998 polygon-class, vegetation theme utilized in the Arcview Geographic Information Systems (GIS) program. The theme includes classifications for vegetation size, structure, and species. A detailed listing of the “existing vegetation theme” properties is provided in Appendix D. A map of the cover types and their relative amounts is shown in Figure 2.

Plant communities will be described within the plant association concept (Johnson Clausnitzer, 1994) and grouped within biophysical environments and potential natural vegetation communities.

The Plant Association Concept

The plant community is a general term for an assemblage of plants living together and interacting among themselves in a specific location (Johnson and Clausnitzer 1992). It is not a taxonomic unit, has no successional status, and may not be recognized by all investigators.

The plant association concept differs in that its purpose is to segment the temperature-moisture gradient through recognition of indicative plant species so as to provide easier recognition of similar environments across the landscape (Johnson and Clausnitzer 1992). As a combination of similar or compensating environmental factors is repeated across the landscape (e.g. elevation, slope position, aspect), a predictable plant community will occupy those sites given time and varying frequencies of disturbance (Johnson and Clausnitzer 1992). This community will then have similar physiognomy (form and structure) and floristics; and may also be called a climax community (Allaby, 1994). It is believed that 1) the individual species in the association are, to some extent, adapted to each other; 2) the association is made up of species

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that have similar habitat requirements; and 3) the association has some degree of integration (Kimmins, 1997).

Because environmental conditions vary continuously across the landscape, the resulting plant composition also varies. For that reason, a plant association is not an exact assemblage of species from one location to another. However, sites in the same plant association differ less than sites from different associations (Powell, 1998).

Plant associations are named for their dominant overstory (tree) and undergrowth (herb or shrub) plants, such as *Abies Grandis*/Clintonia plant association. It is assumed that the dominant tree species (*Abies Grandis*) represents an area's macroclimate, and the undergrowth indicator plant (*Clintonia uniflora*) the area's microclimate and soils.

Plant Series

Plant associations are grouped into series, which are aggregates of *taxonomically related* plant associations. The name of the series is that of the climax species dominating the principal layer. The naming convention is based on temperature/moisture regimes of the environment supporting the plant association. An example would be the *grand fir* series in which all ABGR plant associations are arrayed, as well as the seral plant community types related to grand fir climax vegetation (Johnson and Clausnitzer, 1994).

Plant Association Groups

Plant associations may be aggregated into plant association groups (PAG), classifications that similar *ecological environments*. A Grand Fir/Pacific Yew/Twinflower plant association would occur in the Grand Fir series, and would be grouped into the "*Cool Wet*" plant association group.

Potential Vegetation Groups

Finally, plant associations may be classified into Potential Vegetation Groups (PVG), a group of potential vegetation types that have similar *environmental conditions* and are dominated by *similar types* of plants. Groupings are often made using similar *life forms*. Continuing with the example, the "*Cool Wet*" PAG is located within the "*Moist Forest*" Potential Vegetation Group. This organization is illustrated in Figure 8.

Forested Communities

Forest cover types are generally located on easterly to northwesterly aspects, resulting in a grass-timber mosaic characteristic of the Blue Mountains. The study area contains approximately 3,539 acres of forested habitat. Forested plant associations observed during the course of surveys (n= number of observations) and their relation to plant association groups and potential vegetation groups are displayed in Table 10. Detailed descriptions of each plant association are presented in Appendix C.

Forested surveys were initiated July 7, 1999, and completed August 17, 1999. Twelve transects totaling 20,300 linear feet were completed on the 12 fee-tracts purchased for mitigation purposes. Additionally, 406 square-meter plots were completed to estimate herbaceous cover, and 101 one-tenth acre plots were completed to obtain estimates of basal area, percent canopy

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cover, tree height, and number of snags per acre. Survey results are summarized by transect and habitat parameter and displayed in Tables 11 and 12.

Figure 8. Example of Plant Association Organization.

Table 10. Observed Forested Plant Associations.

Potential Vegetation Group	Plant Association Group	Plant Association	n=
Moist Forest	Cool Very Moist	Grand fir/sword fern	2
	Cool Moist Cool Moist	Grand fir/beadlilly	4
		Grand fir/Twinflower	1
	Warm Very Moist	Grand fir/Rocky mountain maple	6
	Warm Moist Warm Moist	Douglas fir/Pacific Oceanspray Ponderosa Pine/Oceanspray*	7 2
Dry Forest	Warm Dry	Grand fir/Birchleaf spirea	1
		Douglas fir/Pine Grass	1
		Douglas fir/ninebark	10
		Douglas fir/Common Snowberry	6
		Ponderosa Pine/Common Snowberry	3

*This association with productive oceanspray growth in the absence of more mesic tree species is not yet classified. Its prevalence at elevations below 3,000' and the stature of oceanspray on these sites suggests it occurs higher on the moisture gradient than ponderosa pine/common snowberry, but lower than Douglas fir/oceanspray.

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Table 11. Upland Forest Cover Overstory Structural Characteristics.

Transect	Tree Basal Area (Ft²/Ac)	% Canopy Cover	Tree Height (ft)	Snags/Ac
1	88	33	103	26*
2	116	56.3	102	12
3	80	90	100	10
4	25	25	59	3.8
5	72	47	95	2.0
6	26	8	51.2	0
7	0	0	0	0
8	76	28	96	4
9	107.5	65	100	6.3
10	84	89	86	6
11	72	52.5	84	7
12	114	83	96	10
Mean	71.7	48.1	81.0	7.3

*Fire affected stand.

For floodplain forests, eight transects totaling 8,000 feet were completed. Associated with the transects, [32] square-meter and one-tenth acre plots were completed.

Table 12. Floodplain Forest Overstory and Understory Structural Characteristics.

Transect	Tree Basal Area (Ft²/Ac)	Tree Canopy Cover (%)	Snags/Acre	% Total Shrub Cover	Ave. Shrub Height (ft)
1	22.5	61.0	0	64.1	3.2
2	22.5	53.0	0	30.0	5.6
3	23.8	54.0	0	15.5	5.0
4	30.0	60.0	0	19.7	6.1
5	40.0	74.0	.5	17.6	4.5
6	60.0	66.0	.5	25.4	6.5
7	90.0	41.0	.5	5.6	2.4
8	77.5	62.0	.5	7.8	3.1
Mean	45.8	58.9	.3	23.2	4.6

Anthropogenic Effects - Timber Harvest: Timber harvesting and associated road building have been important factors influencing current forest habitat conditions in the Iskuulpa Watershed. A review of a 1959 timber sale contract between the CTUIR and a private purchaser for the “Squaw Creek Logging Unit” (now Iskuulpa Watershed) included more than 10,000 gross acres of tribal lands in subbasin, and contained a provision requiring the following:

“The purchaser shall fell all snags that are more than 14 inches in diameter at breast height and more than 16 feet in height on the area cut over unless relieved in writing by the Superintendent on specifically designated areas of tribal land at the request of the

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tribal governing body, or on specifically designated allotments at the request of allotment owners, when snags are desired for firewood by the local enrolled Indian residents.”

A 1964 “Summary of Operations” for the Squaw Creek Logging Unit indicates approximately 12 million board feet of timber was harvested from the Squaw Creek Logging Unit between 1959 and 1963. The harvested volume consisted of approximately 6 million board feet of ponderosa pine (50%); 4.4 million board feet of Douglas fir (37%), 600,000 board feet of grand fir (5%), and 960,000 board feet of western larch and Engelmann spruce (8%).

The road network to support the removal of timber included an “improved dirt road” paralleling the entire length of the Iskuulpa mainstem, and an unimproved road up the entire length of Bachelor Canyon Creek (a tributary stream). Field observations and aerial photos indicate logging skid trails extended up most side drainages from this road network to support timber removal (downhill tractor skidding).

Because road construction requires the removal of trees, and typically the subsequent removal of hazard trees (snags) within falling distance of the road, timber harvest and associated road construction activities combined to produce the relatively low basal area, snag numbers, and down large wood observed in floodplain habitats (see Tables 11 and 12 and Figure 9). While basal areas ranged from 22.5 – 90 square feet per-acre, similar floodplain forest communities in relatively undisturbed conditions can be expected to provide mean live tree basal areas ranging from 117 to 220 square feet per acre (Johnson and Clausnitzer, 1992). The observed snag density of 5.6 per acre in upland forest habitats was many times greater than the density of .3 snags per acre observed in floodplain forests (see Tables 11 and 12). Harvest of non-Indian fee lands also occurred in the watershed, though empirical records are not readily available.

Upland Forest Communities – Desired Future Conditions

Forested sites will possess an average of 5 snags per acre greater than 6” in diameter-at-breast-height within 40 years. Current second-growth forest stands will continue to develop and stem exclusion will occur. Stem exclusion may occur on dry sites, where moisture is the limiting factor, or on moist sites, where light is the limiting factor. An expected consequence of stem exclusion is tree mortality and therefore snag recruitment. Other processes that may contribute to snag recruitment include root rot, endemic or epidemic populations of insects, floods, drought, and wildfire. These mortality agents may target different tree species and age classes; thus resulting in a mix of snag species and sizes across the landscape (Bull, et al. 1997). Events and decay processes that create dead tree habitat will maintain the snag resource through time.

Basal area on sites with dry forest vegetation potential will possess a minimum 60-80 square feet of basal area while cool moist forest sites will possess a minimum of 100 – 140 square feet per acre.

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Figure 9. Example of Timber Harvest Impacts in the Iskuulpa Creek.

Upland Shrub

Upland shrub cover types occupy approximately 1,045 acres of the study area. Predominant shrub associations include mallow ninebark/common snowberry and common snowberry/rose (Table 13).

Table 13. Observed Upland Plant Associations.

Potential Vegetation Group	Plant Association Group	Plant Association	n=
Moist Shrubland	Warm Moist	Common snowberry/rose	10
		Ninebark/common snowberry	5

Detailed descriptions of these communities are provided in Appendix C.

Upland Shrub Communities – Desired Future Conditions

Shrub crown cover will remain relatively high in the ninebark/snowberry plant association, generally ranging from 20-80% depending on the seral state of a particular site. Within four years of events such as wild or prescribed fire, shrub cover will range from 20-40% and two to three feet in height. Five or more years after such a disturbance event, shrub cover

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will range from 40-80% cover and average shrub height will be equal to or greater than three feet in height.

Within shrub stands, herbaceous canopy cover will remain high in diversity, with eight or more species, but low in overall cover values due to high overstory shrub cover. In earlier seral stages (< 4 years) herbaceous canopy cover will range from 30 – 50%, but in later seres with increasing shrub canopy cover, herbaceous canopy cover will range from 5-30%.

The average height of herbaceous canopy cover will be determined by herbaceous species present.

Floodplain Forest and Shrub Communities

Floodplain communities in Reaches 1 and 2 of mainstem Iskuulpa are dominated by Black Cottonwood/Snowberry and Ponderosa Pine/Snowberry associations, and transitory alder communities. In these reaches, willow communities are expected, but were highly suppressed at project initiation due to recent grazing activity. Himalayan blackberry, an introduced shrub, is prevalent in the shrub layer in these reaches. In Reaches 3 – 5 communities become dominated by coniferous associations and hardwood tree cover decreases. Detailed descriptions of the associations listed in Table 14 are provided in Appendix C.

Table 14. Floodplain/Riparian Plant Communities

Potential Vegetation Group	Plant Association Group	Plant Community	Reach *
Wet Riparian Forest	Warm Wet RF, Moderate soil moisture	Grand fir/Rocky Mtn. Maple – floodplain	4-5
	Warm Wet RF, Low soil moisture	Douglas-fir/common snowberry-floodplain	3-4
Dry Riparian Forest	Hot Dry RF, Moderate Soil Moisture	Black cottonwood/common snowberry - floodplain	1-2
	Hot Dry RF, Low Soil Moisture	Ponderosa pine/common snowberry – floodplain	2-3
Dry Riparian Shrub	Hot Dry, Low Soil Moisture	Black hawthorn	2

*Iskuulpa Creek reach breaks as described previously and shown on Figure [] page [].

Floodplain forest survey results reflect intensive past timber harvest and road construction activities. Live tree basal ranged from 22.5 – 90 square feet per acre. Similar floodplain forest associations in relatively undisturbed conditions can be expected to provide mean live tree basal areas ranging from 117 to 220 square feet per acre (Johnson and Clausnitzer, 1992). The average snag (dead tree) density of only 0.3 per acre is significantly less than observed in similar forested associations in watershed uplands, where snags averaged 5.6 per acre in unburned forest stands, and 7.3 per acre for all surveyed stands. Existing low levels of mature forest basal area

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and dead and dying trees indicate near-term large wood sources are lacking. Without management intervention, large wood sources will continue to be inadequate for several decades pending the development of floodplain forests into late-seral, multi-storied stands capable of contributing live and dead trees of adequate dimensions (length and diameter) to provide snag habitat and beneficially influence floodplain and riparian habitat development processes.

Table 15. Structural characteristics of Iskuulpa Creek Floodplain/Riparian communities.

Transect	Tree Canopy Cover (%)	Tree Basal Area (Ft²/Ac)	Snags/Acre	% Cover Deciduous Vegetation	% Cover Hydrophytic Shrubs	% Total Shrub Cover	Ave. Shrub Height (ft)
1	61.0	22.5	0	64.1	34.1	64.1	3.2
2	53.0	22.5	0	30.0	4.6	30.0	5.6
3	54.0	23.8	0	15.5	6.0	15.5	5.0
4	60.0	30.0	0	23.1	6.4	19.7	6.1
5	74.0	40.0	.5	17.6	6.3	17.6	4.5
6	66.0	60.0	.5	25.4	15.6	25.4	6.5
7	41.0	90.0	.5	5.6	2.1	5.6	2.4
8	62.0	77.5	.5	7.8	3.8	7.8	3.1
Mean	58.9	45.8	.3	23.6	9.9	23.2	4.6

Snags are a dynamic resource, with old snags falling and living trees dying to become new snags. Snag-dependent wildlife therefore need a continual supply of snags over time to meet their life history requisites. To provide that continuum of snag habitat, future snags must be planned for by leaving green trees to eventually become snags in managed stands (Bull, et al. 1997). Because woodpeckers are territorial, snags need to be distributed across the landscape to attain the maximum density of cavity nesters. Retaining snags close to living trees provides cover for cavity users that are less likely to nest in open areas (Bull et al. 1997).

Snag longevity, or the amount of time a snag stands, is an essential consideration in managing for snag habitat. Snag longevity is a function of many factors, including diameter and height, percentage of heartwood, cause of death, soil type and moisture, forest type, surrounding stand conditions, and prevalence of windstorms (Bull et al. 1997). Most studies suggest that 50% of ponderosa pine snags killed by fire or beetles fall within 10 years (Bull et al. 1997).

Limited information is available on numbers of snags to retain for wildlife species in the interior Columbia Basin (Bull et al. 1997). Thomas and others (1979) prescribed a snag density of 3 snags/acre greater than 6 inches in diameter for the downy woodpecker. However, those numbers were based on a hypothetical, untested model and did not include any snags for foraging. It is now known that the numbers presented by Thomas et al (1979) is inadequate because of a lack of foraging strata and invalid assumptions used in the model (Bull et al 1997). Three studies conducted in northeastern Oregon have shown that retaining foraging structure is essential, in addition to nest and roost trees (Bate 1995, Bull and Holhausen 1993, Dixon 1995).

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Floodplain/Riparian Forest Communities - Desired Future Conditions

Forest stands will possess an average of 5 snags per acre greater than 6" in diameter-at-breast-height within 40 years. Current second-growth forest stands will continue to develop and stem exclusion will occur. Stem exclusion may occur on dry sites, where moisture is the limiting factor, or on moist sites, where light is the limiting factor. An expected consequence of stem exclusion is tree mortality and snag recruitment. Other processes that may contribute to snag recruitment include root rot, endemic or epidemic populations of insects, floods, drought, and wildfire. These mortality agents may target different tree species and age classes; thus resulting in a mix of snag species and sizes across the landscape (Bull, et al. 1997). Events and decay processes that create dead tree habitat will maintain the snag resource through time.

Basal area on sites with dry forest vegetation potential will possess a minimum 60-80 square feet of basal area and cool, moist forest sites will possess a minimum of 100 – 140 square feet per acre

Black-hawthorne shrub communities will possess minimum deciduous shrub cover values of 50%, with 70% of the shrub layer composed of hydrophytic species. Shrub heights will average 6 feet or more.

Floodplains in Reaches 1 and 2 of Iskuulpa Creek will possess average deciduous shrub cover values of 60% with 70% of the shrubs composed of hydrophytic species. Plant associations in this reach include the black cottonwood/snowberry and ponderosa pine/snowberry associations, which include hydrophytes such as willow and black hawthorne. Average shrub heights will range from 4 to 6 feet in these reaches.

Floodplains in Reaches 3 – 5 of Iskuulpa Creek will possess 50% average deciduous shrub cover, with hydrophytic shrubs comprising up to 50% of the total shrub cover. Plant associations in these reaches, including the Douglas fir/snowberry, Douglas fir/rocky mountain maple, and grand fir/rocky mountain maple associations, tend to be lower in hydrophytic species. Average shrub heights will range from 4 – 6 feet in these reaches.

Grassland Communities

Grasslands are the dominant cover type in the study area, comprising approximately 10,991 acres. Grassland communities typically occur on westerly to southeasterly slopes and ridgetops. Grassland surveys included 27, 200 feet of transects, 272 square-meter plots and 14 one-tenth acre plots. Fifteen of 17 transects and 13 of 14 one-tenth acre plots consisted of Bluebunch Wheatgrass/Sandberg's bluegrass associations, and the remainder Idaho fescue /Bluebunch wheatgrass associations (Table 16).

The current structure and composition of grassland communities in the watershed has been strongly influenced by severe over-grazing at the turn of the century, consequent invasions by annual, exotic vegetation, and contemporary, season-long grazing practices that have inadvertently maintained perennial grasslands in their annual grass-dominated state.

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Table 16. Grassland Communities.

Potential Vegetation Group	Plant Association Group	Plant Association	n=
Moist Grassland	Warm Moist	Idaho Fescue/Bluebunch Wheatgrass	3
Dry Grassland	Hot Dry	Bluebunch Wheatgrass/Sandberg's Bluegrass	28

Table 17. Grassland Structural Characteristics.

Number Transects	% Cover Herbaceous	% Cover Grass	% Cover Perennial Grass	Mean Height Herbaceous (in)	% Shrub Canopy Cover
17	26.1	18.7	4.0	10.7	1.8

A 1935 Soil Conservation Service report prepared by W.B. Nelson describes management practices at that time and consequent changes in vegetative conditions of the Iskuulpa (Squaw Creek) watershed:

“Vegetative Stage: Improper range practices over a long period of years on the Indian Reservation have resulted in a general regression of the vegetation of the area. Bedgrounds, driveways, trails to and from water holes, and many of the more accessible slopes and ridge tops have been divested of perennial grasses, and, in some cases, completely denuded of vegetation.

Weedy annuals dominate over a great majority of the area, and only on the more inaccessible slopes are found any of the once-dominant bunchgrasses. This type of range has been grossly mistreated by constant, long continued overgrazing.

In general the degree of utilization is largely dependent on the accessibility, and management practices, which, as a rule, have been extremely competitive, and without any semblance of proper range management.

History of Range Use: The Squaw Creek area has been subjected to grazing by Indian horses and wild game for many years before the advent of white settlers in 1860 or thereabouts. Numerous dilapidated cabins on the area at present bespeak of its early settlement. These settlers surged into the cattle business, grazing large herds throughout the area of which the Squaw Creek country is part; and gradually choked the Indians from their domain. However, the Government stepped in to set aside a large portion of the Squaw Creek area, and adjacent territory, as the Umatilla Indian Reservation, and thus protect the rapidly diminishing range resources of the Indians. Since that time, the

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area has been grazed by increased numbers of sheep. The cattle now on the area are largely I.D. cattle, given to the Indians by the federal government, in return for which each Indian, by the terms of the grant, must repay a calf for each breeding cow within a stipulated length of time. Cattle are marketed at all ages, and at varying weights according to age. Horses are allowed to run loose; the quality of this stock is so low that there is now market demand, except for canning or some such special purpose, and only a few are sold. The sheep on the area are the property of the permittees, and are sold as fall lambs at the age of six to eight months and an average weight of from 70 to 80 pounds.

*Grasslands: Over most of the grassland type, the once dominant bunchgrasses have been supplanted by communities of invaders, because of overgrazing, trampling, erosion, and other contributing factors. Important species now found on the area include *Bromus tectorum*, *Festuca pacifica*, *Poa secunda*, *Grindelia* spp., *Madia glomerata*, *Wyethia amplexicaulis*, *Cogswellia* spp., with sub-dominants of *Agropyron inerme*, *Festuca Idahoensis*, *Bromus mollis*, *Bromus brizaeformis*, *Epibolium* spp., *Achillea lanulosa*, *Balsamorhiza sagittata*, *Erigonium* spp., *Amsinokia intermedia*, and other species of weedy forage. In localized inaccessible areas, the vegetation consists largely of *Agropyron-Festuca-Poa* association.*

IV. Range and Pasture Management:

Past – Since the beginning of grazing on the area, the supervision and management practices have been too loosely organized for any benefits to accrue from such practices. From 4,000 to 8,000 head of sheep, together with 600 – 1,400 head of horses, and 800 to 1,000 head of cattle have greatly overgrazed the forage of the area. This heavy use has been given range having a very low percentage of ground cover. It has given rise to erosion of the thin rocky soil, accelerated run-off, reduction of the carrying capacity, and vegetative regression. Water development has been neglected. It is a common practice to bed bands sheep in one spot near a spring for three or four weeks at a time, resulting in varying degrees of denudation of these bedground areas. No drift fences have been built, and no attempts made to secure the optimum utilization by proper salting practices. All in all, it appears that little consideration has been given to the upkeep of range for future use.

Present – At present the numbers of stock have been somewhat decreased, principally because of a lack of forage rather than any consideration of future benefits. The land on the Indian reservation is leased to one sheep company, who are supposedly bonded to take care of the range. Aside from this stipulation, no limitations as to the number or season of use are set by the Indian service. The practice of early spring grazing and over-stocking has destroyed much of the original forage cover. Heavy fall grazing has reduced the amount of vegetation left on the area to hold the snow and retard run-off. In addition, the Indian allottees have run many horses on the range. None of the area is fenced, so all of the stock except herded sheep roam freely over the range.

The Forest Service regulations have halted the regression of the vegetation within the boundaries of the Umatilla National Forest. However, evidences of excessive trailing

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and bedding for too long a time in one place are found in the forest. Twelve hundred head of sheep normally graze this area.

The privately owned land south of the Reservation is generally fairly well cared for. A few of the springs on this area have been partially developed, some drift fences constructed, and a few salt grounds established to afford better utilization of the area. The area is an example of the improvement possible even under a loose grazing plan. Small herds of cattle and flocks of sheep, and some pasture stock are now using the area. The late date at which the snow leaves the area, and the earliness of snow in the fall have protected this range to a large degree. Eighty-five cattle and 400 to 600 sheep in small flocks are grazed on this portion of the area. Stock is put on the area too early in the spring, and this practice has accelerated erosion of the ridge tops and higher slopes."

Recent domestic livestock grazing practices have included stocking up to 192 head of cattle from May 15 to October 31 of each calendar year. The potential consequence of implementing such a grazing schedule on an annual, indefinite basis is the continued suppression of perennial grasses. Figure 10 illustrates this process with the permitted grazing season (light blue zone) imposed over the perennial bunchgrass life cycle (yellow line). Note that the bunchgrass life cycle is impacted through all stages where reserves are developed. Season-long grazing can prevent seedhead elongation and seed set from occurring in bunchgrasses, and limit the development of reserves (proteins, carbohydrates, and fats) needed for leaf growth, seed development, and root system maintenance. If this occurs on an annual basis, the plant may enter and emerge from dormancy with decreasing reserves, which can then result in a reduction of root mass, seed production, and plant vigor. Combined, these effects can reduce the ability of perennial grass stands to maintain themselves and compete with annual exotic grasses.

When the native vegetation is replaced by aliens or when the potential dominant plants decline to a point where the cause of the change is so severe as to eliminate any opportunity for resurgence to former dominance – a threshold has been reached and passed (Johnson, 2001). In the example of bunchgrasses, annual forbs or annual grasses may eliminate the opportunity for perennial bunchgrasses to regain dominance of the site. This has occurred over large expanses of the ridgetops, canyon bottom and even on steep slopes of Iskuulpa Creek. In our classification of seral stages, when the perennial potential bunchgrasses cease to occur at 5% or greater coverage, we determine that the site can no longer sustain those bunchgrasses unless managers intervene with cultural practices to restore the grassland (Johnson, 2001).

Table 18 provides approximate landscape acreage (or percentages) that may have been present prior to the 1800s. It is based on topographic setting – not vegetation groups per se. A predictable pattern involves the role of natural fire and native grazing animals to maintain the majority of a given landscape in mid seral stages of successional development. Another pattern that emerged is that the gentle ground (slope = 15% or less) tends to be where early and very early seral vegetation is most prominent. Steep canyon slopes and ridge tops (removed from water) tend to support the highest percentages of late seral vegetation.

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Figure 10. Season-Long Grazing and the Perennial Grass Life-Cycle (NRCS – Or, 1999).

Table 18. Proposed Historic Ranges of Variability* (Johnson, 2001).

Seral State	<u>Ridgetops</u> %	<u>U.Slopes</u> %	<u>Benches</u> %	<u>L.Slopes</u> %	<u>Bottoms</u> %
Late Seral	25-35(30)	30-40(35)	15-25(20)	25-35(30)	5-25(15)
Mid Seral	35-55(45)	40-60(50)	50-60(55)	40-60(50)	50-60(55)
Early Seral	10-30(20)	5-15(10)	20-30(25)	5-15(10)	10-30(20)
V.Early Seral	5-15(10)	3-7(5)	5-15(10)	5-15(10)	5-15(10)

* Figures are in percent with the HRV given first with the mean value shown in parentheses.

Seral stages for grasslands are defined as follows. In the case of Iskuulpa Creek, the decreasers are Idaho fescue, bluebunch wheatgrass, and to a limited extent, Sandberg's bluegrass.

Early Seral - Climax bunchgrasses are subordinate to increasers, absent, or so few as to make natural re-colonization unlikely (especially forbs); increasers and invaders usually dominate the community (bunchgrasses – 0-15% cover, increasers and invaders – greater than 50% cover).

Mid Seral - Climax bunchgrasses are present; increasers (especially forbs) are co-dominant or dominant (bunchgrasses – greater than 15% cover but less than 25% cover. Increasers and invaders – greater than 25% cover but less than 50% cover).

Late Seral - Climax bunchgrasses are dominant; invading and increasing species are subordinate (bunchgrasses – greater than 25% cover, increasers and invaders – less than 25% cover).

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Recognizing that less than 10% of the grasslands are probably in mid to late seres now, a rational objective would be to seek a goal of 20% by the year 2100 (Johnson, 2001).

Grassland Communities – Desired Future Conditions

Approximately 20% of the grassland cover type will possess between 15 – 25% native perennial bunchgrass cover in approximately 100 years. Increasers and invaders (especially forbs) will be co-dominant at will occur at 25-50% cover. The remaining 80% of the grassland cover type will have perennial grass cover $\leq 15\%$, with annual, exotic grasses and forbs comprising approximately 50% of the vegetative cover.

NOXIOUS WEEDS – EXISTING CONDITIONS

Noxious weeds are defined as any non-native plant species that is injurious to public health, crops, livestock, land, or other natural resources. When noxious weed populations become established, they may expand at an exponential rate. Because they are non-native, they are typically free from the natural controls of their native range. They can negatively impact wildlife habitat by decreasing biological diversity, reducing the amount of palatable forage, and reducing available nesting cover for birds.

In Umatilla County, noxious weeds are divided according to control requirement categories as established by Umatilla County Weed Control Board and Board of County Commissioners. The designations are as follows;

“A” Designated Weed – a weed of known economic importance which occurs in the state in small enough infestation to make eradication and containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent. Prevention, early detection, and eradication are high priority for these species.

“B” Designated Weed – a weed of known economic importance which is regionally abundant, but which may have limited distribution in some counties. Where implementation of a fully integrated statewide management plan is feasible, biological control shall be the main approach where biological agents are available.

All species on the Umatilla County Noxious Weed List are surveyed for at Iskuulpa. The following “A” and “B” designated species have been documented at the Iskuulpa Watershed (Table 19).

Canada Thistle: Canada thistle is a colony-forming perennial that spreads from deep and extensive horizontal stems. Stems are one to four feet tall, rigid, and branched above, and topped with purple flowers. Flowering occurs in July and August. The species is native to southeastern Asia, and was introduced into Canada in the late 18th century. It differs from other species of thistle in that there are male and female flower heads, and these are on separate plants. This aggressive weed is difficult to control, as breaking up its roots serves to increase the

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number of plants. At Iskuulpa, the species occurs in small, scattered infestations in dry upland areas.

Table 19. Noxious Weeds Occurring at the Iskuulpa Watershed.

Common Name	Scientific Name	Designation
Canada Thistle	<i>Cirsium arvense</i>	B
Diffuse Knapweed	<i>Centaurea diffusa</i>	B
Rush skeletonweed	<i>Chondrilla juncea</i>	B
Russian Knapweed	<i>Centaurea repens</i>	B
Scotch thistle	<i>Onopordum acanthium</i>	B
Sulfur cinquefoil	<i>Potentilla recta</i>	B
Yellow starthistle	<i>Centaurea solstitialis</i>	B

Diffuse Knapweed: This is a diffusely branched annual or short-lived perennial, one to two feet tall. Flowering occurs from July to September. The species was introduced from Eurasia, and poses a threat to rangeland as it is highly competitive plant capable of excluding desirable species. This species is often associated with rock outcrop areas at Iskuulpa where little competition with other noxious weeds occurs.

Rush Skeletonweed: Rush skeletonweed is a perennial noxious weed that grows to 4 feet in height with a taproot that can reach 8 feet. Early growth is a rosette of dandelion-like leaves that wither once the plant flowers. Buds on the root crown or along the lateral roots may give rise to new rosettes. Each rosette produces one or more stems, 20-60 inches long, with multiple spreading or ascending light-green branches. Mature plant is a mass of wiry stems with small yellow flowers and barely visible narrow leaves, giving it a “skeleton-like” appearance. The stem produces a milky juice. Flowering and seed production occurs from mid-July through frost. Flowers are self-fertile. A single plant may produce as many as 20,000 parachute-like seeds which are dispersed by wind, water, animals, and humans. Infestation of rush skeletonweed can reduce livestock and wildlife forage. A recent newcomer to Iskuulpa, one patch has been located above the Bingham Road bridge. Since rush is difficult to control, this patch is top priority for treatment.

Russian Knapweed: Russian knapweed is a perennial, forming dense colonies by adventitious shoots from widely spreading black roots. Roots of the plant have been measured at depths exceeding eight feet. Stems are from 18 – 36 inches tall. Flowering occurs from June to September. The plant is a native of Eurasia, and at best estimates was probably introduced in North America in the late 1890’s. In upland habitats at Iskuulpa, Russian knapweed is usually found in well drained, seasonally damp swales and depressions. Approximately 60 acres of knapweeds were treated in 2000 at Iskuulpa.

Scotch Thistle: Scotch thistle is a biennial that sometimes acts like an annual. It blooms from May through June. It often produces a rosette the first year, but when acting annual, it can grow 2-4 feet the first year and is capable of heights of over 10 feet. It has a purple flower and spreads by seed. It stands dense and practically impenetrable because of its spiny nature and large size.

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Sulfur Cinquefoil: Sulfur cinquefoil is a perennial species with a woody rootstock. It produces several erect stems which can reach one to three feet in height. The stout, leafy, hairy stems are unbranched up to the inflorescence. The leaves, which are also rough-hairy, have five-to-seven-toothed, palmately arranged leaflets that are two to four inches long by 1/2-1 inch wide. The flat-topped inflorescences are three to six inches across, and each flower has five light yellow petals surrounding a dark yellow center. The fruits are achenes, which are dark brown, with lighter, prominent, branched ridges, and narrow, winged margins. Sulfur cinquefoil has been found along roads on Telephone Ridge and in the road and ATV-trail along the Iskuulpa Creek bottom.

Yellow Starthistle: Yellow starthistle is an annual, two to three feet tall, and has rigid branching, winged stems. Flower heads are yellow and armed with thorns up to three inches long. Yellow starthistle was introduced from Europe. Large infestations of yellow starthistle have been documented to the east in the adjacent Meacham Creek watershed and to the north in the mainstem Umatilla. Infestations were treated from 1999-2001 by the BIA Umatilla Agency and the CTUIR with cooperative funding provided by the Rocky Mountain Elk Foundation

Noxious weeds can infest an area in numerous ways. Vectors may include; 1) seed dispersal by domestic or wild animals, 2) seed transport and dispersal from vehicles, and 4) expansions of infestations from adjacent, untreated lands.

Noxious Weeds – Desired Future Conditions

The desired condition in regard to noxious weeds is to: 1) control the spread of noxious weeds and eradicate if and where possible; and 2) increase the health native plant communities (referenced in grassland and shrubland sections above). Over the next 5 years, the desired condition is to completely control noxious weeds along roads. In conjunction with the access and travel management plan, weed management along roads will help prevent the further spread of noxious weeds into currently uninfested areas and limit seed redistribution within the project area.

Over the next ten year period, the DFC is to minimize noxious weed colonization from adjacent watershed and obtain an overall decrease in the percent cover of noxious weeds. A proven strategy to achieve complete eradication of noxious weeds is not currently available and managers therefore need to recognize that some noxious weeds are likely to be present following treatment strategies. A combination of prevention, control by manual, chemical, and biological agents, in conjunction with aggressive seeding and planting will be utilized to move the area towards the desired condition.

COMPETING AND UNWANTED VEGETATION – EXISTING CONDITIONS

Competing and unwanted vegetation may include noxious weeds, but also any other species that interfere with management objectives at any given time or place. In the Iskuulpa subbasin, cheatgrass and medusahead rye interfere with management objectives for improving native perennial grasses, while Himalayan blackberry can interfere with objectives of improving riparian shrub habitats and conifer seedling establishment and growth.

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Downy Brome: Introduced from the Mediterranean region, downy brome (cheatgrass) is a winter annual that competes readily with desirable native perennial bunchgrasses because of its winter and early spring growth habit. While it does provide forage for ungulates, it is typically low in nutrients and cures out early. When cheatgrass is the dominant grass in plant communities, it can increase the rate of fire occurrence, increase the length of the fire season, and increase the potential for fire spread. Because of its early curing habit, the species effectively lengthens the period in which fires can occur, therefore increasing the opportunity for fire occurrences. It is a prolific seed producer, and as it establishes it forms fuel beds with a higher degree of continuity that may result in increased potential for carrying flames, or fire spread.

Medusahead: Medusahead is an aggressive winter annual ranging from 6 – 24 inches in height. Flowering and seed formation occur in May and June. The species is introduced from Eurasia and is pre-dominant on arid rangeland in the Pacific Northwest. The species is extremely competitive, and is capable of crowding out even undesirable species such as downy brome. Rangelands infested with medusahead rye have been known to experience 40 – 75% reductions in ungulate grazing capacity.

Himalayan Blackberry: Himalayan blackberry (*Rubus discolor*) is a robust, perennial shrub of the rose family. Despite its name, the shrub is native to western Europe and was probably first introduced to north America as a cultivated crop in the mid-1880's.

Shrubs first appear as individual canes then groups of canes, gradually increasing to mound-like forms with canes reaching up to 10 feet high. Trailing canes spread up to 20 – 40 feet. Daughter plants may form where first-year canes touch the ground. Individual canes may live only 2-3 years, yet reach densities greater than 500 canes per square meter. A large quantity of hard and dry canes standing dead canes accumulate in old thickets. Flowers and fruit form the second year, and ripen from midsummer to autumn. The shrub is capable of tolerating a wide range of soil moisture. Seeds are dispersed by both birds and mammals that eat the fruit, and dispersed seeds may remain viable for years.

Competing and Unwanted Vegetation - Desired Future Condition

Within 10 years, competing and unwanted vegetation on restoration sites will occur at a coverage of 20% or less.

WILDLIFE MITIGATION SPECIES

The following summarized the results of the Habitat Evaluation procedure (HEP) analysis for the project area. Details on survey methodologies, data summaries, assumptions, target mitigation species information, and model results can be found in the "Habitat Evaluation Procedures Report, Iskuulpa Wildlife Mitigation & Watershed Project: Baseline Mitigation Credits and Futures Analysis (Quaempts 2003).

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Habitat Evaluation Procedures (HEP) were used to determine the number of habitat units credited to BPA for acquired lands. Under this methodology, target wildlife mitigation species are selected to best represent the various habitat types within a project area. Under this methodology, both habitat quantity and quality are evaluated through habitat surveys and analytical models. Habitat quality is assigned a numerical value on a scale of 0 to 1.0, known as a habitat suitability index (HSI) with 1.0 being optimum habitat. The product of HEP is the Habitat Unit (HU) whereby one HU is defined as one acre of habitat with an HSI of 1.0. Upland and riparian forest, upland and riparian shrub, and grassland cover types were evaluated in the study. Target wildlife species included downy woodpecker (*Picoides pubescens*), black-capped chickadee (*Parus atricapillus*), blue grouse (*Dendragapus obscurus*), great blue heron (*Ardea herodias*), yellow warbler (*Dendroica petechia*), mink (*Mustela vison*), and western meadowlark (*Sturnella neglecta*). Habitat surveys were conducted in 1998 and 1999. In accordance with published HEP protocols and included 678 m2 plots, and 243 one-tenth-acre plots. Between 123 and 10,794 acres were evaluated for each mitigation species. Derived habitat suitability indices were multiplied by corresponding cover-type acreages to determine the number of habitat units for each species.

Table 20. Acres evaluated, existing habitat units, future habitat units and cover types represented for seven target mitigation species on the Iskuulpa Watershed Project.

Evaluation Species	Cover types	Evaluation Acres	Time to DFC (Years)	Existing Habitat Units	Habitat Units At Year=10
Downy Woodpecker (<i>Picoides pubescens</i>)	Forest Upland shrub	1,287.0	40	1,222.7	1,009.7
Black-Capped Chickadee (<i>Parus atricapillus</i>)	Forest Riparian	1,287.0	40	1,203.8	1,663.6
Blue Grouse (<i>Dendragapus obscurus</i>)	Forest Upland shrub	1,045	40	407.6	407.6
Great Blue Heron (<i>Ardea herodias</i>)	Riparian	123.9	40	30.5	54.6
Yellow Warbler (<i>Dendroica petechia</i>)	Riparian	425.8	10	308.5	308.5
Mink (<i>Mustela vison</i>)	Riparian	123.9	10	103.7	110.8
Western Meadowlark (<i>Sturnella neglecta</i>)	Grassland	10,794.4	100	1,318.0	1,648.7
TOTAL				4,597.4	5,203.5

The total baseline habitat units credited to BPA for Iskuulpa Watershed Project and its seven target species is 4597.4 habitat units (Table 20). Factors limiting habitat suitability are related to the direct, indirect, and cumulative effects of past livestock grazing, road construction,

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and timber harvest which have simplified the structure, composition, and diversity of native plant communities. Alternatives for protecting and improving habitat suitability include exclusion of livestock grazing, road de-commission/obliteration, reforestation and thinning, control of competing and unwanted vegetation (including noxious weeds), reestablishing displaced or reduced native vegetation species, allowance of normative processes such as fire occurrence, and facilitating development of natural stable stream channels and associated floodplains. Implementation of habitat enhancement and restoration activities could generate an additional 606 habitat units in 10 years. Baseline and estimated future habitat units total 5,203.5 for Iskuulpa. Habitat protection enhancements and restoration will require long-term commitments from managers to increase probabilities of success and meet the goals and objectives of the Northwest Power Planning Council's Fish and wildlife Mitigation Program.

Longer-term benefits of protection and enhancement activities include increases in native species diversity and plant community resiliency in all cover types. Watershed conditions, including floodplain/riparian, and instream habitat quality should improve as well, providing multiple benefits for terrestrial and aquatic resources. While such benefits are not necessarily recognized by HEP models and reflected in the number of habitat units generated, they are consistent with the NPPC Fish and wildlife Program.

HUNTING – EXISTING CONDITION

For CTUIR Tribal members, Squaw Creek is an important area for deer and elk hunting, upland bird hunting (including blue grouse, ruffed grouse, California quail, and wild turkey).

As the project area is within the bounds of the Umatilla Indian Reservation, non-member public use has historically been restricted to permitted upland bird hunting. With the introduction of Rio Grande turkey and the sale of spring gobbler permits by the CTUIR, use of the area by the non-member public has increased.

HUNTING – DESIRED FUTURE CONDITIONS

Maintain and enhance treaty hunting opportunities for enrolled tribal members and sport hunting opportunities for non-native game birds on accessible fee lands within the watershed.

FISHING – EXISTING CONDITION

Fishing is currently restricted to enrolled tribal members in all tributaries to the Umatilla River within the Umatilla Indian Reservation in spring and summer to protect spring Chinook salmon. Catch and release fly fishing for resident trout, using ¼ inch or smaller barbless hooks, is open to non-members September 16 through December 31. There is no salmon or steelhead fishing by non-members on the Umatilla Indian Reservation.

FISHING – DESIRED FUTURE CONDITION

Maintain and enhance treaty subsistence fishing opportunities through increased natural production capability. Maintain existing non-member catch and release fishery.

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PLANT GATHERING – EXISTING CONDITION

The Iskuulpa Watershed offers excellent opportunities for CTUIR members to gather cultural plants.

PLANT GATHERING – DESIRED FUTURE CONDITION

Continue to provide access for cultural uses as protected by federal law. Access periods for CTUIR Tribal members to gather cultural plants will be determined by plant phenology and which particular stage of development is the appropriate gathering time.

NON-CONSUMPTIVE USES – EXISTING CONDITIONS

Educational opportunities in the Iskuulpa Watershed are abundant. With both upland and riparian habitats present, it provides an ideal site for both community and public school education. Natural resources may be studied at different levels of complexity, depending on the age of the student. Habitat restoration projects can be living, working laboratories, where students can study growth patterns as they relate to different propagation techniques, water availability, and soils.

NON-CONSUMPTIVE USES – DESIRED FUTURE CONDITIONS

Diversify public use opportunities at Iskuulpa by providing an array of non-consumptive uses that will accommodate the interests of a broader public and allow visitors to enjoy natural resources at Iskuulpa. Access periods for non-consumptive uses will be primarily driven by the need to provide secure periods and habitats for wildlife.

TRAVEL MANAGEMENT

Travel management addresses the ways and means in which access to the project area for public uses and information is provided. Uses are generally provided through a transportation system that includes parking areas, roads, and trails, and associated facilities, such as kiosks or sign boards, trail markers, interpretative sites, and waste receptacles. In this section, the existing travel management infrastructure will be described, as well as the desired future condition of the necessary infrastructure to provide for the public uses.

Motorized Access – Desired Future Conditions

Motorized access, except for administrative or emergency purposes, will continue to be prohibited during summer steelhead spawning and during periods when the Industrial Fire Precaution Level is III or higher. The restriction includes conventional vehicles (passenger cars/trucks), motorcycles, and all-terrain vehicles. Administrative purposes shall include the access by the CTUIR and its subcontractors in the implementation of protection, enhancement, and operations and maintenance activities, the Bureau of Indian Affairs, and emergency vehicles (fire and ambulance).

Non-motorized Access – Desired Future Conditions

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Non-motorized access will be provided in defined periods for the purposes of hiking, and wildlife viewing/photography. Trail systems will be designed and subject to seasonal closures related to protected habitat and targeted species requirements.

TRANSPORTATION SYSTEM – EXISTING CONDITION

Roads

The Iskuulpa Watershed contains approximately 32 miles roads of surface roads. Roads are divided into primary and secondary classifications. For the purposes of this plan, primary roads are defined as roads that connect directly to public highways or other primary travel routes and comprise the basic network project administrative and management activities. There is one primary road, 3.0 miles in length with a gravel surface, and it is maintained by the Umatilla County Road Department.

Secondary roads branch from primary roads, and are typically usually user-defined, four-wheel-drive vehicle roads. These roads are not system roads maintained and are not maintained by Tribal, State, or County departments. There are approximately 29 miles of secondary roads, and all have a native surface.

Trails – Existing Condition

No formal designated hiking trails or paths currently exist in Iskuulpa.

Trails – Desired Future Condition

Provide hiking trails and/or utilize existing roadways as hiking trails to provide non-mechanized access conforming to seasonal- and habitat-driven restrictions. Restrictions serve to:

- 1) manage and protect wildlife habitat;
- 2) prevent disturbance of wildlife during critical life history stages;
- 3) provide recreational opportunities in keeping with improved stewardship, and managed and protected wildlife habitat.

Proposed seasonal trails are defined in this plan as a 3- to 6-foot wide multi-use, natural trails. Any overhead branches will be trimmed at 8 feet vertical clearance to improve visibility. Designated portions of trails may have an improved surface to accommodate handicapped access. Trails will be impacted by seasonal wildlife or wildlife habitat restrictions. Signs will be placed on this type of trail to identify seasonal limitations. No motorized access will be permitted, except emergency and maintenance vehicles, on any trail. All trails will be interpreted by signage at the parking lot and at intersections to indicate directions and distances.

Transportation System – Landownership

The pattern of landownership, including Tribal mitigation lands, Tribal trust lands, allotted lands, and fee lands compounds the difficulty of transportation system management. Managing secondary roads on allotted lands requires coordination with the Bureau of Indian Affairs, and approval of proposed actions by 51% of the owners on a given allotment.

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Transportation System - Desired Future Conditions

The three miles of primary roads are maintained by the Umatilla County Road Department. Maintenance consists of grading, gravel surfacing, and right-of-way clearance.

Roads no longer necessary for project operations and maintenance will be returned to natural resource production through seeding of perennial grasses, transplanting native shrubs where possible, and allowing for passive recovery of native shrubs. Approximately 8 miles of secondary roads are not necessary for the operations and maintenance of the area. Unnecessary roads are candidates for restoration activities involving the reestablishment of natural vegetation.

When and where possible, travel for project operations and maintenance will be accomplished primarily with All-Terrain Vehicles to reduce wear on roads and vehicles and minimize soil compaction.

A map of the transportation system, including roads proposed for maintenance and restoration, is provided on page 41.

Property Improvements – Existing Conditions

Property Improvements – Desired Future Conditions

General desired future conditions for facilities include:

- Maintain interpretive displays (kiosks, signboards) as needed to provide visitor information.

PROPOSED MANAGEMENT ACTIVITIES

Management activities proposed in this section are intended to address key issues and move the project area towards desired future conditions. Proposed activities include habitat enhancements and protection, operations and maintenance, and public use/access and travel management.

Enhancement activities may be considered those actions designed and undertaken to increase the suitability of habitats above existing conditions. Enhancements will typically include active forms of restoration such as site preparation and planting. Protection activities are generally designed to protect existing habitat values from degradation or prevent disturbance to wildlife. However, protection and enhancement activities may occasionally overlap, such as in the case of livestock exclusion (habitat protection) and subsequent increase in the amount of riparian shrub habitats (enhancement). Operations and maintenance activities address the custodial needs of the project area, such as maintaining the grazing unit boundary fences and monitoring for trespass livestock. Public use and access and travel management includes the implementation of area and seasonal and access restrictions, including means of travel, and installation of facilities and trails necessary for visitor use and education.

ENHANCEMENT AND PROTECTION STRATEGIES

The NPPC Fish and Wildlife Program provides possible criteria linking biological objectives to management strategies (protection, restoration, substitution) based on habitat conditions. The Program identifies four categories of habitat conditions, including intact, restorable, compromised, and eliminated. Implementation strategies will vary depending on the current condition and the restoration potential of the habitat for the species and life stages of interest. For example, if the habitat for a given area is intact, and the biological potential of the target population is high, the area becomes a candidate for protection. If the habitat of an area is restorable, and the biological potential of the targets species is high, the area becomes a candidate for restoration. Table 21 illustrates possible applications of these biological objectives to strategies within the NPPC Fish and Wildlife Program.

Intact habitat: Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat and restore the population of the target species up to the sustainable capacity of the habitat.

Restorable habitat: Where the habitat for a target population is absent or severely diminished, but can be restored without heroic efforts, then the biological objective for that habitat will be to restore the habitat with the degree of restoration depending on the biological potential of the target population. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat.

Where the target population has low biological potential the objective will be to restore the habitat up to the point that the sustainable capacity of that habitat is no longer a significant limiting factor for that population.

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Table 21. Criteria Examples of Possible Strategies (NWPPC Fish and Wildlife Program).

		Biological Potential of Target Species	
		Low	High
Habitat Condition	Intact	Preserve	Preserve
	Restorable	Moderate Restore	Restore to Intact
	Compromised	Low Restore	Moderate Restore
	Eliminated	Substitute	Substitute

Compromised habitat: Where the habitat for a target population is absent or substantially diminished and cannot reasonably be fully restored, then the biological objective for that habitat will depend on the biological potential of the target species. Where the target species has high biological potential, the objective will be to restore the habitat to the extent practicable, and restore the population of the target species up to the sustainable capacity of the restored habitat.

Where the target species has low biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of that habitat is no longer a significant limiting factor for that population.

Eliminated habitat: Where habitat for a target population is fundamentally altered or blocked, and therefore there are no opportunities to rebuild the target population by improving its opportunities for growth and survival in other parts of its life history, then the biological objective will be to provide a substitute. In the case of wildlife, where the habitat is inundated, substitute habitat would include setting aside and protecting land elsewhere that is home to a similar ecological community.

Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat through protection measures. Protection measures will be designed to prevent habitat degradation below existing values. Protection may also be used on sites consisting of “compromised habitat,” as these sites generally possess lower restoration potential, and/or longer restoration periods than “restorable” sites. Active enhancement strategies would be implemented on restorable sites first, then compromised sites. Pending many factors, including vegetation class (forested, shrub, herbaceous), the extent of these sites, species richness, composition, and structural diversity, success of protection and enhancement measures, and appropriate recovery periods, “restorable” habitats may progress into “intact” habitats, and

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“compromised” to “restorable.” A tabular summary of the strategies as they relate to vegetation classes in Iskuulpa Creek is presented in Table 22.

Table 22. Potential Habitat Strategies by Vegetation Class.

Habitat Condition	Description	Cover Type	Biological Potential of Target Species	Habitat Strategy
Intact	Ecological Functions and habitat structure largely intact.	Upland Conifer Forest/shrub	High	Preserve
Restorable	Potentially restorable to intact status without heroic measures.	Riparian Hardwood & Conifer Forest/Shrub/Herb	High	Restore to intact
Compromised	Ecological function or habitat structure substantially diminished.	Grasslands	High	Moderate Restore and Interim Protection

HABITAT PROTECTION

Intact habitat: Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat. Protection may also be used on sites consisting of “compromised habitat.”

Habitat Additions

To increase the amount of protected habitat and increase habitat units, acquisition and incorporation of adjacent or interior land parcels will be pursued during the course of this planning period.

Public Use/Access and Travel Management

For the purpose of this management plan, public use and access and travel management are categorized as protection activities. They are intended to prevent physical damage to habitats and reduce disturbance to wildlife by restricting access during critical nesting periods or regulate use and provide refuge periods during permitted consumptive uses.

Consumptive Uses and Allowable Public Access Periods

Upland Bird Hunting: Opportunities for hunting Rio Grande turkey are provided within state seasons. Specific area access regulations and restrictions related to the hunting opportunity will be posted at the primary access route. Project staff will monitor the watershed prior to and during the hunt season to ensure compliance with access regulations.

Plant Gathering: Plant gathering opportunities will be available during appropriate collection periods based on plant phenology. Walk-in access available to the project interior.

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Fishing: According to Fisheries Program regulations, “catch-and-release fly-fishing with a single barbless hook is allowable during trout seasons on the mainstem Umatilla River and tributaries above Thornhollow Bridge to the upper Reservation boundary.” This would include Iskuulpa Creek.

Prohibited Consumptive Uses

Big game hunting: Big game hunting is closed to non-Indians on the Umatilla Indian Reservation.

Native game bird hunting: Native forest grouse species and dove are closed to non-Indian hunting on the Umatilla Indian Reservation.

Trapping: Trapping will not be permitted at Iskuulpa.

HABITAT ENHANCEMENTS

A variety of enhancement and restoration activities will be incorporated into the Iskuulpa Watershed Management Plan. Activities prioritized for restoration and enhancement in the three-year planning period include sites meeting the definition of “restorable” as provided above. The goals of restoration will be to re-establish diversify the structure and composition of existing native vegetation towards and intact condition. The proposed sites will serve as management experiments for restoring additional shrub steppe habitats at Iskuulpa in the future.

Proposed Restoration Sites

Activities to meet these goals will be implemented in the floodplains of Iskuulpa Creek and its tributaries.

Site Preparation Activities

Over the next five years, several site preparation activities will be implemented on the restoration sites. These activities are designed to remove or reduce competing and unwanted vegetation and prepare seed beds to improve seed and/or plant establishment.

Livestock Removal

Since 1998 2 BIA-administered grazing allotments, containing nearly 20,000 acres and providing approximately 1,056 animal unit months (AUMs), have been purchased and rested from grazing use to provide habitat protection. Livestock grazing was identified as a factor in degradation of grassland, riparian wetland, and in-stream habitats. Healthy riparian wetland vegetation provides habitat for songbirds and other wildlife, stream shading, bank stability, and sediment retention. Riparian vegetation is easily impacted by improper livestock grazing practices.

The watershed will continue to be rested from livestock grazing through this planning period.

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Large Wood Additions

Projects to place large wood into Iskuulpa Creek will be developed to enhance instream habitat. Fish habitat and floodplain forest surveys documented a lack of large woody debris in Iskuulpa Creek and a low numbers of near-term large wood sources in the floodplain. Placement of large woody debris into streams can result in pool creation that may influence the distribution and abundance of juvenile salmonids. Large woody debris also influences the physical form of the channel, retention of organic matter, and biological community composition. Anticipated long-term benefits of such a project include 1) restored natural/stable channel morphology and floodplain function, 2) reduced streambank erosion and sediment transport, 3) improved water quality through decreased summer water temperature, and 4) enhanced in-stream habitat diversity and complexity. Work would be conducted during the in-stream work window and trees would be placed in the stream using a helicopter, to limit disturbance.

Control of Competing and Unwanted Vegetation

A variety of methods could be used to control competing and unwanted vegetation, including noxious weeds. The most effect management programs often include a combination of methods, including mechanical, chemical, biological, and prevention. Annual surveys will be conducted to locate and treat new infestations while they are small and manageable.

Planting

Grass Seeding: Grass seed mixtures will be dominated by native perennial grasses. Seed sources would include native cultivars and seed collected on-site and propagated off-site. Based on the findings and recommendations of ecological reconnaissance surveys and reviews of the Umatilla County Soil Survey, the primary species utilized in upland seeding operations would be bluebunch wheatgrass, Sandberg's bluegrass, and Idaho fescue. Riparian grass seeding would consist of sedge species collected on site. Seed application would be accomplished through a combination of aerial and vehicle (truck and ATV) methods in uplands, and ATV and belt-seeders in riparian areas.

Shrub Planting: Native shrub species would be collected on-site, propagated off-site, and potted for future planting in riparian zones

Tree Planting: Native tree seedlings would be planted using stock collected from appropriate Blue Mountain seed zones. Species utilized would include ponderosa pine and Douglas fir.

OPERATIONS AND MAINTENANCE

Perpetual operations and maintenance (O&M) requirements are reflected in basic, long-term custodial needs for management of the Iskuulpa Watershed. Operation and maintenance needs may be categorized in terms of facilities, trails, wildlife and wildlife habitat management requirements. Facilities and trail O&M would require appropriate personnel, equipment and land management activities which would be funded jointly by CTUIR through a variety of

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funding sources (grants, donations, general funds, etc.). Individual volunteers and supporting organizations will may play a role in accomplishing O&M activities. O&M needs for wildlife and wildlife habitat would include personnel, equipment, land management activities, and miscellaneous management needs. Funding would be provided by the BPA and continue indefinitely through annual funding allocations. Specific activities and needs would be documented and approved by BPA based on the Iskuulpa Watershed Management Plan. Actual O&M costs would be determined on a project-by-project basis and should be based upon actual needs and per acre value estimates assigned to specific habitat types.

Noxious Weed Control

Noxious weeds on the Umatilla County A & B weed list will be controlled through development of subcontracts for survey and control. Surveillance and early detection of listed species is considered a critical component of weed control. Surveys will be conducted on an annual basis by project staff and the selected subcontractor to determine the status of existing infestations and determine if newly listed noxious weed species threaten to infest project area. Noxious weed species of principle concern include sulfur cinquefoil, diffuse knapweed, scotch thistle, and yellow starthistle. A variety of methods would be used for control, including manual, mechanical, chemical, and biological. Prevention of new infestations will be a high priority, with annual weed surveys being conducted to locate new infestations while they are small and manageable.

Fence Maintenance

Fence maintenance will be conducted throughout the year as needed. Fence maintenance will consist of replacing supporting structures such as h-braces, figure four's, and rock jacks, replacing or adding posts, and replacing or splicing and tightening wires. Maintenance will include gates, which may include replacing gates, supporting posts, bolts, and locking devices.

Sign Maintenance

Maps and informational signs will be posted and maintained at the kiosks seasonally to provide visitor information regarding access opportunities and restrictions.

GENERAL ADMINISTRATION

Law Enforcement

It is not permissible to fund law enforcement with mitigation funds. However, project staff will coordinate with tribal law officials in the case of trespass incidences, violations of state and tribal harvest regulations, property damage, and emergency situations.

Fire Protection

Iskuulpa falls within the protection jurisdiction of the Oregon Department of Forestry. Fire protection assessment fees are therefore collected from the project area in property taxing.

MONITORING AND EVALUATION

The NPPC identifies the following as a scientific principle in its Draft Fish and Wildlife Program (August 2000):

“Many of the features of ecological systems counsel against the notion of command and control of the environment. Adaptive management – the use of management experiments to investigate biological problems and to test the efficacy of management directions—provides a model for experimental management of ecosystems. Experimental management does not mean passive “learning by doing”, but rather a directed program aimed at understanding key ecosystem dynamics and the impacts of human actions using scientific experimentation and inquiry.”

Programs designed to include adaptive management must then logically incorporate monitoring and evaluation (M&E). Monitoring and Evaluation of habitat and target wildlife populations will be conducted to evaluate how well management plan objectives are achieved. The monitoring and evaluation portion of this plan identifies tasks related to the biological objectives, identifies who will do the evaluation and on what schedule, what kind of independent review will be incorporated, and the necessary budget for completing the monitoring and evaluation work.

The NNPC set forth the following monitoring and evaluation criteria for wildlife mitigation projects:

1. The project must have measurable, quantitative biological objectives.
2. The project must either collect or identify data that are appropriate for measuring the biological outcomes identified in the objectives.
3. Projects that collect their own data for evaluation make this data available to the region in electronic form. Data and reports developed with Bonneville funds should be considered in the public domain. Data must be submitted within six months of their collection.
4. The methods and protocols used in data collection must be consistent with guidelines
5. approved by the Council. Bonneville, in its contracting process, should ensure that each project satisfies these four criteria.

Habitat, wildlife use, and access and travel management monitoring will be conducted during the five-year implementation of this plan. Habitat monitoring includes measuring changes in structural characteristics and species composition of plant communities. Public access and travel will be monitored to insure that the objective of providing periods of disturbance-free, secure habitat is met and user compliance with access regulations and restrictions is achieved.

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HABITAT MONITORING

Habitat monitoring will be accomplished using the Habitat Evaluation Procedures (HEP) (USFWS 1980) to quantify changes in habitat conditions for the project area. The HEP analyses was completed in 2003 and will be repeated at approximately ten year intervals thereafter. Habitat parameters (variables) measured are dependent on the selected Target Species and associated HEP Model(s). The following habitat variables (V#) are contained in HEP Models for the selected Mitigation Target species.

Table 23. Target species, cover types, and habitat parameters measured.

Target Species	Cover Type	Habitat Variable Measured/Monitored
Blue Grouse (<i>Dendragapus obscurus</i>)	Forest Upland shrub	V1: Canopy cover evergreen & aspen V2: Percent shrub crown cover V3: Average height of shrub canopy V4: Percent herbaceous canopy cover V5: Average height of herbaceous canopy cover V6: Diversity of herbaceous vegetation V7: Distance to forest cover type
Western Meadowlark (<i>Sturnella neglecta</i>)	Shrub-steppe	V1: Percent cover herbaceous plants. V2: Percent cover herbaceous cover composed of grass. V3: Ave. height herbaceous cover. V4: Distance to perch site. V5: Percent shrub canopy cover.
Great Blue Heron (<i>Ardea herodias</i>)	Riparian	V1: Distance between potential nest sites & foraging areas V2: Presence of water body with suitable prey population V3: Disturbance-free zone up to 100 meters around potential foraging areas V4: Presence of tree cover type within 250 m of wetland V5: Presence of 250m (land) or 150m (water) disturbance-free zone around potential nest sites V6: Proximity of potential nest site to active nests
Mink (<i>Mustela vison</i>)	Riparian	V1: % of year surface water present. V2: % tree canopy cover. V3: % shrub canopy cover. V4: % canopy cover of emergent vegetation V5: % canopy cover of trees and shrubs w/in 100 m of wetland's edge. V6: % shoreline cover.
Yellow Warbler (<i>Dendroica petechia</i>)	Riparian	V1: Percent deciduous crown cover. V2: Average height of deciduous shrub canopy. V3: Percent deciduous shrub canopy comprised of hydrophytic shrubs.
Downy Woodpecker (<i>Picoides pubescens</i>)	Forest Upland shrub	V1: Basal area of woody vegetation. V2: No. snags > 15 cm DBH/ha.
Black-capped Chickadee (<i>Parus atricapillus</i>)	Forest Riparian	V1: Percent tree canopy cover V2: Tree height V3: No. snags/ac >4-10" diameter

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Additional habitat monitoring will include ecological reconnaissance surveys, which are designed to monitor changes in the species composition of plant communities. The protocol for the ecological reconnaissance methodology is provided in Appendix B.

Habitat surveys are complemented with photopoints to provide a visual representation of measured habitat values. Photos are generally taken with a 35mm camera and slide film. To insure repeatability, photopoints are staked and recorded with Global Positioning System (GPS) dataloggers. These data points are then converted to themes in Geographic Information System (GIS) software for mapping.

Table 24. Monitoring and Evaluation Elements.

Biological Objective	Unit of Measure	Tasks	Responsible Agency(ies)	Schedule	Independent Review
Provide 4,476 Units of Habitat Protection Credit.	Habitat Units.	1. Conduct HEP surveys for target species. 2. Prepare HEP Analysis and Report.	CTUIR Lead, Interagency HEP Team Review.	Year 2003. 10-Year Interval Thereafter.	Inter-agency HEP Team Review of Protocols, Assumptions, Analysis and Results.
Provide 393 Units of Enhancement Credit.	Habitat Units.	1. Conduct HEP surveys for target species. 2. Prepare HEP Analysis and Report.	CTUIR Lead, Interagency HEP Team Review.	Year 2003. 10-Year Interval Thereafter.	Inter-agency HEP Team Review of Protocols, Assumptions, Analysis and Results.
Increase Diversity of Upland Plant Community Composition.	Percent Cover. Count of Native/ Preferred Species.	1. Conduct Ecological Reconnaissance Surveys. 2. Repeat Plot Photography. 3. Summarize/Report Results.	CTUIR	Year 2005. 5 – 10 Year Interval Thereafter.	USFS or Other Independent Ecologist.
Decrease Noxious Weeds, Competing and Unwanted Vegetation Cover.	Percent Cover.	1. Conduct Cover Surveys. 2. Repeat Plot Photography. 3. Summarize/Report Results.	CTUIR CTUIR	Year 2002, Annually Until 2005. 5-Year Interval Thereafter.	None.
Provide Habitat Security (Disturbance-Free Periods).	Human Presence & Compliance with ATM Restrictions.	1. Provide/Post Access/Travel Mgmt Restrictions. 2. Monitor Visitor Use & Compliance. 3. Summarize/Report Results.	CTUIR	Annually.	ATM Restrictions Reviewed Through Management Plan Scoping Process, ISRP review of project proposal.

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APPENDICES

Appendix A

STAKEHOLDERS LIST

General Council – Confederated Tribes of the Umatilla Indian Reservation

Board of Trustees – Confederated Tribes of the Umatilla Indian Reservation

Various Committees of the Confederated Tribes of the Umatilla Indian Reservation

Natural Resource

Fish and Wildlife

Culture Resource

Appendix B

ECOLOGICAL RECONNAISSANCE SURVEY METHODOLOGY

SAMPLING VEGETATION FOR MONITORING PLANT COMMUNITIES

Introduction

A monitoring location is selected to exemplify a particular plant community, stand, or site. Several locations may be selected to portray the variation within the plant communities across a particular landscape. The decision when and where to locate a sample point for monitoring is made by the investigator for the purposes of a particular project need. This approach will help in the standardization of procedures utilized by the investigator once a decision is made to establish a monitoring point.

Plot Location and Orientation

Take time to locate the plot centers in order to avoid areas with variation due to site disturbance. Patches of disturbance may be included, however, to see how they change over time. In forested stands, old-growth vegetation representing site potential may be sought to serve as a reference point or benchmark to an adjacent monitoring plot located in an area of disturbance. The ecological condition or status of the vegetation is one of the foremost attributes evaluated in the decision as to where a plot should be located. Another rationale for plot center location is the desire for characterization of a specific plant species in relation to the associated vegetation.

Establishment of Permanent Monitoring Point

Each monitoring point, whether followed by extensive or intensive sampling, is important for trend analysis and comparative analysis at two or more points in time. Therefore, it is important to utilize metal stakes, which will withstand the ravages of time, fire, and other possible threats to the existence of the stake. In general, an 18-inch angle iron with 1 to 1-1/4 inch sides is utilized. Ideally this stake should be marked with location or reference information. The stake may be marked by either fixing a tag (which is aluminum) or marking with a letter and number punch. If the primary job is to leave a camera point behind, or conduct a reconnaissance level sampling procedure, the stake will then represent the plot center. Reconnaissance sampling techniques may be conducted in a circular plot:

1. 10.93 meters in radius (which is equivalent to 375 square meters) and 36 feet in radius.

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2. One-tenth acre which is 37 feet in radius. After establishing the distance from plot center, locate a reference object such as a meter pole at the end of this measurement on the contour of the slope. This defines the perimeter of a visualized circle.

Photography of the Reconnaissance Plot

The plot center stake can become a camera point. A general view should be taken from the plot center to the perimeter. Additional photographic views can be taken in a clockwise fashion pivoting from the plot center to capture various views. These views should be recorded by azimuth on a form for future use when revisiting the camera point.

Additionally, it is recommended that a square yard be delineated using folding carpenter rulers at a point 5 feet distant from the plot center stake with the 5 foot mark in the center of the square yard. This square yard defines an area which can be redefined in future years to assess the change in stand structure and composition. More than one can be established to show the vegetation at different locations within the sample area. The locations must be measured for distance from the plot center.

Sampling of the Reconnaissance Plot

The reconnaissance vegetation sample is conducted following the photography by traversing throughout the circular area. A species list is derived in this traverse and upon the conclusion, estimates are made of percent canopy coverage of all principle species found within the area. The estimates should be made to the nearest 5 percent. Additional information taken for the plant community should include surface cover by mosses and lichens, litter, bare ground, rock, gravel, and erosion pavement.

Environmental attributes are measured to conclude the measurement process. Some attributes should always be measured, such as: elevation, aspect, slope, position on the slope, the relief of the site, and the micro relief of the plot. Other information which might be derived if desired, would include: soils information, productivity information, utilization information, down woody material, wildlife signs, etc.

Completing the Sampling Process

After all photography and sampling has occurred, it is now time for the investigator to sit and reflect upon what has been observed at the site and to note those observations accurately and completely in prose on the front of the sampling form. Among the observations made should be the condition of the vegetation, disturbance indicators, additional species occurring in the stand but not located in the sample area, and any other factors influencing the health and vigor of the plant species within the community.

Referencing the Plot

Transect installation and sampling requires a good deal of energy and cost. Therefore, the most important event following this expenditure is to properly reference the permanent monitoring point location so that future investigators can relocate the site and the plot. Before leaving the plot, pinprick an aerial photo and place the appropriate designation of the plot on the back of the photo. Mark a map with the location (preferably a USGS quadrangle). Place location

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information on the plot form. The referencing of the monitoring point in the field should utilize semi-permanent objects located in the periphery of the plot. These include fenceposts, large rocks, and trees. Metal tags appropriate for referencing should be located on trees and fenceposts with rocks being referenced either silently or with paint. A sketch map should accompany the form showing the location of the plot center or the transects in relationship to the referenced objects. The azimuth and distances should be provided from these reference objects to the plot center or the Transect 1 zero end stake.

Appendix C

PLANT ASSOCIATION DESCRIPTIONS

Forested Associations

Grand Fir/Sword Fern-ginger – ABGR/POMU-ASCA3 (*Abies Grandis*/*Polystichum munitum*-*Asarum caudatum*)

Vegetation Composition: Low elevation sites, on steep, northerly slopes near canyon bottoms support this type of the northern Blue Mountains. Grand fir is associated with Rocky Mountain. Maple and a wealth of shrubs. Common snowberry and twinflower are usually abundant. Herbaceous vegetation is dominated by sword fern, ginger, queen's cup beadlily, Hookers fairybells, foamflower and starry Solomon's seal. The sword fern – ginger community reflects the influence of warm, maritime climate in the northern Blue Mountains and a species composition more common in the Cascades.

Typal Comparisons: The presence of Rocky Mountain Maple and Pacific yew here are not indicative of those types using these species as indicators. The indicators of ABGR/POMU-ASCA3 are sword fern–ginger herbs which reflect the environment as a warm, maritime climate. The association flora is more common to the west side of the Cascades to the Blue Mountains.

Successional Relationships: Douglas-fir and larch are seral to grand fir. Reflecting the drier canyon slope influence from adjacent communities are ninebark, oceanspray, and woods strawberry. Wet conditions of the riparian bottoms provide red alder, Pacific yew, and black cottonwood incursions. Shrublands of Rocky Mountain maple, big huckleberry, scouler willow, and Sitka alder may dominate in early seral stages following burns.

Management Considerations: The riparian nature of this type increases its management sensitivity. Appropriate management systems should consider wildlife, watershed, aesthetic, recreational, and biological diversity values inherent to sites supporting the Grand Fir/Sword Fern-ginger association. A diverse habitat provides for bear, deer, elk, grouse, and passerines. Thermal cover for ungulates during summer months may be provided. Forage production for domestic stock is low, although herbage production is high within these wet drainages.

Grand Fir/Cup Beadlily - ABGR/CLUN - (*Abies grandis*/*Clintonia uniflora*)

Vegetation Composition: Grand fir occurs with spruce usually associated. Shrubs are few with big huckleberry (VAME), baldhip rose (ROGY) and twinflower (LIBO2) often present.

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The herbaceous layer contains a variety of plants adapted to cool, moist environments. Queen's cup beadle (CLUN), starry Solomon's seal (SMST), trail plant (ADBI) and foam flower (TITRU) are indicative of this environment.

Typal Comparisons: The tall shrub, AGCL – indicative of the ABGR/ACGL association, is usually absent from the ABGR/CLUN type. VAME may occur but queen's cup beadle beneath the scattered shrubs indicate the mesic-site conditions of this plant association. Sites have moderate soil depth and are among the highest for tree production in the Blue Mountains (ABGR/CLUN is very high in productive potential).

Successional Relationships: Western larch and Douglas-fir usually precede grand fir successional. Principal shrubs which are promoted with surface disturbance on these sites are big huckleberry (VAME), common snowberry (SYAL), Oregon boxwood (PAMY), Rocky Mountain maple (AGCL), spiraea (SPBE), swamp gooseberry (RILA) and Scouler willow (SASC). Disturbance of the herbaceous layer may promote heartleaf arnica (ARCO) strawberries, vetch (VIAM), lupines, bracken (PTAQ), coneflower (RUOC) and golden pea (THMO).

Management Considerations: Silvicultural options to utilize the productive capabilities of these sites are varied dependent upon the succession status of stands and management objectives. Concern for competition with seedlings may be concentrated on seral shrubs promoted by ground disturbance and burning. Composition of late seral stands on some sites may lead to insect defoliation by spruce budworm or Douglas-fir tussock moth and pathogen problems. Notably Indian paint fungus. Later seral and climax stands as well as densely canopied stands produce low amounts of forage for domestic livestock; stands are used for cover and browse by deer and elk. Huckleberries provide food for grouse and bear. Fire leads to dominance by seral tree species, lodgepole pine, Douglas-fir, or western larch. Engelmann spruce is a mid to late-seral tree.

Relationship to Other Studies: Pfister, et al (1977) described ABGR/CLUN with 3 phases in Montana. Steele (1981) and Cooper et al (1987) described ABGR/CLUN in north central and central Idaho. Johnson and Simon (1987) described ABGR/CLUN as the most mesic of the grand fir associations in the Wallowa-Snake classification.

Grand Fir/Twinflower - ABGR/LIBO2 - *Abies grandis*/Linnaea borealis

Vegetation Composition: Grand fir is associated with Douglas-fir, larch, and spruce. Twinflower (LIBO2) is always present. Depending on tree canopy density, big huckleberry may dominate or be absent from ABGR/LIBO2 communities. Herbaceous vegetation is usually scattered at low coverage or in limited patches due to depauperate nature of many sites. The more prevalent shade-tolerant forbs are sidebells pyrola (PYSE), rattlesnake plantain (GOOB) and mitelia (MIST2).

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Typal Comparisons: This type, ABGR/VAME, does not have the subshrub, twinflower (LIBO2), present; VAME may be abundant within the ABGR/LIBO2 association. This type occurs on mid-elevation slopes with moderate ash depths and is perhaps the most widespread plant association of the Blue and Ochoco Mountains.

Successional Relationships: Western larch, lodgepole pine, ponderosa pine, and Douglas-fir are key seral tree species. The PICO/VAME-LIBO2 plant community type is assigned to this plant association. Early seral ABGR/LIBO2 communities may be dominated by shrubfields of big huckleberry (VAME), common snowberry (SYAL), spiraea (SPBE), or pinemat manzanita (ARNE). Disturbed forest understory may result in the promotion of heartleaf arnica (ARCO), pinegrass (CARU), elk sedge (CAGE), meadowrue (THOC), fireweed (EPAN), aster, golden pea (THMO).

Management Considerations: Silvicultural options for these sites are varied dependent upon the successional status of stands and management objectives. Seral shrubs and huckleberry may compete with tree seedlings during establishment following clearcutting. Composition of late seral stands, where tolerant grand fir dominates, promote defoliation by spruce budworm and Douglas-fir tussock moth and pathogen problems (Indian paint fungus). The tree species, PSME, PICO, PIPO, and LAOC are favored by fire – ABGR is susceptible to fire. Little forage is available in late seral or climax standards; browse and cover are provided by big game. Huckleberries are food source for grouse and bear.

Relationship to Other Studies: The ABGR/LIBO2 plant association was described by Hall (1973) in the Blue Mountains, by Pfister, et al (1977) in Montana, by Steele (1981) in central Idaho, by Cooper et al (1987) in N. Idaho, by Clausnitzer and Zamora (1987) in N. Washington, and by Johnson and Simon (1987) in the Wallowas and Seven Devils.

Grand Fir-Rocky/Mountain Maple – ABGR/ACGL - *Abies grandis*/*Acer glabrum*

Vegetation Composition: Grand fir dominates on mountain slopes with Rocky Mountain maple. Engelmann spruce may occur. Shrub layer also contains big huckleberry (VAME). Queen's cup beadle (CLUN) and twinflower (LIBO2) are often associated.

Typal Comparisons: Less mesic than ABGR/POMU and ASCA3 of the low elevations in northern Blue Mountains. In the ABGR/ACGL plant association, the moist-site herbs, POMU and ASCA3, so prevalent in the ABGR/POMU-ASCA3, are absent. The tall shrub, Rocky Mountain maple, is typical of the physiognomy presented by stands of this association. Stands have high timber production capability.

Successional Relationships: Larch and Douglas-fir are seral to grand fir. Occasionally, ponderosa pine may pioneer when the type occurs on seepage sites adjacent to warmer, drier slopes. Shrubfields may precede tree emergence and are dominated by Rocky Mountain maple (ACGL), big huckleberry (VAME), common snowberry (SYAL), Oregon boxwood (PAMY), spirea (SPBE), thimbleberry (RUPA), ninebark (PHMA), and/or oceanspray

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(HODI). Surface disturbance of the forest understory may promote heartleaf arnica (ARCO), strawberries (FRVI, FRVE), vetch (VIAM) fireweed (EPAN), bracken (PTAQ) or golden pea (THMO).

Management Considerations: Where this association occurs on the upland, opportunities for silvicultural treatments are varied; they are lessened when this type occurs as riparian stringers. Post-harvest tall and medium shrub responses indicate considerations of appropriate site preparation and conifer release methods for plantation establishment. The sites provide habitat for bear, grouse, big game, and passerines. Members of the understory readily sprout following fire, Douglas-fir, ponderosa pine, western white pine, larch, and spruce occur as seral trees.

Relationship to Other Studies: Steele (1981) described a ABGR/ACGL habitat type in central Idaho. Johnson and Simon (1987) described the ABGR/ACGL plant association in the Wallowas and Seven Devils.

Douglas Fir/Oceanspray - PSME/HODI - Pseudotsuga menziesii/Holodiscus discolor

Vegetation. Composition: A common community on lower canyon slopes and bottoms in the Northern Blue Mountains. Douglas-fir and ponderosa pine co-dominate over a shrub-grass mosaic in the understory. Oceanspray (HODI). Serviceberry (SYAL), spiraea (SPBE), and common snowberry (SYAL) are the principal shrubs. Pinegrass (CARU) elk sedge (CAGE), Columbia brome (BRVU), woods strawberry (FRVE), and western fescue (FEOC) are the more common herbs.

Typal Comparisons: This plant association is found on moderately warm sites; elevations range lowest of the series and exposures are principally southerly. HODI dominates the tall shrub component; PHMA, if present, has less than 5% coverage. Basal areas, tree productivities, and stockability are the highest of the PSME series for Douglas-fir and ponderosa pine.

Successional Relationships: Ponderosa pine is seral to Douglas-fir. Ungulate disturbance to these communities may provide increased dominance by pinegrass, elk sedge, Oregon-grape (BERE), blue wildrye (ELGL), heartleaf arnica (ARCO), bracken (PTAQ) and long stalked clover (TRLO).

Management Considerations: Silviculturally, a wide range of even-aged and uneven-aged systems are appropriate. Other resource values of individual stands are considerations to limit application. Winter habitat for deer and elk, summer forage for ungulates, aesthetics, and recreation are a few associated with sites supporting this plant association. Plant species are fire-resistant; many resprout readily or, for tree species, are protected by thick bark. Competition from shrubs and grasses should be considered during regeneration activities.

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Relationship to Other Studies: First described by Hall (1973) in the northern Blue Mountains; described by Clausnitzer and Zamora (1987) on the Colville Indian Reservation in northern Washington; and described in the Review Draft for the Yakima Indian Reservation of west central Washington by John and Tart (1986).

Grand Fir/Birchleaf Spirea – ABGR/SPBE - *Abies grandis*/Spiraea betulifolia

Vegetation Composition: Grand fir and Douglas-fir tend to co-dominate. Birchleaf spiraea (SPBE) and common snowberry (SYAL) provide a shrub domination beneath grand fir stands. Pinegrass (CARU), elk sedge (CAGE) and heartfelt arnica (ARCO) are present; often at higher coverages than the shrubs. The ABGR/SPBE plant association has close affinities to the Douglas-fir series vegetation as exemplified by high constancies of species more regularly associated with Douglas-fir plant associations.

Typal Comparisons: The ABGR/SPBE association differs from ABGR/CARU in the occurrence and abundance of spiraea in the former type. The spiraea is the dominant and constant member of a diverse shrub group including snowberry, rose, huckleberry, boxwood, prince's pine, and willow. While these two associations are similar in distribution, ABGR/SPBE appears to have a deeper ash cap and greater soil water-holding capacity than ANGR/CARU. Tree productivities are similar.

Successional Relationships: Larch, Douglas-fir and ponderosa pine are all important seral tree species in this type. Oregon boxwood (PAMY), serviceberry (AMAL), and pinemat manzanita (ARNE) are important seral shrub species. Herbs which tend to increase with soil surface disturbance and ungulate use are northwestern sedge (CACO), heartleaf arnica (ARCO), strawberries, lupines, vetch (VIAM) peavines (LATHY) and long stalked clover (TRLO3).

Management Considerations: Droughty soils, warm aspects, and competition from rhizomatous understory shrubs and herbs are concerns for successful natural and artificial regeneration following harvest activities. Douglas-fir, ponderosa pine, and larch are seral trees in this association. Stand of grand fir and Douglas-fir are susceptible to the insect defoliators, spruce budworm and Douglas-fir tussock moth. Surface fires have historically favored the seral trees and the rhizomatous understory vegetation. There is seasonal use of the understory by both domestic livestock and big game; passerines, grouse, and bear find food in the associated shrubs.

Relationship to Other Studies: Steele (1981) described ABGR/SPBE in central Idaho; Cooper et al (1987) classified ABGR/SPBE as a minor habitat type in north Central Idaho; Johnson and Simon (1987) classified ABGR/SPBE in the southern Wallowa Mountains. Hall (1973) did not describe ABGR/SPBE but included this vegetation within the mixed conifer-pinegrass plant community type of the Blue Mountains.

Douglas-fir/Pinegrass – PSME/CARU - *Pseudotsuga menzeisii*/Calamagrostis rubescens

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Veg. Composition: Ponderosa pine commonly dominates in PSME/CARU stands from its greater fire resistance. Douglas-fir is the climax dominant, however. Common snowberry (SYAL) and creeping Oregon-grape (BERE) are common but in low coverage within the pinegrass-elk sedge dominated ground cover. Heartleaf arnica (ARCO) is the most prevalent forb.

Typal Comparisons: Understory dominance by the rhizomatous grass and sedge, CARU and CAGE, typify stands representing this plant association. Low shrubs, while ubiquitous, are somewhat inconspicuous in the pinegrass dominated understory. Sites supporting this type represent some of the highest elevation occurrences of the PSME series in the Blue Mountains. Most sampled stands had soils with a mantle of volcanic ash. Overstory productivity is moderate.

Successional Relationships: Ponderosa pine is the principal seral tree species. Spiraea (SPBE) and Oregon-grape (BERE) may be more abundant in early seral stands. Pinemat manzanita (ARNE) and ceanothus (CEVE) are pioneers following fire along pinegrass-elk sedge. Peavines (LATHY), vetch (VIAM), tailcup lupine (LUCA) and heartleaf arnica (ARCO) are forbs that increase with disturbance in the type.

Management Considerations: Regeneration activities that consider competition from rhizomatous grasses and sedges, potential pocket gopher populations, wildlife and cattle damage of seedlings, and soil drought are appropriate in the PSME/CARU plant association. Big game and cattle make heavy seasonal use of the understory grasses, sedges and associated forbs. The association recovery quickly from fire; ponderosa pine, pinegrass, and seral shrubs (CEVE and SASC) are promoted by recurrent fire. Buckbrush serves as passerine habitat as well as a nitrogen-fixer for the site.

Relationship to Other Studies: Daubenmire (1968) described the PSME/CARU habitat type in eastern Washington; Hall (1973) incorporated PSME/CARU in the mixed conifer-pinegrass p.c.t. in the Blue Mountains; Pfister, et al (1977) describes PSME/CARU in Montana; (Stoele (1981) considered PSME/CARU a major habitat type in central Idaho; Cooper, et al (1987) found it to be incidental in northern Idaho; Williams and Lilybridge (1983) and Williams, et al (1991), described it in northern Washington. Clausnitzer and Zamora described PSME/CARU on the Colville Indian Reservation. Johnson and Simon (1987) described it in the Wallowas.

Douglas Fir/Ninebark – PSME/PHMA - *Pseudotsuga menziesii*/Physocarpus malvaceus

Vegetation Composition: A steep canyon slope forested community dominated by Douglas-fir with ponderosa pine usually associated; larch is infrequent. Ninebark (PHMA), common snowberry (SYAL), spiraea (SPBE), serviceberry (AMAL), and baldhip rose (ROGY) are the principal shrubs. Principal herbs are pinegrass (CARU), elk sedge (CAGE), woods strawberry (FRVE), and heartleaf arnica (ARCO). Aspect strongly controls the distribution of these communities.

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Typal Comparisons: Physiognomy and composition are similar to PSME/HODI stands but the tall shrub component is dominated by ninebark, not oceanspray. Three productivities are moderate in this association with PIPO, PSME, and LAOC all showing similar potential.

Successional Relationships: Stand replacing fir has been principal modifying event. Stands are replaced with shrubfields dominated by ninebark, oceanspray, Scouler willow, Rocky Mountain maple, cherry, and serviceberry. The pinegrass-elk sedge stand may also be promoted by tree-replacement burns. Forbs exhibiting an increase with fire in PSME/PHMA are fireweed (EPAN), peavines (LATHY), vetch (VIAM), heartleaf arnica (ARCO), and asters.

Management Considerations: Steep slopes and shrub grass competition create concerns for timber management. Silvicultural operations that consider stocking requirements, operability constraints, and animal-related problems are applicable in this type. Plant species are fire-resistant and post-fire recovery occurs relatively quickly in most situations. Fire will promote shrubfields with a grass-sedge mosaic. These plants are rhizomatous and competition is intense. Very difficult to regenerate trees in less than 10 years. These early successional communities provide valuable browse for deer and elk. Older stands provide hiding or thermal cover. A relatively droughty forest; mistletoes and root rots are common.

Relationship to Other Studies: Described in eastern Washington by Daubenmire (1968); by Hall (1973) in the northern Blue Mountains; by Pfister, et al (1977) in Montana; by Steele (1981) in central Idaho; by Cooper et al (1987) in northern Idaho; by Williams and Lilybridge (1983) and by Clausnitzer and Zamora (1987) in northern Washington; and by Johnson and Simon (1987) in the Wallowa Mountains.

Douglas Fir/Common Snowberry – PSME/SYAL - *Pseudotsuga menziesii* /*Symphoricarpus albus*

Vegetation Composition: Douglas-fir and ponderosa pine are common on these sites: ponderosa pine may dominate (but Douglas-fir demonstrates potential to succeed). Common snowberry (SYAL) and spiraea (SPBE) form a shrub layer, elk sedge (CAGE) and pinegrass (CARU) dominate the herbaceous vegetation. Baldhip rose (ROGY), creeping Oregon grape (BERE) and serviceberry (AMAL) are prominent shrubs at low coverage.

Typal Comparisons: This plant association is characterized by the occurrence and abundance of rhizomatous low shrub layer dominated by common snowberry on warm, mesic sites. Tree productivities, basal area, and stockability are similar to the psme/phma plant association.

Successional Relationships: Ponderosal pine generally precedes Douglas-fir as the principal seral tree species. Forbs abundant in early seral stages are asters, peavines, heartleaf arnica (ARCO), tailcup lupine, (LUCA) vetch (VIAM), strawberries, and medowrue (THOC).

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Smooth brome (BRIN), mountain brome (BRCA) and Kentucky bluegrass (POPR) often increase with disturbance.

Management Considerations: As in the Douglas-fir/tall shrub association, competition from rhizomatous understory vegetation (syal, spbe, caru, and cage) and animal use are factors to consider in choosing appropriate timber management systems. Plant species are fire-resistant, recurrent fire promotes ponderosa pine and pinegrass on this type. Animal use is high – deer, elk, cattle, grouse, and passerines all utilize this habitat seasonally.

Relationship to Other Studies: Described by Daubenmire (1968) in eastern Washington; by Pfister, et al (1977) in Montana, by Steele (1981) in central Idaho; by Cooper, et al (1987) in northern Idaho, Williams and Lilybridge (1983) in north central Washington; Willimas, et al (1991) and Clausnitzer and Zamora (1987) in northeast Washington. Johnson and Simon (1987) described PSME/SYAL in the Wallowas of northeast Oregon.

Ponderosa Pine/Common Snowberry – PIPO/SYAL - *Pinus ponderosa*/Symphoricarpus albus

Vegetation Composition: Ponderosa pine is climax; Douglas-fir may occur at low coverage. Common snowberry, spiraea (SPBE), baldhip rose (ROGY) and serviceberry (AMAL) are principal, shrub components. Elk sedge is the principal herb. Shrubs are usually present at lower coverages unless the understory has been disturbed.

Typal Comparisons: PIPO/SYAL occurs at the lowest mean elevation of any PIPO plant association (3,995 ft). It occurs principally in the north and central Blue Mountains on gentle to steep slopes at all slope positions. It occurs on deep soils over varying geologic substrates. The PIPO/SYAL community occurs on the deepest soils of any PIPO series vegetation and is considered the most mesic of the PIPO plant associations. Site index, stockability, and the productivity index are the highest of the PIPO series.

Successional Relationships: Mountain brome (BRCA) and blue wildrye (ELGL) are grasses that tend to increase disturbance. Forbs which may be more abundant at lower seral stages are vetch (VIAM), heartleaf arnica (ARCO), tailcup lupine (LUCA) and yarrow (ACMIL).

Management Considerations: Tree regeneration success is limited by SYAL, CARU, and CAGE competition. Clumps of pine regeneration can cause stagnation requiring stocking level control. Ungulate use is high (proximity is to adjacent bunchgrass). CARU used late in season after frost; SYAL use is high by deer, elk, grouse, and passerines. Often used for bedding and shading. Fire promotes CARU, PIPO regeneration and bunchgrasses. Use of prescribed fire promotes vigor of rhizomatous shrub, grass, forb species. Additionally, fire maintains community vigor and develops the unevenaged character of the PIPO/SYAL plant community. This one of the highest herbage producing plant association of the ponderosa pine series.

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Relationship to Other Studies: The PIPO/SYAL habitat type was described by Daubenmire (1968) in eastern Washington and northern Idaho; Pfister, et al (1977) in Montana; Steele (1981) in central Idaho; Johnson and Simon (1987) in the Wallowa-Snake of northeast Oregon; Clausnitzer and Zamora (1987) on the Colville Indian Reservation of northern Washington.

Upland Shrub Associations

Common Snowberry- Rose - (SYAL-ROSE) - *Symphoricarpus albus*/Rose spp.

These stands appear to have increased throughout the canyonlands of the Blue Mountains. This increase may be the result of fire removal from the ecosystem or as a response to overgrazing of deep-soil mesic grassland communities (i.e. Idaho fescue – prairie junegrass FEID-KOCR). It is also possible that the shrubs are responding to more favorable moisture, indicating either a wetter period of a climatic cycle, a change in distribution, timing of precipitation, or a combination of all three factors. These shrublands are not considered to be future ponderosa pine – common snowberry forest communities.

The amount of herbage produced in these communities is inversely related to canopy cover of the dominant shrubs. Dense common snowberry – rose shrub communities produce very little herbaceous forage. However, very early seral communities with low shrub cover may produce substantial amounts of forbs and grasses. Browse production by snowberry can also be significant in all seral stages.

These shrublands provide a diversity for wildlife habitat (i.e., browse, hiding cover). Common snowberry is palatable to cattle and big game. It can withstand normal grazing well, but heavy grazing will eradicate it. Periodic heavy grazing of some stands may promote production of favorable grasses.

Common snowberry is resistant to fire and sprouts vigorously after burning. Roses are moderately resistant to fire and develop basal sprouts following fire.

Ninebark – PHMA - *Physocarpus malvaceus*

Vegetation Composition – The PHMA-SYAL shrubland may be the result of stand replacement fire in the PSME/PHMA communities or may be the result of severe competition imposed by ninebark to thwart tree establishment. The PHMA-SYAL shrubland may contain ponderosa pine and/or Douglas-fir trees at low coverage. Ninebark (PHMA), common snowberry (SYAL), oceanspray (HODI), spiraea (SPBE), and serviceberry (AMAL) are the most common shrubs of the community type. Roses, cherries, Rocky Mountain Maple (ACGL) and syringe (PHLE2) are often present. Beneath the shrubs, herbaceous growth is restricted. Elk sedge (CAGE) and Bluebunch wheatgrass (AGSP) occur from adjacent communities.

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Typal Communities – Ninebark-snowberry shrublands occur primarily in the northern Blue Mountains on steep canyon slopes at upper, mid, and lower slope elevations. Soils are deep loess and ash over basalt. Sampled elevations ranged from 1,750 to 4,775 feet (mean = 2,635).

Successional Relationships – Fire periodically consumes PHMA-SYAL shrublands. Most of the associated shrub species resprout basally following fire, quickly returning the shrubland to vigorous growth. Cyclic fire events may help discourage tree establishment. Initial pioneering plants following fire are varileaf phacelia (PHHE), fireweed (EPAN) and annual bromes. Rocky Mountain maple presence indicates a moist phase of this type.

Management Considerations – Principal use is for big game cover and shading. These communities provide wildlife habitat and add diversity to the canyon landscape. Silvicultural activity may be cost ineffective based on the intense shrub competition and difficulty of access. Value to watershed for slope stability and water quality is high.

Grassland Associations

Bluebunch Wheatgrass/Sandberg's bluegrass – AGSP/POSA - *Agropyron spicatum*/*Poa sandbergii*

The bluebunch wheatgrass/Sandberg's bluegrass association represents one of the highest elevational extensions of the AGSP-POSA3 communities. The highest bluebunch wheatgrass (mean: 54%) and Sandberg's bluegrass (mean: 7%) cover among these communities is usually found in late seral communities on basalt substrates.

Perennial grasses and forbs common to this plant association include yarrow, creamy buckwheat, and biquitroots.

When these communities degenerate, bluebunch wheatgrass and mosses decline. Early seral stages may show greater frequency of annual bromes (BRBR, BRTE), yarrow, arrowleaf balsamroot, tall annual willowweed, deerhorn, and blepharipapus. Sandberg's bluegrass is not able to persist well on steep slopes, and becomes less frequent as the slope length increases down from ridge tops.

Hot range fires and severe over-grazing by cattle will often promote dense homogeneous stands of cheatgrass in this type. If the bunchgrass seed source is not lost, these sites may succeed to the bluebunch wheatgrass/Sandberg's bluegrass domination again, but only after a very long period of time (estimate: 50 to 100 years).

Overall herbage production is moderately high in this association. However a significant decrease in production for all forage species may occur in early seral communities.

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Cattle prefer bluebunch wheatgrass in these communities. They may also reduce the amount of Sandberg's bluegrass in the type through overgrazing and trampling. Sheep tend to utilize cheatgrass, the primary increaser in these communities. On sheep range, Sandberg's bluegrass may tend to increase as a result of sheep usage where preference is to competing succulent annual vegetation.

Bluebunch wheatgrass is the species to manage since it supplies a majority of the total forage produced and is the most preferred species for both domestic and wild ungulates. Utilization by winter grazing livestock should cease prior to onset of the boot stage (usually in May to early June). Use on summer ranges should be initiated following the flowering period of bluebunch wheatgrass.

Annual bromes in this association provide early spring grazing forage, especially in early seral communities where cheatgrass may dominate and desirable perennials are fewer. Fire cannot be used to convert annual brome stands to native bunchgrass vegetation. To reclaim perennial bunchgrasses herbicidal use, plowing under of the annual grasses and re-seeding with wheatgrass will be required.(Johnson son and Simon, 1987).

Management Considerations – Light burns occurring after seed maturity can enhance the competitive ability of Bluebunch wheatgrass. Where cattle, deer and elk graze, and use is heavy, Sandberg's often declines from continued overgrazing and trampling. Early season use on steep slopes can also negatively impact the smaller Sandberg's bunchgrasses. Especially impacted are the south slopes where elk and deer congregate in early spring when soils are saturated with moisture and plants are prone to damage. Plant loss from uprooting due to use by animals and slope movement is especially high at this time.

Idaho Fescue/ Bluebunch Wheatgrass – FEID/AGSP - *Festuca idahoensis*/Agropyron spicatum

This plant community is transitional between the Idaho fescue/bluebunch wheatgrass communities of the steep canyon slopes and the Idaho fescue/ (kocr) or Sandberg's bluegrass-(DAUN) gentle ridgetop communities. It is likely that associations on these ridgetops are a result of overgrazing with subsequent soil loss such that the junegrass union of plants is unable to persist in the droughtier environment. These transitional Idaho fescue/bluebunch wheatgrass communities usually occur adjacent to thinner soil sites dominated by Sandberg's bluegrass-DUAN, other communities to droughty for fescue, or deeper soils dominated by GEID-KOCR communities. The occurrence of significant dry rocky site plants in a fescue community is significant. Onespike oatgrass occurring with fescue is very indicative of this type.

Total forage production in late seral communities is only slightly more that that measured in POSA-DAUN scablands. Bluebunch wheatgrass and Idaho fescue provide most of the forage in later seral stages. Very early seral communities typically provide half as much total forage with fescue often completely absent.

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Trampling damage may be most severe in saturated soils early in the season resulting in compaction and/or plant upheaval. Repeated heavy use of these gentle slopes by wild and domestic ungulates at the early spring period may create retrogression. The principal increaser for the type is silky lupine which is toxic when seeds and fruits are eaten in quantity by cattle, horses, or sheep. These transitional communities are easily degraded with minimal use owing to their scant vegetative cover and location on wind-swept ridgetops. Fire may be difficult to use owing to the uneven nature of bunchgrass and the consequent difficulty in achieving consistent fire spread.

Degraded stands (overgrazing, rotational slumping) often show increases in annual bromes, bulbous bluegrass, Kentucky bluegrass, lupines, fleabanes, phlox, yarrow, creamy buckwheat, red avens, cinquefoils, and milkvetches. Balsam roots and mule's ears form extensive stands on some sites that have been severely overgrazed.

Early grazing may deter seed formation and be detrimental to bunchgrass vigor if continued over several seasons. Early seral stages are likely from continued grazing on gentle slopes and ridgetops. More diverse mid-seral vegetation may be promoted by dual use of fire and grazing to achieve increased forbs and annual vegetation.

Floodplain/Riparian Communities

Grand Fir/Rocky Mountain Maple (Floodplains) -ABGR/ACGL - *Abies grandis*/Acer glabrum

Physical Environment - The grand fir/rocky Mountain maple-floodplain plant association occurs on low to mid-elevation streambanks, floodplains, and terraces in the northern and central portions of the study area. Elevations range from 2500 to 4500 feet. Low to moderate gradient, V-shaped valleys over 1000 feet wide. Soils are silt loams, sandy loams, and clay loams over gravel and cobbles. Depth to this coarse alluvium varies from 4 to 16 inches. Stream types identified include Rosgen's A2a, A4, B2, B4, C3, and C4 types. Stream widths range from 1-50 feet.

Vegetation Composition - Grand fir dominates the overstory in climax stands of the ABGR/ACGL-Floodplain association. Engelmann spruce is a late-seral overstory component with Douglas-fir, ponderosa pine, and western larch occurring earlier in the (Clausnitze 1992). A diverse group of tall shrubs is characterized by Rocky Mountain maple. Mallow ninebark is a late-seral/minor climax shrub on some sites. Common snowberry, bald-hip rose, Lewis' mockorange, and western thimble-berry are occasionally abundant. Western serviceberry, birch-leafed spirea, and oceanspray are common or well represented on about half the sites. While herbaceous richness is high in this association, most species have low abundance individually, Sweet-scented bedstraw is constant in the understory with mean coverage of 4%. Mountain sweet-cicily, woods strawberry, starry false-solomon's seal, trail plant, stream violet, heartleaf arnica, and baneberry are often associated in the understory.

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Management Considerations - Rocky Mountain maple is an important browse species for wild ungulates and provides food cover for birds, squirrels, and chipmunks (Uchtyil 1989). Associated shrubs provide similar habitat for wildlife. These shrubs hinder rapid tree establishment in post-harvest communities. Silvicultural systems should consider appropriate treatments to affect plantation establishment. Streamside stands provide shade, woody debris, and stream bank stability for associated fish habitat.

USDI Wetland Classification

System – Palustrine

Class - Forested Wetland

Subclass - Needle-leaved Evergreen

Water Regime - (nontidal) Temporarily Flooded to Intermittently Flooded.

Other Studies

The ABGRT/ACGL-Floodplain is defined as the riparian element of the ABGR/ACGL plant association (Steele and others 1981, Johnson and Simon 1987, Johnson and Clausnitzer 1992).

Douglas-fir/Common Snowberry (Floodplains) - PSME/SYAL

Psedostuga menziesii* /*Symphoricarpus albus

Physical Environment

The Douglas-fir/Common Snowberry-Floodplain plant association was found in the northern portion of the study area at elevations from 3300-4500 feet. Floodplain and terrace sites are located in very narrow to very broad V-shaped valleys from 15 to 1000 feet wide. Low (1%) to very high (10%) gradient valleys were sampled. Soils generally consist of fine textured silt loam and loams over sandy loams, coarse sands, gravels, and cobbles. Distances from the surface to coarse alluvium range from 8 to 31 inches. Adjacent streams are 1 to 30 feet wide and classified as B3, C2, C3, or F4 stream types.

Vegetation Composition

This floodplain association is dominated by Douglas-fir in the overstory. Seral tree species such as ponderosa pine or western larch are important overstory components in successional stands. Common snowberry is the most abundant shrub species under late-seral or climax conditions. Two species are abundant in seral tall shrub layers: water birch and black hawthorn. These shrubs will diminish in importance as stands move successional toward Potential Natural Vegetation. Red-osier dogwood, bald-hip rose, and western thimbleberry are important shrub components of this plant association. Sampled stands generally consist of mountain sweet-cicely, broad-petal strawberry, yarrow, northern bedstraw, and sweet-scented bedstraw in the forb layer. Important grasses and sedges include blue wildrye, orcutt brome, Kentucky bluegrass, western fescue, elk sedge, and Dewey's sedge.

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Management

The PMSY/SYAL-Floodplain plant association provides habitat for an assortment of wildlife species. Passerines, grouse, woodpeckers, deer, elk, squirrels, chipmunks, cattle all utilize this habitat seasonally (Johnson and Clauksnitzer 1992). In addition, this streamside association provides shade, streambank stability, and woody debris for fish habitat in adjacent streams. Overuse by grazing animals will lead to reduction of snowberry abundance and an increase in Kentucky bluegrass. Some overgrazed sites are characterized by abundant western blue flag. Plant community components are fire-resistant and will resprout following fire. Insects and disease may impact overstory trees stressed by recurrent drought.

USDI Fish and Wildlife Service Classification

System – Palustrine

Class - Forested Wetland

Subclass - Needle-leaved Evergreen

Water Regime - (non-Tidal) Temporarily Flooded to Intermittently Flooded.

Other Studies

The PSME/SYSAL-Floodplain plant association has not been described.

Black Cottonwood/Common Snowberry – Floodplains - POTR2/SYAL ***Populoides trichocarpa/Symphoricarpus albus***

Physical Environment – This type occurs on low elevation, gentle terraces along major rivers and streams. Valley widths are usually broad (300 – 1,000 feet), but this type has been sampled in the moderate width valleys of 100 feet. The community occupies deep alluvial soils of fine-textured surface horizons with sands, gravels, and rocks below. Sites are flooded infrequently, and the water table was below soil depths sampled on study plots. Mottling was evident, however, in one profile. Plots occurred along B2, C1, C4 and D3 Rosgen stream types. Stream widths varied from 5 – 100 feet.

Vegetation Composition – Black cottonwood dominates a tree overstory with conifers present in all layers. While irregular in occurrence, the conifer species (ponderosa pine, Douglas-fir, and grand fir) may indicate community potential on these terrace sites. The shrub component is dominated by common snowberry with scattered black hawthorn and western serviceberry creating a diverse shrub canopy beneath the cottonwood. The black hawthorn is seral in this community but may form climax riparian stringers at lower elevations. Starry false-solomon's seal is a regular member of the herbaceous understory. Less common in occurrence is butterweed groundsel, cowparsnip, sweet-scented bedstraw, and western meadowrue. Kentucky bluegrass, blue wildrye, and red fescue are abundant where they occur in the understory.

Management Considerations – The shrub understory of this community type provides nesting habitat and food for both nongame and game birds while the overstory is used by woodpeckers, raptors, and other bird species for foraging, nesting, and roosting (Snyder

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1991). Understory cottonwood and shrubs are browsed by both domestic and wild ungulates. Continuous and severe grazing results in a decline in the snowberry component while Kentucky bluegrass increases in abundance. The overstory of cottonwoods will decline in vigor over time unless management alternatives are developed to maintain the seral nature of these stands.

USDI Fish and Wildlife Service Wetland Classification

System – Palustrine

Class – Forested Wetland

Subclass – Broad-leaved deciduous

Water Regime – (nontidal) Intermittently flooded.

Ponderosa Pine/Common Snowberry-Floodplains – PIPO/SYAL

Pinus Ponderosa/ Symphoricarpus albus

Physical Environment

The ponderosa pine/common snowberry-floodplain association occurs on floodplains and terraces throughout the study area. It is found principally from 2800 to 5300 feet in elevation in V-shaped, trough-shaped, or flat-shaped low gradient valleys. Valley widths range from very narrow (15 feet) to very broad (>1000). Soil texture varies from silt loams to sandy clay loams over sands, cobbles, and stones. Depth to cobble and stones ranges from 15 to 24 inches. Mottling was present in one-half of the sampled soil profiles. The water table was 27 inches below the surface in June-July. Rosgen stream types of B2, B3, B5, E3, and F4 were identified and stream widths varied from 5 to 30 feet.

Vegetation Composition

Stands representing this association are dominated by ponderosa pine in the overstory and common snowberry in the shrub layer. Other trees occur rarely; Douglas-fir, grand fir, and quaking aspen are scarce and western juniper occasionally well represented. Black hawthorn, a persistent early-seral shrub of this association, is abundant on some plots. The herbaceous layer is dominated by Kentucky bluegrass, a naturalized Eurasian grass. Yarrow, broad-petal strawberry, northern bedstraw, northern cinquefoil, starry false-solomon's seal, and blue wildrye are occasionally well represented in the understory.

Management

This type is similar to the PIPO/SYAL plant association described in upland classifications, but is separated by its occurrence in stream bottoms and the occurrence of more mesic-site species (i.e., meadow rue and starry false-solomon's seal) in the community. These floodplain communities provide important habitat for deer, elk, game birds, songbirds, and woodpeckers. The streamside association may be a valuable source of shade, woody debris, and stream stability for fish habitat. Livestock use the understory layer and can cause common snowberry to decline if a pattern of overuse is established (Kovalich 1987). Kentucky bluegrass will eventually dominate such communities.

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USDI Wetland Classification

System Classification – Palustrine

Class - Forested Wetland

Subclass - Needle-leaved Evergreen

Water Regime (NON-TIDAL) - Temporarily Flooded to Intermittently Flooded.

Other Studies

The PIPO/SYAL-Floodplain plant association was described for central Oregon by Kovalich (1987). It appears related to the PIPO/PRVI habitat type of Hansen and others (1991).

Black Hawthorn – CRDO - *Crataegus douglasii*

Physical Environment

The black hawthorn community type was sampled at low to moderate elevations in the Wallowa Mountains (Wallowa Valley and Pine RDs and Hells Canyon NRA Wallowa-Whitman NF). Valleys in which the black hawthorn community type occurs are low to gradient (1-7%), moderately wide, and V- or flat-shaped with moderately step to steep side slopes. Fluvial surfaces are terraces, floodplains, and most basins. Soils and Mollisols, Andisols, Entisols, and Inceptisols, consisting of silt loam to loamy gravel mineral material that ranges from 0 to more than 60 cm deep over the old stream bed. These sites are infrequently flooded as the water table is 2-5 ft. below the soil surface by mid summer. Rosgen stream types of adjacent streams are A3, B3, B4, C2 and C3. Streams are 5-30 ft wide with less than 10% of the active channel affected by woody debris.

Composition - The black hawthorn communities that were sampled are disturbance-induced seral stages of various shrub and forest plant associations. Black hawthorn forms dense thicket over shrub understories of common snowberry, alder-leaved buckthorn, or mallow ninebark. These understory shrubs may indicate the potential vegetation on the site (e.g., ALIN/SYAL, PSME/SYAL, PIPO/SYAL, PSME/PHMA). Herbaceous species include sweet-scented bedstraw, mountain sweet-cicely, woods' strawberry, western meadowrue, feathery Solomonplume, blue wildrye, and Kentucky bluegrass. The grasses often increase in cover with grazing under these strands. Black hawthorn may be a climax species in non-forested landscapes.

Management - Total dry herbaceous biomass ranged from 100 to 2301 (avg. 962) lbs/acre. Black hawthorn foliage is readily eaten by livestock when it is available (Habeck 1991). Common strawberry is browsed by deer, elk, and cattle. It is a nutritious species for cattle late in the season but probably sustains the least damage if grazed in the spring. Common snowberry reproduces mainly by rhizomes and can increase or decrease following heavy grazing depending on the season and yearly moisture conditions (Snyder 1991). Mallow ninebark is little browsed by livestock and wild ungulates (Habeck 1992).

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Although the above-ground plant parts of black hawthorn are killed by even low intensity fires, some plants may survive and resprout from the root crown. Fire can be used to reduce or contain a black hawthorn population (Habeck 1991). Fires of low to moderate intensity will generally cause snowberry to sprout vigorously from its rhizomes. Severe fires may kill snowberry plants (Snyder 1991). Mallow ninebark is fire resistant and will resprout vigorously from horizontal rhizomes following fire (Habeck 1992).

Black hawthorn is a valuable source of food and cover for wildlife. Fruits are eaten by blue and sharp-tailed grouse, mule deer, and small mammals. The dense branching in a hawthorn thicket provides good nesting for black-billed magpies and thrushes, long-eared owls, and other birds. Mice, voles, deer, and birds use hawthorn thickets for hiding and thermal cover (Habeck 1991). Snowberry provides good nesting cover for small mammals and many birds including grouse, wild turkeys, and various songbirds. The fruits are eaten by quail, pheasant, grouse, and other animals (Snyder 1991).

USDI Fish and Wildlife Service Wetland Classification

System - Palustrine

Class - Scrub-shrub

Subclass - Broad-leaved Deciduous

Water Regime - (non-tidal) Temporarily Flooded to Intermittently Flooded.

Other Studies

Hansen and others (1991) described a *Crataegus succelenta* community type for Montana that includes *Crataegus douglasii* stands and is essentially the same community type as that described above.

Appendix D

EXISTING VEGETATION THEME PROPERTIES

EVEG99_1 Existing Vegetation

Feature Class: polygon, originally grids

Data source, date, and scale: Thematic Mapper Imagery, July, 1998

Data extent: all lands in Umatilla County, with a one mile buffer (all ownerships)

Data Confidence: good (see narrative)

Locational Confidence: excellent (see narrative)

Stable base used, date, and scale: 1:24,000

Date data transferred to base:

Projection: UTM 11 (original)

Name of final approval/approver: Scott O'Daniel

Resource responsible for updates: Scott O'Daniel

Vegetation Classification Scheme

Classification Scheme:

Size/structure:

Non-Forested

- 1.) Water
- 2.) Rock, Sparsely Vegetated
- 3.) Snow
- 4.) Herbaceous/Grass
- 5.) Agriculture
- 6.) Developed
- 7.) Shrub

Single Story:

- 8.) Seed-Sap
- 9.) Pole
- 10.) Small
- 11.) Medium
- 12.) Large
- 13.) X-Large

Multi-Storied:

- 14.) Pole/MS
- 15.) Small/MS

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- 16.) Medium/MS
- 17.) Large/MS
- 18.) X-Large/MS

Species:

- 1.) Water
- 2.) Rock, Sparsely Vegetated
- 3.) Snow
- 4.) Herbaceous/Grass
- 5.) Agriculture
- 6.) Developed
- 7.) Dryland Shrubs 25-65%
- 8.) Dryland Shrubs 66-100%
- 9.) Riparian Shrubs 25-65%
- 10.) Riparian Shrubs 66-100%
- 11.) Douglas Fir
- 12.) Ponderosa Pine
- 13.) Lodgepole Pine
- 14.) Western Larch
- 15.) Englemann Spruce
- 16.) True Fir
- 17.) Wet Mix
- 18.) Dry Mix
- 19.) Juniper
- 20.) Hardwood
- 21.) Conifer/Hardwood Mix

Crown Closure

- 1.) Non-Forested
- 2.) 11-35%
- 3.) 36-60%
- 4.) 61-80%
- 81-100%

Classification Key:

Size/Structure:

Following are the tree diameters ranges corresponding to the size/structure classes identified in the classification key below:

Seedling-Sapling(SD-SP)	0-4.9" dbh
Pole (PL)	5.0 - 9.9" dbh
Small (SM)	10.0 - 14.9" dbh

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Medium (MD)	15.0 - 19.9" dbh
Large (LG)	20 - 29.9" dbh
X-Large (XL)	30" + dbh

Non Forest - If the total tree crown closure is $\leq 10\%$
then the site is labeled with the appropriate Non Forest class

Canopy Layer - After making a call for total tree crown closure, allocate the percent cover into three layers by dividing the height of the tallest trees into 3 equal parts. The sum of the layers must equal the total tree crown closure.

If $> 85\%$ of the total tree crown closure is present in one canopy layer then single-story ELSE Multi-storied.

Single-Story

If $> 50\%$ of the total tree crown cover is in a single diameter class choose class for a label.

Else if $\geq 70\%$ of the total crown cover is in two adjacent classes choose the label based on the largest crown closure contribution. In cases of tie, choose the largest diameter class.

In cases where three adjacent diameter classes combine to make $\geq 70\%$ total tree crown closure choose the label based on the largest closure contribution. In cases of ties, choose the largest diameter class.

Multi-Storied (MS)

If X-Large (XL) $\geq 15\%$ crown cover,	then	X-Large
Else If Large (LG) $\geq 15\%$ crown closure,		
or if $\geq 25\%$ crown cover in LG and XL	then	Large/MS
ELSE If Medium (MD) $\geq 15\%$ crown cover <u>or</u>		
$\geq 25\%$ crown cover in MD.....XL	then	Medium/MS
ELSE If Small (SM) $\geq 15\%$ crown cover <u>or</u>		
$> 25\%$ crown cover in SM.....XL	then	Small/MS
ELSE If Pole (PL) $\geq 15\%$ crown cover <u>or</u>		
$> 25\%$ crown cover in PL.....XL	then	Pole/MS
ELSE choose the label based on the largest closure contribution		
IF SEED-SAP THEN SEED-SAP/SS		

Species:

Sites are described by percentage tree crown cover by species class as seen above (i.e., as seen from an aerial photo). Total crown cover can not exceed 100%.

Sites with $< 11\%$ total tree crown cover are considered Non Forest. This includes both sites that do not naturally support tree crown cover and managed sites with less than 11% tree crown cover.

If total tree crown cover is $< 11\%$

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then if $< 25\%$ herbaceous/grass or shrub

Label either

Water

Rock, Sparsely Vegetated

Snow

Agriculture and Developed as appropriate.

Else if $25\% - 65\%$ dryland shrub crown closure label as

Dryland Shrubs 25-65%

Else if $> 65\%$ dryland shrub crown closure label as

Dryland Shrubs 66-100%

Else if $25\% - 65\%$ riparian shrub crown closure label as

Riparian Shrub 25-65%

Else if $> 65\%$ riparian shrub crown closure label as

Riparian Shrub 66-100%

Else if $\geq 25\%$ herbaceous/grass crown closure label as **Herbaceous/Grass**

If total tree crown closure is $> 11\%$

Then $\geq 80\%$ of the total tree crown closure is in hardwood species then

Hardwood

Else if $\geq 50\%$ of the total tree crown closure is in hardwood species then

Conifer/Hardwood Mix

Else if $\geq 80\%$ of the total tree crown closure is in a single conifer species then label becomes that single species.

Else if 30-80% of the total tree crown closure True Fir then

Wet Mix

Else if $< 30\%$ True Fir of the total tree crown closure and
(PP+DF+WL+LP) of the total tree crown closure $\geq 50\%$ then

Dry Mix

Else Other Conifer Mix

Crown Cover:

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Crown cover will be classified according to the sum of all conifer crown cover plus crown cover of hardwood species > 5" dbh. However, if there is > 11% total crown cover in pole of larger hardwood, then all hardwood (including those < 5" dbh) are considered as trees and tallied accordingly.

Shrub Types:

A. Major Eastern Oregon Dryland Shrubs

1. Bitterbrush
2. Manzanita
3. Ceanothus
4. Mt Mahogany
5. Low Sagebrush
6. Stiff Sagebrush
7. Big Sagebrush
8. Silver Sagebrush
- Ninebark
- Snowberry
- Spiraea
- Big huckleberry
- Low huckleberry

B. Major Eastern Oregon Riparian Shrubs

1. Plum
2. Cherry
3. Serviceberry
4. Shrub aspen
5. Alder
6. Cottonwood
7. Willow
8. Rocky Mt Maple
9. Hawthorne

Appendix E

DESCRIPTION OF SOIL COMPLEXES AND ASSOCIATIONS

The *Soil Survey of Umatilla County Area, Oregon* (USDA 1988) provides the following soil complexes and association descriptions:

Chapter A 1113D Waha-Rockly Complex

This map unit is on foot slopes of the Blue Mountains on 2 – 20% slopes and elevations ranging from 1,700 to 4,300 feet. The soils occur as patterned and, locally known as biscuit-scabland. The Rockly soil is in the form of scabland between and around the areas of the Waha soil. The Waha soil is in the form of circular mounds, or biscuits, that have a convex surface and are deepest in the center.

Potential plant communities for the Waha complex include Idaho fescue and bluebunch wheatgrass, and Bluebunch Wheatgrass/Sandberg's bluegrass/stiff sage for the Rockly soil. However, the high content of rock fragments and the very shallow depth of the Rockly soil limit herbaceous production.

5C Albee-Bocker-Anatone Complex

This map unit is on broad ridges with slopes ranging from 2 – 15%, and elevations typically ranging from 3,500 to 5,200 feet. These soils too occur as biscuit-scabland.

Potential plant communities on the Albee soil include Idaho fescue, bluebunch wheatgrass, and prairie junegrass. The potential plant community on the Bocker soil is mainly Sandberg bluegrass and bluebunch wheatgrass. The potential plant community on the Anatone soil is mainly Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. Again, herbaceous production is limited by the high content of rock fragments and shallow depth of the Anatone and Bocker soils.

Chapter B 1100C Tolo-Klicker Association

This map unit is on plateaus of the Blue Mountains with slopes of 3 – 15 percent, and at elevations between 3,000 and 4,500 feet. These soils will typically support Douglas-fir, grand fir, and western larch communities.

108-Umatilla-Kahler-Gwin Association

This map unit is on steep hillslopes of the Blue Mountains (35 – 70% slopes) at elevations ranging from 2,000 to 5,000 feet. Both Douglas-fir and grand fir communities occur on these soils. Other species that grow on these soils include western larch and ponderosa pine. The understory is mainly pinegrass, mallow ninebark, and common snowberry.

Chapter C 1Management Limitations of Soils

If the understory of the above soil complexes and associated plant communities is overgrazed, the proportion of preferred forage plants decreases and that of less preferred forage plants increases. Livestock grazing, if prescribed, should 1) be delayed until the preferred forage plants have achieved sufficient growth to withstand grazing pressure, and 2) include a rest-rotation system to allow preferred forage plants seasons of non-use by domestic livestock.

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113D Waha-Rockly Complex, 2 to 20 percent slopes

This map unit is on ridges in the foot slopes at elevations ranging from 1,700 to 4,300 feet. The average annual precipitation is 18 to 25, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 115 to 120 days.

This unit is 50 percent Waha silty clay loam and 30 percent Rockly very cobbly loam. The percentage varies from one area to another. The soils occur as patterned and, locally known as biscuit-scabland. The Rockly soil is in the form of scabland between and around the areas of the Waha soil. The Waha soil is in the form of circular mounds, or biscuits, that have a convex surface and are deepest in the center.

Included in this unit are small areas of Gwin and Gwinly soils and soils that are similar to this Waha soil but have more than 35 percent rock fragments. Also included are small areas of Rockly and Waha soils that have slopes of 20 to 30 percent and soils that are 40 to 60 inches deep to bedrock. Included areas make up about 20 percent of the total acreage.

The Waha soil is moderately deep and well drained. It formed in loess and residuum. Typically, the surface layer is dark grayish brown silty clay loam about 12 inches thick. The upper 16 inches of the subsoil is dark grayish brown and brown silty clay loam, and the lower 10 inches is yellowish brown gravely silty clay loam. Basalt is at a depth of 38 inches. Depth to basalt ranges from 20 to 40 inches. In some areas the surface layer is silt loam.

Permeability of the Waha soil is moderately slow. Available water capacity is about 3 to 8 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Rockly soil is very shallow and well drained. It formed in residuum mixed with loess. Typically, the surface layer is brown very cobbly loam about 2 inches thick. The subsoil is brown very cobbly loam about 4 inches thick. Basalt is at a depth of 6 inches. Depth to basalt ranges from 5 to 12 inches.

Permeability of the Rockly soil is moderately slow. Available water capacity is about 0.5 inch to 1.5 inches. Effective rooting depth is 5 to 12 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Waha soil is mainly Idaho fescue and bluebunch wheatgrass. The potential plant community on the Rockly soil is mainly Sandberg bluegrass, bluebunch wheatgrass, and stiff sagebrush. The production of forage is limited by the high content of rock fragments and the very shallow depth of the Rockly soil.

If the rangeland is overgrazed, the proportion of preferred forage plants decreases and that of less preferred forage plants increases; therefore, livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Grazing should be delayed until the more desirable forage plant have achieved sufficient growth to withstand grazing pressure.

The suitability of this unit for rangeland seeding or other mechanical or chemical treatment is poor. The main limitations is the interspersed areas of the very shallow Rockly soil. The plants selected for seeding should meet the seasonal requirements of livestock or wildlife, or both.

Management practices suitable for the use on this unit are proper grazing use, deferred grazing, and a planned grazing system.

5C Albee-Bocker-Anatone Complex, 2 to 15 percent slopes.

This map unit is on broad ridges. Elevation is 3,500 to 5,200 feet. The average annual precipitation is 17 to 35 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 60 to 110 days.

This unit is 40 percent Albee silt loam, 30 percent Bocker very cobbly silt loam, and 20 percent Anatone very cobbly silt loam. The percentage varies from one area to another. The soils occur as patterned land, locally known as biscuit-scabland. The Bocker and anatone soils occur as scabland between and around areas of the Albee soil. The Albee soil is in the form of circular mounds, or biscuits, that have a convex surface and are deepest in the center.

Included in this unit are small areas of Kahler, Klicker, Tolo, and Umatilla soils. Also included are small areas of Albee, Anatone, and Bocker soils that have slopes of 15 to 30 percent. Included areas make up about 10 percent of the total acreage.

The Albee soil is moderately deep and well drained. It formed in residuum mixed with loess. Typically, the surface layer is grayish brown silt loam about 10 inches thick. The subsoil is brown and yellowish brown silt loam about 18 inches thick. Basalt is at a depth of 28 inches.. Depth to basalt ranges from 20 to 40 inches.

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Permeability of the Albee soil is moderate. Available water capacity is about 4 to 6 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Bocker soil is very shallow and well drained. It formed in residuum mixed with loess. The surface layer is brown very cobbly silt loam about 4 inches thick. The subsoil is brown very cobbly silt loam about 3 inches thick. Basalt is at a depth of 7 inches. Depth to basalt ranges from 4 to 10 inches. In some areas the surface layer is stony.

Permeability of the Bocker soil is moderate. Available water capacity is about 0.5 inches to 1.5 inches. Effective rooting depth is 4 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Anatone soil is shallow and well drained. It formed in residuum mixed with loess. Typically, the surface layer is dark brown very cobbly silt loam about 5 inches thick. The subsoil is dark brown extremely cobbly loam about 7 inches thick. Basalt is at a depth of 12 inches. Depth to basalt ranges from 10 to 20 inches. In some areas the surface layer is stony.

Permeability of the Anatone soil is moderate. Available water capacity is about 1.0 inch to 2.5 inches. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

The potential plant community on the Albee soil is mainly Idaho fescue, bluebunch wheatgrass, and prairie junegrass. The potential plant community on the Bocker soil is mainly Sandberg bluegrass and bluebunch wheatgrass. The potential plant community on the Anatone soil is mainly Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. The production of forage is limited by the high content of rock fragments and shallow depth of the Anatone and Bocker soils.

If the rangeland is overgrazed, the proportion of preferred forage plants decreases and that of less preferred forage plants increases; therefore, livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Grazing should be delayed until the preferred forage plants have achieved sufficient growth to withstand grazing pressure.

The suitability of this unit for rangeland seeding or other mechanical or chemical treatment is poor. The main limitation for treatment is the interspersed areas of the shallow Anatone and Bocker soils. The plants selected for seeding should meet the seasonal requirements for livestock or wildlife, or both.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, and a planned grazing system.

100C Tolo-Klicker association, 3 to 15 percent slopes.

This map unit is on plateaus of the Blue Mountains. Elevation is 3,000 to 4,500 feet. The average annual precipitation is 20 to 40 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 60 to 100 days.

This unit is 40 percent Tolo silt loam and 30 percent Klicker silt loam.

Included in this unit are small areas of Albee, Anatone, and Bocker soils. Also included are small areas of soils that are similar to the Klicker soil but that have an ash layer 5 to 20 inches thick on the surface and small areas of Tolo and Klicker soils that have slopes of 15 to 35 percent. Included areas make up about 30 percent of the total acreage.

The Tolo soil is deep and well drained. It formed in volcanic ash over a buried soil and generally is on north and east-facing slopes. Typically, the surface is covered with a mat of needles and twigs about 1 inch thick. The surface layer is brown silt loam about 4 inches thick. The subsoil is very pale brown silt loam about 18 inches thick. Below this is a buried subsoil of light yellowish brown silt loam about 38 inches thick over basalt. Depth to basalt is 60 inches or more. In some areas depth to basalt ranges from 40 to 60 inches.

Permeability of the Tolo soil is moderate to a depth of 22 inches and moderately slow below this depth. Available water capacity is about 12 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Klicker soil is moderately deep and well drained. It formed in residuum mixed with loess and generally is on south- and west-facing slopes. Typically, the surface is covered with a mat of needles and twigs about 1 inch thick. The surface layer is dark reddish brown silt loam about 7 inches thick. The subsoil is dark reddish brown very cobbly silty clay loam about 14 inches thick. Basalt is at a depth of 21 inches. Depth to basalt ranges from 20 to 40 inches.

Permeability of the Klicker soil is moderately slow. Available water capacity is about 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

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This unit is used for timber production, livestock grazing, and wildlife habitat.

The Tolo soil is suited to the production of grand fir, Douglas-fir, and western larch. Other species that grow on this soil include lodgepole pine. The understory is mainly elk sedge, prince's pine, and myrtle pachystima.

On the basis of a 50-year site curve, the mean site index for grand fir is 85. Thus, the mean annual increment for 80-year-old trees is 122 cubic feet per acre. The culmination of mean annual increment (CMAI) is 124 cubic feet per acre at 100 years for all trees 1 inch and larger in diameter at breast height.

The Klicker soil is suited to the production of ponderosa pine. Other species that grow on this soil include Douglas-fir. The understory is mainly common snowberry, elk sedge, and pinegrass.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 76. Thus, the mean annual increment for 80-years-old trees 6.6 inches and larger in diameter at breast height is 51 cubic feet per acre. The mean annual increment at culmination (CMAI) for 50-year-old 0.6 inch and larger in diameter at breast height is 63 cubic feet per acre.

The main limitations for the management of timber are the hazards of compaction and erosion, steepness of slope, the high content of rock fragments in the Klicker soil, and plant competition.

Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Pudding can occur when the soil is wet. Displacement of the surface layer occurs most readily on the Tolo Soil when it is dry. Using low-pressure ground equipment damages the soil less and helps to maintain productivity. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Seeding road cuts and fills to a permanent plant cover reduces erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullyng unless they are provided with adequate water bars or are protected by plant cover, or both.

Logging roads require suitable surfacing for year-round use. Construction and maintenance of roads built on this unit are difficult because of the 20-to 40-inch-thick ash layer in the Tolo soil. This material makes poor subgrade for roads because it does not compact easily when dry, has high potential for frost action, and has high available water capacity. When wet or moist, unsurfaced roads and skid trails are soft and slippery. They may be impassable during rainy periods.

Natural reforestation of harvested areas of the Tolo soil by Douglas-fir, grand fir, and western larch occurs if a seed source is present. Ripping skid trails and landings when the soil is dry breaks up compacted layers and improves soil tilth, which increases seedling survival. Mortality of naturally established seedlings may be high if logging or scarification displaces the layer of ash. Reforestation can be accomplished by planting Douglas-Fir and grand fir seedlings. Seedlings planted in the less fertile subsoil grow poorly.

Natural reforestation of harvested areas of the Klicker soil by ponderosa pine occurs if a seed source is present. Ripping skid trails and landings when the soil is dry breaks up compacted layers and improves soil tilth, which increases seedling survival. Reforestation can be accomplished by planting ponderosa pine and Douglas-fir seedlings. The high content of rock fragments in the soil reduces seedlings survival. To compensate for the higher mortality that can be expected, larger trees or more trees than normal can be planted.

Undesirable plants on the Tolo soil limit adequate natural or artificial reforestation unless site preparation and maintenance are intensive. Intensive site preparation and maintenance generally are not needed on the Klicker soil.

Because roots are restricted by bedrock, trees on the Klicker soil are subject to wind throw.

Thinning, logging, or fire reduces the density of the overstory canopy and increases the production of understory. Broadcast seeding of adapted bunchgrasses is desirable after the canopy has been opened. To reduce the mortality of planted tree seedlings as a result of plant competition, grasses and trees should be seeded at the same time.

If the understory is overgrazed, the proportion of preferred forage plants decreases and that of less preferred forage plants increases; therefore, livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Grazing should be delayed until the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, and a planned grazing system.

108-Umatilla-Kahler-Gwin association, 35 to 70 percent slopes. This map unit is on hillslopes of the Blue Mountains. Elevation is 2,000 to 5,000 feet. The average annual precipitation 15 to 45 inches, the average annual air temperature is 40 to 47 degrees F, and the average frost-free period is 30 to 120 days.

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This unit is 40 percent Umatilla loam, 20 percent Kahler silt loam, and 15 percent Gwin very cobbly silt loam.

Included in this unit are small areas of Buckcreek, Klicker, and Tolo soils and Rock outcrop. Also included are small areas of soils that are similar to the Umatilla and Kahler soils but that are 40 to 60 inches deep to basalt and small areas of Umatilla and Kahler soils that have slopes of 15 to 35 percent. Included areas make up about 25 percent of total acreage.

The Umatilla soil is deep and well drained. It formed in loess and colluvium and is on north- and east-facing slopes. Typically, the surface is covered with a mat of needles and twigs about 1 inch thick. The surface layer is dark grayish brown and brown loam about 12 inches thick. The upper 16 inches of the subsoil is brown cobbly clay loam, and the lower 32 inches or more is brown very cobbly clay loam over basalt. Depth to basalt to 60 inches or more.

Permeability of the Umatilla soil is moderate. Available water capacity is about 7 to 12 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Kahler soil is deep and well drained. It formed in loess and colluvium and is on north- and east-facing slopes. Typically, the surface is covered with a mat of needles and twigs 1 inch thick. The surface layer is dark brown and brown silt loam about 20 inches thick. The upper 17 inches of the subsoil is dark brown silty clay loam, and the lower 23 inches or more is brown cobbly silty clay loam over basalt. Depth to basalt is 60 inches or more. Runoff is rapid, and the hazard of water erosions high.

The Gwin soil is shallow and well drained. It formed in colluvium, residuum, and loess and is on south- and west-facing slopes. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is dark grayish brown extremely stony silt loam about 7 inches thick. The subsoil is brown very cobbly silty clay loam about 6 inches thick. Basalt is at a depth of 13 inches. Depth to basalt ranges from 10 to 20 inches.

Permeability of the Gwin soil is moderately slow. Available water capacity is about 1.5 to 2.5 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, livestock grazing, and wildlife habitat.

The Umatilla and Kahler soils are suited to the production of Douglas-fir and grand fir. Other species that grow on these soils include western larch and ponderosa pine. The understory is mainly pinegrass, mallow ninebark, and common snowberry.

On the basis of a 50-year site curve, the mean site index for Douglas-fir is 70 on the Umatilla soil. Thus, the mean annual increment for 80-year-old trees is 59 cubic feet per acre. The culmination of mean annual increment (CMAI) is 61 cubic feet per acre at 103 years for all trees 1 inch and larger in diameter at breast height.

On the basis of a 50-year site curve, the mean site index for Douglas-fir is 75 on the Kahler soil. Thus, the mean annual increment for 80-year-old trees is 70 cubic feet per acre. The culmination of mean annual increment (CMAI) is 71 cubic feet per acre at 96 years for all trees 1 inch and larger in diameter at breast height.

The main limitations for the management of timber are steepness of slope, the hazard of erosion, and the hazard of soil compaction.

Steepness of slope restricts the use of wheeled and tracked equipment on skid trails. Cable yarding generally is safer and disturbs the soil less.

Locating roads on midslopes results in large cuts and fills and thus removes land from production. Material cast to the side when building roads can damage vegetation. It is also a potential source of sedimentation. Because of the steepness of slope, the unit may be subject to slumping, especially where road cuts are made. End hauling of waste material minimizes damage to vegetation downslope and reduces the potential of sedimentation. Seeding road cuts and fills to a permanent plant cover reduces erosion. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are provided with adequate water bars or are protected by plant cover, or both.

Logging roads require suitable surfacing for year-round use. When wet or moist, unsurfaced roads and skid trails are soft and slippery. They may be impassable during rainy periods.

Natural reforestation of harvested areas by Douglas-fir and grand fir occurs if a seed source is present. Reforestation can be accomplished by planting Douglas-fir and grand fir seedlings. The high content of rock fragments in the soil reduces seedling survival. To compensate for the higher mortality that can be expected, larger trees or more trees than normal can be planted. Ripping skid trails and landings when the soil is dry breaks up compacted layers and improves soil tilth, which increases seedling survival. Undesirable plants prevent adequate natural or artificial reforestation unless intensive site preparation and maintenance are used.

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Thinning, logging, or fire reduces the density of the overstory canopy and increases the production of understory. Broadcast seeding of adapted bunchgrasses is desirable after the canopy has been opened. To reduce the mortality of planted tree seedlings as a result of plant competition, grasses and trees should be seeded at the same time.

Because the overstory canopy of the Umatilla and Kahler soils generally is very dense and forage production therefore is low, livestock and wildlife usually graze on the nonforested Gwin soil and in areas that have been opened by logging or fire. Also, included soils such as the Buckcreek soils offer a considerable amount of forage to livestock and wildlife. Wildlife use this unit primarily as shelter from winter storms.

If the understory is overgrazed, the proportion of preferred forage plants decreases and that of less preferred forage plants increases; therefore, livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Grazing should be delayed until the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, and a planned grazing system.

GLOSSARY OF TERMS

Columbia Basin Fish and Wildlife Authority (CBFWA) - An organization established by Charter in 1987, whose membership consists of the four state and two federal fish and wildlife management entities and thirteen Indian tribes of the Columbia River Basin. Members are the legally recognized managers of the fish and wildlife resources. Responsibilities of CBFWA are provided through federal and state statutes, treaties, and court actions, and include 1) coordinating the efforts of its members to protect and enhance fish and wildlife resources, 2) providing an open forum for members to exchange information on matters affecting anadromous and resident fish, wildlife resources, and habitat concerns, 3) assuring comprehensive planning and implementation of the Northwest Power Planning Council's Fish and Wildlife Program, 4) improving the quality of fish and wildlife decision making, 5) influencing other regional decision makers. The Authority is a consensus organization, and provides the Northwest Power Planning Council and Bonneville Power Administration with recommendations representing the best available information from the fish and wildlife managers.

Community (Biotic): All plants and animals occupying a specific area under relatively similar conditions.

Critical Areas: Areas which include the following areas and ecosystems: (a) wetlands; (b) areas with a critical recharging effect on aquifers used for potable water; (c) fish and wildlife habitat conservation areas; (d) frequently flooded areas; and (e) geologically hazardous areas.

Critical Habitat: Any air, land, or water area determined (through a regulatory action under the *Endangered Species Act of 1973*) to be essential to the survival of a population of an endangered or threatened species or habitat deemed to be necessary for the recovery of a threatened or endangered species.

Cultural Resources: Areas or objects that are of cultural significance to human history at the national, state, or local level. Generally includes archaeological, historic, and prehistoric resources, as well as resources of traditional use or religious value to Native Americans.

Endangered Species: Defined in the Endangered Species Act of 1973 as "any species which is in danger of extinction throughout all or a significant part of its range"

Endangered Species Act of 1973: This Act requires Federal agencies, with the consultation and assistance of the Secretaries of the Interior and Commerce, to ensure that their actions will not likely jeopardize the continued existence of any endangered or threatened species or adversely affect the habitat of such species.

Fauna: Animals, especially those of a specific region, considered as a group.

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Floodway: The channel of a river or watercourse and the adjacent land areas that must be reserved to discharge the one per cent probability flood without cumulatively increasing the water surface elevation more than a designated height, generally one foot.

Flora: Plants, especially those of a specific region, considered as a group.

Habitat: The place or type of site where a plant or animal naturally or normally lives and grows.

Infrastructure: The basic services, facilities, and equipment needed for the operation and growth of an area.

Mitigation: Avoiding, minimizing, rectifying, or compensating for adverse critical area (i.e., wetland) impacts. Mitigation, in the following order of preference is:

- (a.) Avoiding the impact altogether by not taking a certain action or parts of an action;
- (b.) Minimizing impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;
- (c.) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment, and
- (d.) Compensating for the impact by replacing, enhancing, or providing substitute resources or environments.

National Wetland Inventory (NWI): An national inventory of wetland locations containing maps and general hydrological and morphological data on listed sites maintained by the U.S. Fish and Wildlife Service.

Non-motorized: Any mode of transportation that utilizes a power source other than a motor. Primarily, non-motorized modes include walking (pedestrian), horseback riding (equestrian), and bicycling.

Northwest Power Planning Council (NWPPC) - The Northwest Power Planning Council is a four-state compact formed by Idaho, Montana, Oregon and Washington to oversee electric power system planning and fish and wildlife recovery in the Columbia River Basin. Congress initiated the Council through approval of the Northwest Power Act of 1980 (Public Law 96-501). Key to the Council's mandates is the directive to carry out its activities in a public forum.

Northwest Power Planning Council Fish and Wildlife Program (Fish and Wildlife Program) – The NWPPC's organized list of procedures, events, and other pertinent information for planning, policy-making and project review. The program is organized in three levels: 1) a basinwide level that articulates objectives, principles and coordination elements that apply generally to all fish and wildlife projects, or to a class of projects, that are implemented throughout the basin; 2) an ecological province level that addresses the 11 unique ecological areas of the Columbia River Basin, each representing a particular type of terrain and corresponding biological community; and 3) a level that addresses the 53 subbasins, each

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containing a specific waterway and the surrounding uplands. The program is implemented by the Bonneville Power Administration, the U.S. Army Corps of Engineers, the Bureau of Reclamation and the Federal Energy Regulatory Commission and its licensees, and monitored by the NWPPC.

Pacific Northwest Electric Power Act (Power Act) - In 1980, Congress passed the Pacific Northwest Electric Power Planning and Conservation Act, which authorized the states of Idaho, Montana, Oregon and Washington to create the Northwest Power Planning Council. The Act directs the Council to prepare a program to protect, mitigate and enhance fish and wildlife of the Columbia River Basin that have been affected by the construction and operation of hydroelectric dams while also assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply. The Act also directs the Council to inform the public about fish, wildlife and energy issues and to involve the public in its decision-making.

Preservation/Preserve: Areas of ecological, geological, archaeological, and cultural significance and sensitivity that are to be protected and managed so as to preserve their natural condition and value.

Raptor: A bird of prey, such as an eagle, hawk, or falcon.

Refuge Area – A specific sub-unit of the planning area providing protection from specified consumptive uses or disturbances related to consumptive uses.

Riparian Area: The land bordering a stream, pond or river; also pertaining to the vegetation typical of those borders (grasses, shrubs, and trees such as reed canary grass, spiraea, willows, ash and cottonwoods).

Riparian Habitat: A specialized form of wetland restricted to areas along, adjacent to, or contiguous with perennially flooded and intermittently flowing rivers and streams. Also, periodically flooded lake and reservoir shore areas.

Scope: In a document prepared pursuant to NEPA, the range of actions, alternatives, and impacts to be considered.

Scoping: Involves the solicitation of comments from interested persons, groups, and agencies at public meetings, public workshops, in writing, electronically, or via fax to assist DOE in defining the proposed action, identifying alternatives, and developing preliminary issues to be addressed in an EIS.

Sensitive Areas: Areas that because of the susceptibility to erosion, sliding, earthquake, or other geological events, are not suited to the siting of commercial, residential, or industrial development consistent with public health or safety concerns. (RCW 36.70A.030)

Sensitive (Category 2) Species. An Oregon State category for plant species considered vulnerable or declining, that could become endangered or threatened without active management

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or removal of threats. Also sometimes used as a generic term for any plant and wildlife species that are threatened or endangered, rare, vulnerable or declining, or monitored by state or federal agencies.

Shrub-steppe: Typically a treeless area covered by grasses and shrubs and having a semiarid climate. Precipitation is typically very slight, but sufficient to support the growth of sparse grass and other plants adapted to living in conditions where water is scarce.

Surface Waters: Streams, rivers, ponds, lakes or other waters.

Threatened or Endangered Species: Animals, birds, fish, plants, or other living organisms threatened with extinction by man or natural changes in their environment. Requirements for declaring species endangered are contained in the Endangered Species Act of 1973.

Threatened Species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant part of its range.

Upland Area: Inland areas above the riparian areas.

Vegetation Type: A classification of the plant community on a site based on the dominant plant species in the community.