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Blue Creek Winter Range: Wildlife Mitigation Project

Final Environmental Assessment

DOE/EA-0939
November1994

Bonneville
POWER ADMINISTRATION

Spokane
Tribe of Indians

Bureau
of Indian Affairs

DISCLAIMER

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CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 Proposed Action

Bonneville Power Administration (BPA) proposes to fund that portion of the Washington Wildlife Agreement pertaining to the Blue Creek Winter Range Wildlife Mitigation Project (Project) in a cooperative effort with the Spokane Tribe, Upper Columbia United Tribes, and the Bureau of Indian Affairs (BIA). If fully implemented, the proposed action would allow the sponsors to protect and enhance 2,631 habitat units of big game winter range and riparian shrub habitat on 2,185 hectares (5,400 acres) of Spokane Tribal trust lands, and to conduct long term wildlife management activities within the Spokane Indian Reservation project area.

This Final Environmental Assessment (EA) examines the potential environmental effects of securing land and conducting wildlife habitat enhancement and long term management activities within the boundaries of the Spokane Indian Reservation. Four proposed activities (habitat protection, habitat enhancement, operation and maintenance, and monitoring and evaluation) are analyzed.

1.2 Purpose Of and Need For Action

The proposed action is intended to meet the need for mitigation of wildlife and wildlife habitat adversely affected by the construction of Grand Coulee Dam and its reservoir.

The purposes of the proposed action are to:

- Increase quality and quantity of riparian and upland wildlife habitat and wildlife populations on the Spokane Reservation;
- Maintain consistency with interim Washington Wildlife Agreement; and
- Maintain consistency with the Northwest Power Planning Council's 1989 Fish and Wildlife Program Wildlife Rule, and the 1993 Phase IV Resident Fish and Wildlife Program Amendments.

1.3 Background

1.3.1 Mitigation Process under the Northwest Power Act

Under provisions of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act), BPA has the authority and obligation to fund wildlife mitigation activities consistent with the Northwest Power Planning Council's (Council) Fish and Wildlife Program. The initial phase of mitigation planning for wildlife habitat losses was submitted to the Council for amendment into the Fish and Wildlife Program in

1989. The Fish and Wildlife Program includes a process for review of habitat losses and design of mitigation plans for each of the Federal hydro projects in the Columbia River Basin (Section 1002).

In 1989, the Council amended the Fish and Wildlife Program to include wildlife habitat losses resulting from construction and operation of Grand Coulee Dam. The Council adopted an interim goal, for a ten year period, of addressing up to 35 percent of the wildlife habitat losses due to construction of the Federal hydropower system on the Columbia River and its tributaries (Section 1003, Measure (1) (C)).

Consistent with Section 1003(7) of the Fish and Wildlife Program's Wildlife Mitigation Rule, BPA proposes to fund projects that would help reach the Council's mitigation goals. In 1990, the Council reviewed and approved the Spokane Tribes' proposed Blue Creek Winter Range Project.

1.3.2 Relationship to Other Actions.

The Final EA incorporates concepts from and is consistent with the following Spokane Tribe resource plans:

- Spokane Tribal Comprehensive Recreational Plan (in Draft);
- Overall Economic Development Plan for the Spokane Reservation (1993);
- Integrated Resource Management Plan for the Spokane Indian Reservation (in Draft);
- Spokane Indian Reservation Forest Management Plan (1989);
- Range Management Plan for the Spokane Indian Reservation (1970);
- Water Resources Management Plan for the Spokane Reservation (in Draft); and
- Road Management Resolution (1994).

Potential activities proposed in the Final EA are also consistent with the goals and policies of the following Federal and regional plans, programs, and agreements:

- Washington Wildlife Mitigation Agreement -- Among Members of the Washington Wildlife Coalition of Resource Agencies and Tribes and the BPA (1993); and
- Columbia River Basin Fish and Wildlife Program and Amendments (Northwest Power Council, 1982).

CHAPTER 2: ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

This Chapter describes a No-Action Alternative (Alternative A) and a Habitat Enhancement Alternative (Alternative B). Alternative B presents proposed habitat protection and enhancement, operation and maintenance, and monitoring and evaluation activities.

2.2 No-Action: Alternative A

In Alternative A, BPA **would not fund** activities on the Spokane Indian Reservation needed to partially mitigate for wildlife and wildlife habitat adversely affected by construction of Grand Coulee Dam and reservoir. The Spokane Tribe and the BIA could pursue alternative funding sources to protect key riparian and upland wildlife habitats and wildlife populations within the Reservation project area. However, because funding sources are limited, the opportunity to mitigate for adverse wildlife and wildlife habitat impacts in this alternative would be constrained.

Selection of Alternative A could reduce opportunities for BPA to receive credit for wildlife mitigation under the Council's Fish and Wildlife Program, and would limit the ability of BPA to meet terms and conditions of the Washington Wildlife Mitigation Agreement.

2.3 Land Acquisition and Habitat Enhancement: Alternative B

In Alternative B, BPA **would fund** activities on the Spokane Indian Reservation needed to partially mitigate for wildlife and wildlife habitat adversely affected by the construction of Grand Coulee Dam and reservoir. BPA funding would enable the Spokane Indian Tribe to protect trust lands identified for the Project, and provide an opportunity to enhance, maintain, and monitor site-specific conditions to increase wildlife values.

Selection of Alternative B would increase opportunities for BPA to receive credit for wildlife mitigation under the Council's Fish and Wildlife Program, and provide the means for BPA to meet the terms and conditions of the Washington Wildlife Mitigation Agreement.

2.3.1 Project Area Location

As shown in Figure 1, the Spokane Tribes' Blue Creek Winter Range Project encompasses over 2,185 hectares (5,400 acres) of big game winter range and riparian shrub habitat in the vicinity of the Columbia and Spokane Rivers, and the Blue and Oyachen Creek

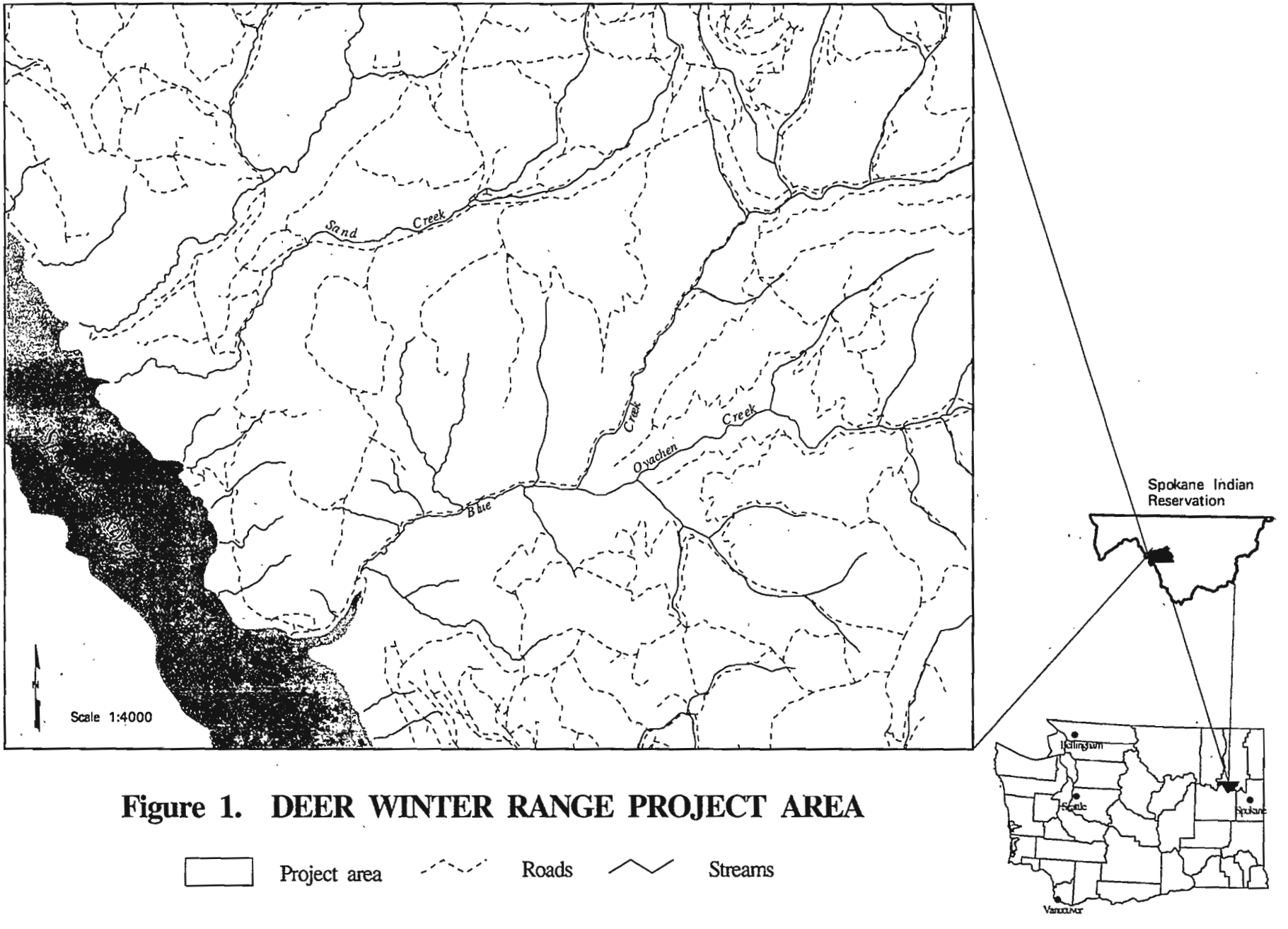

Figure 1. DEER WINTER RANGE PROJECT AREA

Project area Roads Streams

corridors. The project study area is located in the State of Washington and totally within the boundaries of the Spokane Indian Reservation.

2.3.2 Spokane Tribe/BPA Management Agreement

As proposed in Alternative B, the Spokane Tribe and BPA would finalize and formally stipulate the terms and conditions of a long term funding and management agreement for the Blue Creek Winter Range Project. By signing the agreement BPA would agree to purchase timber rights, grazing rights, and development rights to protect wildlife and wildlife habitat within the project area. The Spokane Tribe would agree to protect, and conduct long term enhancement, operation and maintenance, and monitoring and evaluation activities. The Spokane Tribe/BPA agreement would include but would not be limited to total land protection and management costs and the length of the agreement in terms of years.

2.3.3 Managing Land for Wildlife Habitat under Alternative B

2.3.3.1 *Proposed Habitat Protection and Enhancement Activities*

Proposed protection and enhancement activities within the project area (by habitat type) include:

All habitats:

a) removal of domestic livestock to reduce risk of overgrazing;
b) road closures to reduce wildlife disturbance, poaching, and vandalism;
c) fencing of project area perimeter with high tensile non-barbed wire and removal of interior barbwire fences to maintain wildlife habitat values;
d) chemical applications to control noxious weeds;
e) fire suppression to protect wildlife habitat resources; and
f) prescribed burning (frequent low intensity burns in dry forest habitats; and hotter broadcast burns in wetter sites) to simulate the natural role of fire in the plant successional process.

Upland pine and fir forest:

a) silvicultural practices for wildlife objectives (conifer tree planting, selective tree harvesting, thinning, debris and prescribed burning) to improve forest canopy characteristics for optimum deer winter habitat conditions.

Riparian forest, shrub, and herb:

a) establishment of native vegetation to increase wildlife habitat values;
b) removal of competing (conifer) vegetation to improve vertical and structural habitat diversity; and
c) installation of water collection/tank devices at hillside springs for wildlife water sources.

Shrub-steppe and grassland:

a) noxious weed control including herbicide applications along roadways to slow spread of knapweed into project area; and
b) hand planting of native vegetation (bunchgrasses, sagebrush, bitterbrush).

2.3.3.2 *Proposed Operation and Maintenance Activities*

As part of this alternative, BPA funding of operation and maintenance (O&M) would continue for the number of years as defined in the terms of the Spokane Tribe/BPA Management Agreement. Proposed O&M activities within the project area (by habitat type) include:

All habitat types:

a) fence maintenance;
b) noxious weed control including herbicide applications along roadways to slow spread of knapweed into the project area;
c) road management including installation and maintenance of main access gates, and cattle guards; road maintenance including permanent or seasonal closures;
d) amendment and update of management plans;
e) fire suppression to protect wildlife habitat resources; and
f) prescribed burning (frequent low intensity burns in dry forest habitats; and hotter broadcast burns in wetter sites) to simulate the natural role of fire in the plant successional process.

Upland Pine and Fir Forest:

a) vegetation management (controlled burning, thinning of young age tree classes) to maintain optimum habitat values.

Riparian forest, shrub, and herb:

a) maintenance of springs and water tank developments for wildlife water sources.

Shrub-steppe and grassland:

a) native shrub/grassland weed management (replanting native grass plots, hand weeding and/or herbicide applications) to maintain optimum wildlife habitat conditions; and
b) fertilization of native grass plots to maintain optimum habitat conditions.

2.3.3.3 *Proposed Monitoring and Evaluation Activities*

As part of this alternative, BPA funding of monitoring and evaluation (M&E) would continue for the number of years defined by the terms of the Spokane Tribe/BPA Management Agreement.

M&E of a site would begin immediately after land is secured for the Project. Initial baseline surveys to document the land's current condition and maps of existing vegetation

and habitat types have been completed by the Spokane Agency BIA. Additional long term monitoring to evaluate changes in the wildlife indicator species (white tailed deer, mule deer, beaver, and sharp tailed grouse) and habitat conditions would occur through continuing Habitat Evaluation Procedures (HEP) analysis. For further information concerning HEP procedures, see Appendix A. Site-specific and/or overall project area monitoring activities may include:

- Wildlife population trends and habitat use;
- Wildlife habitat;
- Terrestrial vegetation;
- Public use;
- Identification of elk and deer migration routes;
- Winter wildlife population trends; and
- Historic, prehistoric and traditional cultural use sites.

2.3.4 Land Acquisition Methodology under Alternative B

2.3.4.1 *Land Acquisition Standards*

The Spokane Tribe may acquire additional interest in land for the Project (for example purchase, lease, or conservation easement of fee patent lands, trust lands or individual allotments). The following conditions would apply to all land acquisitions located outside of the project study area:

- Fair market values of all land parcels would be established through Federal land value/lease appraisals, and secured through existing Tribal/BIA purchasing, leasing or conservation easement procedures (25 C.F.R. 151.3).

- Large contiguous Reservation parcels and acreage highly suitable for wildlife habitat mitigation would be identified and prioritized for inclusion into the Project.

- Future land acquisitions for the Project would be on a voluntary basis and would not involve land condemnations.

- Suitable properties not falling totally within the project area boundaries (due to property line locations, or other land use considerations) could be determined eligible for acquisition on a case by case basis.

- When fee patent lands are acquired for the Project, a Spokane Agency BIA application would be filed to convert such property into trust status. The fee to trust conversion process, pursuant to Federal regulations, would commence prior to BPA reimbursement options. The BIA would notify local and county governments of such proceedings and/or transactions as established through existing BIA procedures (25 C.F.R. 151.8 through 25 C.F.R. 151.12).

- A long-term management plan (Site Plan) would be developed for each individual property acquired outside of the project area. The Site Plan would document the site-specific management and enhancement activities, O&M, and M&E operations to be implemented at each property. Exhibits could include but are not limited to engineering specifications or detailed descriptions of all proposed activities, time schedules, equipment, and personnel needs. Detailed budget information for both initial work activity and long-term management requirements could also be included.

- Completed Site Plans and budgets may be subject to further National Environmental Policy Act (NEPA) review prior to implementation. This would involve further coordination with BIA, appropriate Tribal programs, BPA, and other Federal agencies, to ensure consistency with Federal environmental legislation and Tribal program requirements. All site-specific NEPA analysis and decisions would be tiered to this EA.

CHAPTER 3: AFFECTED ENVIRONMENT

3.1 Physical Environment

3.1.1 Climate

The Spokane Indian Reservation is located in Stevens County in northeast Washington State. Summers in the project area are characterized as warm and dry, with July and August being the hottest months. The average daily maximum temperature is 28^0 C (82^0 F). Typically, winters are cold, with an average daily minimum temperature of -6^0 C (21^0 F). Temperature extremes in the Reservation area can vary from over 38^0 C (100^0 F) in the summer months to -34^0 C (-30^0 F) in the winter.

The average yearly precipitation at Wellpinit, Washington, located 11.3 km (7 mi) east of the project area, is 48.3 cm (19 in). From 1924 to 1960, 16 of the 37 years received over 51 cm (20 in) of precipitation while six received less than 38 cm (15 in). At the project area, drier conditions are documented. The average annual rainfall ranges from 30 to 51 cm (11 to 20 in), and in normal years the average annual precipitation is approximately 36 cm (14 in). Overall, the precipitation patterns in this area of eastern Washington are typically light during the spring and summer, then increase in the fall and peak in winter. The maximum precipitation in winter coincides with the greatest frequency of Pacific storms crossing the State. An appreciable portion of the winter precipitation occurs as snow. Typically, winter storms are of light intensity and long duration. Late spring and summer rainfall frequently occurs as showers or thunderstorms, and amounts are variable. Generally, prevailing winds are from the southwest (Merker, 1993).

3.1.2 Physiography

The project area is composed of two general land forms (Riverbreaks Zone and Pine Zone) in a large glaciated valley setting.

The Riverbreaks Zone is a fairly steep and narrow belt of land about 800 meters (1/2 mile) wide along the Columbia and Spokane Rivers at the southern and western boundaries of the Project. The topography is generally rugged, characterized by river terraces that are separated by basalt and granite bluffs, and vertical terrace walls. Slopes in this segment of the Columbia River Valley have south and west facing aspects. Elevations range from 393 m (1,290 ft) at Lake Roosevelt to about 701 m (2,300 ft) along the rim of the bluffs where it borders the mid-elevation Pine Zone.

Most of Pine Zone occupies the middle ground between upland areas and the Spokane and Columbia Rivers, with elevations from approximately 488 m to about 1,158m (1,600 to 3,800 ft). The topography is characterized by foothills and rolling plains, which are dissected by numerous draws. Influenced by the glacial activity of the geologic past, the lower elevations exhibit a good deal of variation in slope and aspect, while the higher

elevations in the non-glaciated terrain are chiefly of moderate mountainous slopes with south and west aspects. Overall, the slopes over most of the Pine Zone are moderate with a general aspect of south and west.

3.1.3 Soils

Residual soils of the project area are derived from the weathering of underlying granite, basaltic, and metamorphic bedrock formations. Soil depths generally vary with the rate of weathering and degree of slope. Because the parent material in the project area is varied and diversified, several different soil types within a comparatively small area have been produced. Most soil types of the Riverbreaks Zone are thin due to the steep slopes and are described as course, well-drained, and prone to mass movement or sliding. Soils of the Pine Zone are generally deeper because topography is less steep. Soil permeability for the overall project area is generally moderate to rapid, and water retention ranges from low to very high. Runoff can be slow to rapid depending upon the percent of slope: on 0 to 25 percent slopes runoff is slow to medium and water erosion potential is slight to moderate; on 25 to 40 percent slopes runoff is rapid and the hazard of water erosion is high; and on 40 to 65 percent slopes, runoff is extremely rapid and the hazard of water erosion is very high. Certain areas along the river terraces and the banks of Lake Roosevelt experience the highest degree of mass movement. At steeper sloped locations in the project area, slumping, earthflows, debris flows, rockslides, and rockfalls have occurred at road cutbacks and fills, and sidecast debris sites.

A group of soils that occupy the Columbia River terraces, the main valley floor, and a few of the lateral valleys tributary to the principal valley trough were formed by glacial outwash from streams flowing from the ice front (in the Pleistocene era). These alluvial soil types are characterized by accumulations of variable textures mixed with varying proportions of gravel, pebbles, and boulders. Derived from weathered bedrock materials and glacial ground materials, these soils vary greatly in texture but are mostly coarse (sandy to gravely) and well drained. Specific soil descriptions of individual soils series in the project area can be obtained in the *Soil Survey of Stevens County Washington* (SCS,1982).

3.1.4 Water

3.1.4.1 Water Quantity

As shown in Figure 2, the project area has ten intermittent springs, two perennial streams, and numerous intermittent streams. Water quantity is sufficient for current levels of livestock watering, fish and wildlife, recreation usage, and filtration necessary to recharge the aquifer. Over the ten year period of record, the Blue Creek drainage area of 30.7 km^2 (19.1 mi^2) discharged an average of .04 m^3/s (1.42 cfs) or 1,271,020 m^3 (1,030 acre feet). Peak flows normally occur in March and April. The maximum discharge of record 2.6 m^3/s, (93 cfs) occurred in March of 1986 (USGS, 1994).

DEER WINTER RANGE PROJECT AREA

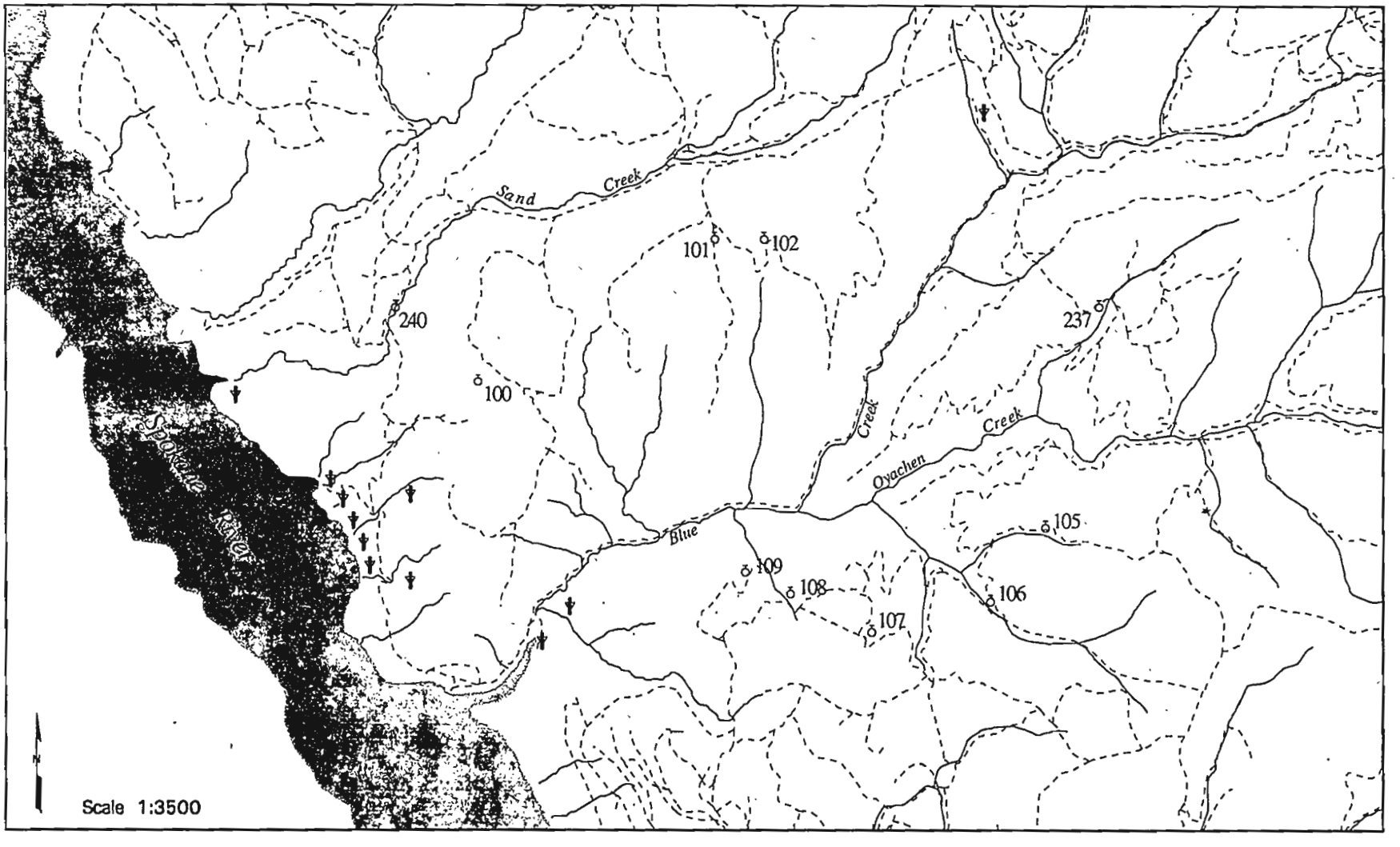

Figure 2. Existing perennial streams and spring sites

Spring/hardwood site

Proposed hardwood site

Roads

Perennial streams

Project area

3.1.4.2 Water Quality

Water quality of the Blue Creek drainage is monitored by the U.S. Geological Survey (USGS) and the Spokane Tribe above and below the former Midnite Mine site. The former uranium mine located upstream of the proposed wildlife mitigation project area was operated by the Dawn Mining Company. This company has recently submitted a reclamation plan for the mining site and will be working with appropriate federal agencies evaluating that plan (Blumenfeld, 1994). Currently, water released from the onsite water treatment plant is pumped at a rate of 1-2 m^3 per minute (300-500 gallons per minute) into an unnamed tributary of Blue Creek. Conductance, pH, and temperature, water quality parameters are monitored by the USGS on an hourly basis to measure acidity and heavy metals in the stream. Tribal monitoring over the past two years indicate an overall improvement in cadmium, iron, manganese, uranium, nitrates, ammonia, alkalinity, hardness, dissolved oxygen, temperature, and sediment, water quality parameters. Blue Creek water quality in the wildlife mitigation project area, with regard to occasional high sulfate levels, currently falls within Spokane Tribe, Washington Class A stream, and Federal water quality standards (Peone, 1994).

3.1.5 Air

The remote location, steep mountainous terrain, daily wind patterns, and westerly maritime storm patterns influence the Reservation project area. These conditions produce optimum atmospheric mixing conditions that help to maintain excellent air quality conditions over most of the year.

In 1989, the Spokane Tribe designated the Spokane Reservation a Class I airshed under the Clean Air Act (42 USC Section 7474(c)). The Environmental Protection Agency's (EPA) regulations for the prevention of significant deterioration of air quality allow for only small increases in ambient levels of particulate matter and sulfur dioxide. Presently, the Class I designation does not affect Tribal and other agricultural and timber industry waste disposal methods presently occurring within Stevens County, Washington.
The State of Washington has a State Implementation Plan for administering, monitoring, and enforcing the Clean Air Act in its Eastern Division of the Department of Ecology. The State does not currently monitor air quality conditions in Stevens County (Billings, 1994). However, the Spokane Agency of the BIA, works in cooperation with the State of Washington for all prescribed burning operations conducted on the Spokane Indian Reservation.

3.2 Biological Resources

3.2.1 Vegetation

3.2.1.1 *Pine Zone Vegetation: Commercial Forest*

Ponderosa pine is the most common tree and dominant cover type in the project area. Pine-dominated commercial forests make up a total of 1,637 hectares (4,044 acres). Most of this cover type is found at lower elevations and on flat or south facing slopes, as it is a more drought-tolerant tree species. Tree densities in the project area vary due to the microclimate and the amount of available moisture for a given location. Generally, low tree densities result in canopy cover that is less than desired for deer winter range requirements.

Scattered Density (0-10 percent canopy cover): Ponderosa pine comprises 405 hectares (1,001 acres) or 18.3 percent of the project area. Ecologically, this cover type closely resembles the shrub steppe classification due to the high degree of shrub densities. Shrubs, especially antelope bitterbrush, are the most common understory species. Bitterbrush is a preferred deer browse. Bluebunch wheatgrass and Idaho fescue bunchgrasses are also common understory species. Microclimate conditions are too harsh in the scattered density forest type for highly successful tree establishment.

Uneven-aged Light Density (11-40 percent canopy cover): Ponderosa pine makes up 735 hectares (1,815 acres) or 33 percent of the project area. Canopy cover is the most limiting factor for wildlife winter habitat until the 40 percent level is reached. Much of the light density forest type has the potential to naturally reach the optimum 40 percent cover with little active forest enhancement.

Uneven-aged Medium Density (40-70 percent canopy cover): Ponderosa pine makes up 474 hectares (1,172 acres) or 21.4 percent of the project area. In Pine forest the 40 percent canopy cover is optimum because bitterbrush production is encouraged in the understory. Above 40 percent optimum cover, some timber harvest could occur to increase winter range habitat value or other wildlife values.

Full Density (70-100 percent canopy cover): Ponderosa pine is present in the project area but at only 13.4 hectares (33 acres) or 0.6 percent total. An improvement in deer winter range benefits could be expected with a reduction in canopy cover towards 40 percent. Largest trees in this zone are valuable for perching and nesting habitat. Selected trees could be removed to increase winter range habitat or other wildlife values in this forest cover type.

3.2.1.2 *Pine Zone Vegetation: Pine-Fir Codominant Forest*

Most of the Ponderosa pine-Douglas fir codominant tree species are found on project area north slopes or within the wetter riparian environments of Blue, Sand, and Oyachen

Creeks. The majority (255.4 of 312.4 hectares (631 of 772 acres), or 82 percent) of this cover type has larger tree size, older age class, and higher tree density per acre. Generally, a 70 percent Douglas fir canopy cover is considered optimum, because the older age class trees encourage the growth of lichens (*Alectoria* spp.), a valuable winter food source for deer. Additional habitat values are increased due to the multilayered stand and interlocking canopy of the older trees that improve thermal conditions and body heat retention for the wildlife species below. Douglas fir is more effective than pine in intercepting snow, making it easier for deer to move and find food under the canopy.

3.2.1.3 *River Breaks Zone Vegetation: Shrub-Steppe/Grassland*

The River Breaks Zone is fairly steep, with exposed basalt, scattered trees, and shrub cover. There are 259 hectares (640 acres) of shrub-steppe cover types within the project area. The cover types include bitterbrush, bunchgrasses, and forbs, which make up 168 hectares (416 acres) or 65 percent of the total in this category. In the early and mid-1980s, cattle and horse densities were high and rangeland was in a low quality condition. Currently, cattle stocking is lower and the rangeland is in an improved condition (McCrea, 1994).

3.2.1.4 *Riparian Vegetation*

Riparian zones in the project area are generally confined to narrow corridors around the springs and along the perennial and intermittent streams that drain the area. In some places the habitat has been enlarged and enhanced by beaver activity. Riparian vegetation is usually comprised of aspen, cottonwood, rock spirea, alder, dogwood, and various marsh grasses and sedges. Notwithstanding their small area, the wide distribution of these riparian areas makes them critical habitat for a great variety of wildlife dependent on them for all or part of their life cycle.

3.2.1.5 *Noxious Weeds*

Although not a problem in the mid-elevation Pine Zone, undesirable or noxious weed infestations are substantial in the Riverbreaks Zone. As of 1985, BIA-Land Operations estimated that 36 percent of the Reservation is currently infested with noxious weeds, and the extent of infestation is increasing annually. Approximately 297 hectares (733 acres) in the Riverbreaks Zone are infested with knapweed species.

The knapweed complex, which includes yellowstar thistle, diffuse knapweed, spotted knapweed, and Russian knapweed, are the major noxious weed species found in the project area. These acres are currently being treated via the BIA-Lands Operations' "Knapweed Containment Plan," which calls for the use of Picoloram (Tordon). This herbicide is currently being applied to all infested road rights-of-way annually. On average, lands within the project area receive a low level of herbicides on an annual basis.

3.2.2 Wildlife

The following description of existing wildlife resources is based on published and unpublished literature and studies conducted on the Spokane Reservation. Appendix B is a representative list of plants, birds, mammals, and reptiles occurring in the project area.

3.2.2.1 *Wildlife Winter Range Requirements*

Winter range is an area that provides the resources deer and elk use during all but the mildest of winter conditions. The physical criteria of the Blue Creek drainage fit the general definition of a desirable winter range:

- General southeast, south, southwest, or west aspects (the exceptions include large river valleys);
- Gentle to moderate slopes (10-45 percent);
- Elevations below 1,219 m (4,000 ft) in shallow and moderate snowpack zones, and below 762 m (2,500 ft) in deep snowpack zones; and
- Ponderosa pine as the predominate tree species (mature and over-mature trees present).

3.2.2.2 Existing and Affected Wildlife

The most important game species is the white-tailed deer, which is commonly found in all major vegetation zones of the Reservation. Data from a recent aerial survey census of the deer population indicate that the mule deer to white-tailed deer ratio is about 1:2 (Merker, 1993).

Black bear and Rocky Mountain elk populations are two other major big game species that frequent the project area. Historically, Rocky Mountain elk have been sighted on occasion within the project area. In February of 1990, 49 elk were released in the Sand Creek drainage. These elk presently use Sand Creek and parts of the Blue Creek Riverbreaks Zone as winter range.

The project area offers good habitat for a variety of bird species. Habitat features associated with existing vegetation zones are adequate to support nesting populations of raptors (goshawk, American kestrel, Cooper's hawk, red-tailed hawk, osprey, golden eagle), and upland game species such as ruffed grouse, Merriam's turkey, and California quail (see Appendix B).

Waterfowl as a group are not common to the project area due to the loss of riparian and wetland habitat. Green-winged teal, wood ducks, mallards, and American coots are occasionally observed on the Spokane River, small beaver ponds, and creeks of the project area. Great blue herons are commonly observed feeding on small fish, amphibians, and insects along the shallower margins of the rivers and small ponds.

3.2.3 Threatened and Endangered Species

The bald eagle, a threatened species in the State of Washington, is the only federally listed species identified by the U.S. Fish and Wildlife Service (USFWS) as occurring within the project area. Bald eagles are observed wintering on the Reservation boundary waters eating fish and deer carrion (Columbia and Spokane Rivers), and along the shores of nearby large inland lakes. Endangered Species Act consultation with the USFWS has been completed. In a letter dated March 25, 1994, the USFWS concurred that no adverse effects on bald eagles are anticipated as a result of the Project.

There is one known State Species of Special Concern, the western bluebird (Siala mexicana). Its present range overlaps into the Riverbreaks Zone. Typically, Western bluebirds feed on insects in open woodlands, pastures, burned areas with snags, and other open areas with scattered trees. The population limiting factor is the availability of nest cavities located in or near open feeding areas. Nests are built in abandoned woodpecker holes and natural tree cavities.

3.3 Social , Economic, and Cultural Resources

3.3.1 Cultural Resources

Historically, the Spokane people ranged widely throughout Northeast Washington and Northern Idaho as hunter-gatherers. As well as hunting and collecting roots and berries, the Spokane Tribe was very dependent on the salmon fishery both as a food source and a trade item. Salmon was often traded with the plains Tribes to the east, usually during the annual journey to Montana for buffalo and other big game hunting. Anadromous fish are now totally extinct above Grand Coulee Dam. Today, subsistence hunting and fishing, and the gathering of many types of roots and berries on the Reservation, are still an important supplement to family income.

3.3.1.1 *Archaeological Sites*

An ethnoarchaeological reconnaissance field survey by John Ross from Eastern Washington University was conducted in the project area vicinity (Ross, 1985). The field survey confirmed the presence of cultural resource sites close to the Spokane River and its tributaries and concluded that the project area was heavily used by the Spokane people in the past. While some sites have been damaged or destroyed through present activities such as logging, road construction, grazing, and mineral exploration, evidence is sufficient to conclude that the area near the mouth of Blue Creek was likely used for winter villages and seasonal hunting camps. The project area is considered by the Spokane Tribe to have a high potential for additional cultural sites (Wynne, 1994).

3.3.1.2 *Native Food Plants and Medicines*

Native foods and medicines are important cultural resources to the Spokane Tribe. In the past, the seasonal movement of the Tribe was closely tied to harvest times of certain native plant species. After harvesting, native plant materials (bulbs, berries, moss, and so on) were eaten fresh, cooked, or dried and stored to be used later. Today, many of these same foods and medicines are used by Tribal members, particularly the elders.

The Blue Creek area contains some unique native raw plant materials needed for traditional purposes. A wide variety of native food and medicinal plants are found in diverse habitats ranging from shrub-steppe to Ponderosa pine and riparian vegetative communities. The specific native plant species used for food and materials by Spokane Tribal members are discussed at length by Nancy J. Turner in *The Ethnobotany of the Okanagan Indians of British Columbia in Washington State*. An additional listing of native plants by common, scientific name, and Spokane dialect are presented in an unpublished manuscript by John A. Ross of Eastern Washington State University. Both documents are available for review at the Spokane Agency, BIA.

3.3.2 Current Land Management/Economic Programs

In addition to subsistence hunting and fishing, additional land uses managed within the Reservation project area include timber harvesting, grazing, recreation, and transportation networks.

3.3.2.1 *Timber Program*

Timber revenues provide the majority of the working budget for the Spokane Tribe. Direct revenues from all Reservation timber sales are paid to allottees and the Spokane Tribe by timber purchasers. Indirect timber revenues are produced through the Spokane Indian Reservation Timber Products Enterprise which provides employment to Tribal members through various logging, log hauling, and reforestation contracts. Other forestry-related contracts for thinning, slashing, vegetation control, and reforestation projects provide additional employment opportunities for Tribal members. In addition, the BIA issues approximately 100 free-use permits annually to Tribal members for the purpose of harvesting live trees for use as props, posts and poles, and harvesting of standing dead or downed trees for firewood.

It takes approximately 100 years to grow a commercially valuable tree. Based on a current timber volume estimate, there is about 19 million board feet of commercial timber within the project area. BIA harvest schedules for pine forests are on a 20 year rotation cycle. This means about 20 percent of the merchantable saw timber is available for harvest each rotation. In the project area, this is equivalent to 3.8 million board feet every 20 years (BIA-Forestry, 1994).

The value of Ponderosa pine is flexible and is determined by market forces. At the time of the latest timber sale (March 1994) a bid of $690/thousand board feet was received by the Tribe. At this rate, the total timber value of the 19 million board feet within the project area would be $13,110,000. In the present harvest schedule, this would be worth $2,622,000 over the 20 year rotation period, or roughly $130,000 annually.

3.3.2.2 *Range Management*

The type of vegetation and forest cover-types found in the Riverbreaks Zone and mid-elevation Pine Zone typify the warmer, drier sites found in the Blue Creek area. The combination of overgrazing and a change in the fire frequency has contributed to deterioration of range conditions throughout the project area. Past overgrazing has contributed to the removal of native perennial grasses and their replacement with annual cheatgrass. As the native bunchgrass species declined, an increase in gray and green rabbitbrush, toadflax, and knapweed has occurred.

There is a total carrying capacity of 62 cow/calf units in the project area if all open land were converted to cattle grazing practices (McCrea, 1994). Range management activities are minimal. There are few water developments and fences, and these do little to distribute the animals uniformly across the range. Cattle are allowed to disperse freely from turnout points without follow-up redistribution practices required. This has resulted in the cattle grazing as free-roaming animals with little interference from ranchers or BIA range managers. There is a small herd (7-10 animals) of feral horses that share the range with cattle, deer, and elk.

3.3.2.3 Fire Management

Fire is a natural force in the development of forest and range ecosystems. Fire has played an important role in the natural succession of plant species that are native to the project area. Over the past 50 years, however, attempts to exclude fire from the project area forest zones have altered the dominant vegetation cover types toward less fire-resistant species. Organized fire suppression on the Reservation has allowed dead and down woody fuels to accumulate. Because of fuel availability, steep terrain, and fuel types, wildfires in the project area have a high risk for becoming large and destructive.

The BIA presently has fire management responsibility on about 62,729 hectares (155,000 acres) of Reservation timber and rangelands. The project area lies entirely within the Dry Pine Fire Management Zone, which accounted for 85 percent of the Reservation fires from 1980 to 1990. Currently, BIA fire suppression policy does not include fire suppression in the bitterbrush cover type common to the Riverbreaks and portions of the mid-elevation Pine Zone.

3.3.2.4 *Recreation*

The visual character of the Riverbreaks Zone includes scenic views of mountainous terrain. Open distant vistas are found in scattered locations due to the mountainous nature of the project area. The Riverbreaks Zone provides for recreational opportunities including swimming, fishing, hunting, picnicking, and horseback riding for Spokane Tribal members. The mid-elevation Pine Zone provides important deer hunting opportunities.

There are picnic shelters, comfort facilities, and docks located at the mouth of Blue Creek and along the Spokane Arm of the National Recreation Area. These facilities were built and are maintained by the Tribe's Parks Department and are available for use by the general public. Normally visitor use at the developed sites is high in the summer season. Dispersed camping is not allowed in the vicinity due to high fire hazard conditions.

3.3.2.5 *Transportation*

Road density is high in the project area (see Figure 3) and constitutes roughly 19 percent of the transportation system within the Reservation. The Tribe recently enacted a Roads Management Resolution for controlling traffic and disturbance related impacts to wildlife including wintering big game (Verner, 1994). Most roads were originally constructed to provide access to timber. Over time, logging roads became part of the permanent transportation system, increasing use of all forest and nonforest resources by Tribal members and their families.

DEER WINTER RANGE PROJECT AREA

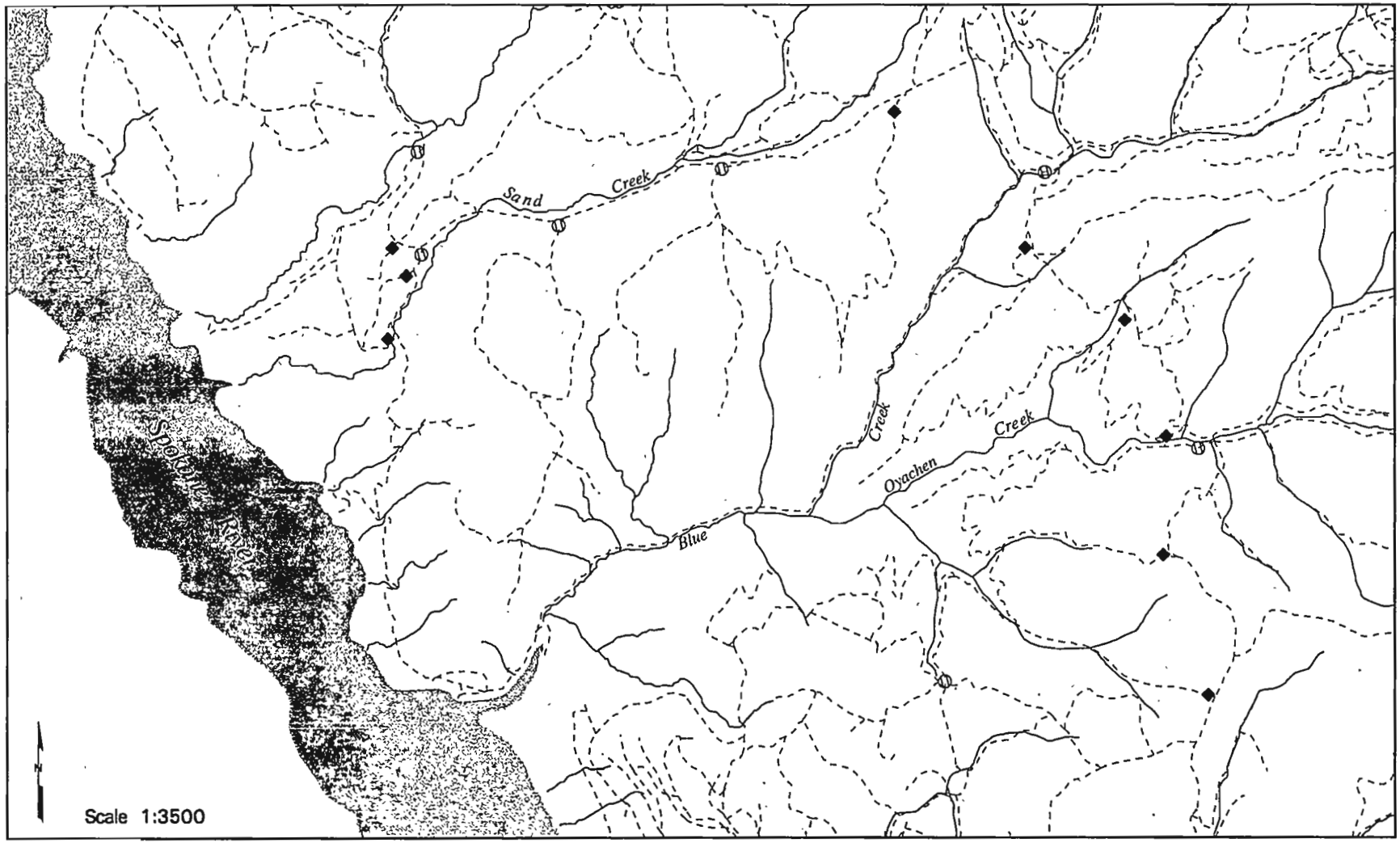

Figure 3. Road management plan

Gate
Tank trap berm
Roads
Streams
Project area

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

NO-ACTION: ALTERNATIVE A

Under Alternative A, the primary activities of timber and range management would continue in the project area. Pressure on timber resources is rapidly growing in northeastern Washington due to ever-increasing demand and tightening supplies. This is reflected in the nine-fold increase in Reservation stumpage prices over the past ten years. Prices of mature and old-growth Ponderosa pine are especially affected. With increased demand and prices, increased harvest rates could occur. Increased road building, truck traffic in the forest and on the system roads, noise and dust, soil erosion, and wildlife displacement would be expected. The rangelands in the project area are presently understocked with domestic livestock. A potential increase of livestock numbers would increase grazing of native bunchgrasses important for wintering elk. An increase in lake-side recreational use and facilities, and an increase in housing and other urban development on the reservoir, would be expected if present conditions persist. The result could be increased habitat loss, human activity, and harassment of wildlife.

Selection of Alternative A would limit the ability of BPA to satisfy terms and conditions of the Washington Wildlife Mitigation Agreement. It also could reduce opportunities for BPA to obtain mitigation credit for funding long term protection of upland and riparian wildlife habitat and to enhance Spokane Indian Reservation lands to increase wildlife habitat values..

LAND PROTECTION AND HABITAT ENHANCEMENT: ALTERNATIVE B

Alternative B would protect and enhance the long-term quality of riparian and upland wildlife habitats within the project area. With BPA funding, the project area would be dedicated and managed for wildlife values in perpetuity.

Selection of Alternative B would meet the need for mitigation of wildlife and wildlife habitat adversely affected by the construction of Grand Coulee Dam and Reservoir. Selection of Alternative B would increase the quantity and quality of wildlife and wildlife habitat on the Spokane Reservation. Alternative B would provide the means for BPA to meet the terms and conditions of the interim Washington Wildlife Coalition Agreement.

4.1 PHYSICAL ENVIRONMENT EFFECTS

4.1.1 Climate

Neither alternative would have a known effect on regional climatic patterns. Microclimate effects of continued commercial timber harvests may include altered patterns of snow

accumulation and melt in large canopy openings created by clear cuts and selective cuts. Microclimate effects of enhancing or thinning the forest canopy as proposed in Alternative B would benefit wintering big game by increasing or optimizing thermal retention on the forest floor and by maintaining the existing pattern of snow accumulation and melt.

4.1.2 Physiography

Neither alternative would have a known effect on physiography.

4.1.3 Soils

Under Alternative A, existing commercial timber harvest schedules with tree-falling, skidding, road building, and truck traffic activity would continue. Soils would continue to be affected by increased duff removal, compaction, disturbance, and erosion. Because the removal of timber would expose more mineral soil to rain, sediment transport into surface water could increase. After logging, the next most likely source of exposed soils is the unprotected cuts and fills of forest roads. New road construction or reopening old logging roads would remove additional land from wildlife habitat production and could increase sedimentation into surface water.

Although some limited amount of timber may be removed for wildlife purposes, no commercial timber harvesting is proposed in Alternative B. Ending commercial timber harvesting would mean reducing soil disturbance and thus soil impacts. In the long term, protecting soils from logging and road construction would support increased vegetation and would decrease soil erosion. Closing roads, as proposed in this alternative, would further decrease traffic and dust. As plants and trees reclaim portions of the existing forest road system, more land would become available for wildlife habitat.

4.1.4 Water

4.1.4.1 Water Quantity

Timber harvesting and livestock grazing influence watershed streamflow patterns in two primary ways: by reducing evapotranspiration (water evaporated or transpired by vegetation into the atmosphere), and by decreasing water infiltration into the soil. Evapotranspiration rates are reduced by removal of trees and other vegetation which intercept and utilize water. Reduction of water filtration occurs on soils compacted from increased road building, skid trails, landings, mechanical site preparation activities, and livestock use.

The potential effect of continued commercial timber harvests and livestock grazing practices in Alternative A would be to decrease water demand, and to increase water surface runoff. Surface water runoff would occur at a quicker rate on steeper slopes and with less soil infiltration. Depending on the amount of precipitation in a given year and other site conditions, a watershed could show an increase in the amount of spring peak

flows and a decrease in flows earlier in the summer. For example, a perennial stream in the project area could dry up in lower stream segments by July or August under this alternative.

In Alternative B, commercial timber harvesting and livestock grazing would end, trees and shrub-steppe/grassland cover types would be protected and enhanced, and several miles of road would be closed. In the long-term, more vegetation would increase the evapotranspiration rate, slow surface water runoff, and increase water infiltration into uncompacted soils. This would result in lower peak streamflows and longer streamflow periods in many instances. For example, an intermittent stream could flow year-round because of the increased amount of subsurface soil moisture in the watershed that would enter the stream course at a slower rate.

4.1.4.2 Water Quality

Under Alternative A, water quality degradation could occur as increased surface water runoff and sediment enter streams, lakes, and ponds. Also, logging debris left in stream channels, could divert flow, causing cutting and subsequent mass wasting of streambanks.

Habitat protection and enhancement activities, as proposed in Alternative B, would result in less sediment entering stream courses, and increased streamflow periods in both the near and long term. Cleaner, longer flowing streams and springs would benefit vegetation and wildlife species that are dependent on aquatic and riparian areas for all or part of their life cycle.

4.1.5 Air

Under Alternative A, continued logging, site treatment, road use, controlled burning, and wildfires may have localized, short term adverse effects on air quality in the form of dust, smoke particulate, and vehicle engine emissions. These impacts would result from increased road maintenance, vehicle traffic, burning debris, heavy equipment at the harvest site, and wind erosion.

In Alternative B, the halt of commercial logging and reduction of general road use (in the project area) would decrease dust, smoke, and vehicle engine emissions from current levels. Prescribed burning and other near-term enhancement activities could produce smoke or expose mineral soils to wind action that would result in temporary reductions in air quality at localized areas. Although more frequent but less intense springtime underburning would be implemented, smoke quantity should be less. This is because the amount of debris burned as a result of thinning and creating small openings would be less than that produced by commercial logging. To avoid the potential for any adverse air quality effects, it is recommended that standard BIA fire protocols be followed prior to and during burning activities. In the long-term ambient air quality would improve under this alternative and Class I attainment would be preserved.

4.2 Biological Resources

4.2.1 Vegetation

Important components of the proposed action are the re-establishment of native vegetation communities, vegetation management to improve habitat diversity, site protection by fencing, and termination of land use practices harmful to native vegetation. Re-establishment of native vegetation would provide the greatest habitat value possible, with long term benefits for wildlife populations and traditional Spokane Nation cultural uses. Fencing the perimeter of the project area and terminating land use practices harmful to native vegetation could provide increased wildlife habitat benefits within a single growing season. Potentially, management activities may be required to control weed infestations in disturbed areas or areas with exposed soils. Enhancement activities that restore large and vigorous native plant communities, combined with road closures, should provide the most cost-effective and practical means of future weed control. Proposed O&M activities would focus on increasing native vegetation communities. Proposed M&E would guide these activities to ensure that success is achieved.

Near-term effects of native vegetation restoration may include the potential disturbance of wildlife populations presently using the existing vegetative cover types. For example, potential effects to ground nesting birds could result from the removal of non-native weed species in spring and early summer. It is recommended that management activities that include burning or herbicide treatments be conducted at the appropriate season and timed to avoid any adverse effect to wildlife species.

4.2.1.1 Potential Effects on Vegetation by Cover Type

Upland pine and fir forest: Under Alternative A, both even-aged and uneven-aged timber harvest practices would continue in the project area. Potential near term effects of logging would include reduced vertical and structural forest diversity as commercial sized trees are removed. In the long term, overstory and understory species would recover, with the exception of old-growth age tree classes. Because of harvest rotation schedules, old-growth aged tree classes would not be allowed to re-establish. The highest canopy cover and thermal protection benefits for wildlife are provided by this cover type.

In Alternative B, silvicultural activities are notably reduced and proposed only to enhance or manipulate canopy cover characteristics that are necessary to optimize big game winter habitat conditions. In the long-term, conifer tree planting, harvesting, thinning, and controlled burning activities would increase the quality and diversity of the cover types in the forest overstory and understory plant species now present in the project area. Depending on local site conditions, it is expected that habitat improvement could take from 1-3 years for an observable response. Potential adverse effects to native vegetation are not predicted in the near-term, because all age classes of trees and other native plant species would be protected and increased over time. It is recommended, however, that

burning or herbicide treatments be conducted at appropriate seasons and timed to avoid any adverse impacts to existing wildlife populations.

Riparian forest, shrub, and herb: Under Alternative A, timber harvesting would continue to affect riparian areas by reducing bank stability, modifying the microclimate, and converting dominant vegetation from trees to shrubs. Continued disturbances within a riparian zone might be caused by reopening and maintaining existing logging roads, development of log landing sites, or falling and yarding timber. These activities could produce changes in the local vegetation by compacting soils, altering ground cover, reducing root strength, and opening tree canopies. Livestock grazing would continue to impact riparian vegetation, as cattle tend to select streamside and spring sites throughout the year. Cattle and wild horse grazing would continue to impact the bunchgrasses, which are the basis of winter elk forage. Homesite and recreation development would continue, especially along the reservoir shoreline. Riparian vegetation could be further cleared for development and views.

In Alternative B, establishment of native vegetation, removal of competing conifers, installation of water collection devices at hillside springs, and control of noxious weeds would increase the quality and diversity of the riparian cover types now present. Control of grazing practices within riparian corridors and around springs should allow for quicker restoration of native shrubs and herbs, and allow hardwood trees to propagate. Quaking aspen recruitment and planting should increase habitat benefits within a relatively short time frame (5-10 years) as the young trees grow in height. In areas with existing native riparian shrub and grass communities, habitat improvement may be observable within a single growing season. Thinning and underburning would speed development of large trees in the overstory and increase desired canopy cover levels for deer. Ceanothus and other fire dependent shrub species preferred as deer browse would respond positively to controlled burning.

Shrub-steppe and grassland: Continued cattle grazing practices in Alternative A would sustain the adverse impacts to native bunchgrasses, which are the basis of winter elk forage. Increased grazing, soil compaction, and other soil disturbance levels could reduce total grassland production and limit winter forage and other wildlife habitat values. Controlled burning would provide increased habitat benefits by creating or maintaining open, mature stands of larger or old-growth Ponderosa pine that is needed for its protecting canopy cover. In addition, controlled burning could be used to reduce the amount of available fuel sources to reduce the risk of large uncontrolled wildfires, and to regenerate ceanothus and other valuable deer browse species. Although it is preferred by deer as a winter food source, bitterbrush habitat would continue without wildfire protection in the project area. Because bitterbrush is not a fire-sprouting species and can be killed or destroyed by fire, adverse affects to deer winter range would continue under this alternative.

Depending on specific site conditions, the quantity of shrub-steppe and grassland vegetation and the quality of wildlife habitat, under Alternative B, could be increased in 2-

3 years. Restoration activities could produce observable improvements in some areas within 3 years. By excluding cattle from project area grasslands, an immediate improvement in bunchgrass and other native grass production should be observed. As a result, the habitat quality of ground nesting birds could be increased with a 1-2 year timeframe. Controlling competing weed species, such as knapweed, which increase with livestock grazing practices, should also favor native shrub and grass productivity. Potentially, native grass and shrub communities could be partially restored in disturbed sites within 3-5 years. In areas with productive soils and adequate moisture, habitat enhancement could be expected to occur at a quicker pace. Controlled burning would be beneficial for regeneration of ceanothus and other valuable deer browse species which require fire to reproduce. Fire suppression in the bitterbrush cover type would provide immediate benefits to wintering deer populations.

4.2.1.2 Noxious Weeds

It is nearly impossible to predict the rate of spread of noxious weeds within the project area. The spread of noxious weeds occurs primarily by vehicle traffic carrying seed and plant parts from one site to another. Logging, road maintenance, and earth-moving equipment operated in infested areas also contribute to the increase in the rate of collection and transportation of seeds. In both alternatives, noxious weed control, including the use of herbicides, would be pursued. To avoid adverse effects on non-targeted species, and to avoid transportation of chemicals to ground water or surface water, chemical applications would continue to be coordinated with BIA-Lands Operations. The purpose would be to ensure that EPA, BIA, and State of Washington chemical and label restrictions are followed.

The continued commercial logging activities in Alternative A would result in increased amounts of disturbed soils and thus a greater amount of seedbeds for noxious weeds. The potential for the spread of noxious weeds would be accelerated as increased amounts of soils are disturbed and the incidence of site reentry is increased. In the long-term, continued commercial timber harvesting activities may result in noxious weed population levels that cannot be eliminated economically. As noxious weeds increase in number and displace desirable vegetation, forage production levels of bunchgrasses, and in some cases tree regeneration levels, would be decreased.

The proposed wildlife management activities in Alternative B may help to immediately control the rate of spread of noxious weeds in a number of ways. First, less soil disturbance and fewer seedbed sites would be expected due to the halt of commercial logging and grazing activities. Second, reduced road traffic levels due to proposed road closures would mean less collection and transportation of seeds by vehicles. In the long-term, the amount of herbicide application as proposed in Alternative B is expected to be less than Alternative A. Chemical use should decrease due to the lesser degree of soil exposed to seed sources, the crowding or shading out of weed species as native plant communities expand, and proposed alternative weed control methods.

4.2.2 Wildlife

Continued timber harvesting activities in Alternative A could have negative or positive impacts on wildlife, depending on the animal species and the intensity of logging activities. Practices that adversely affect one species could benefit another. The activities that would have an adverse effect on all wildlife species, however, are construction and reconstruction of roads, skid trails, and the yarding areas associated with logging practices. There are many species that would be adversely affected by any timber management activity. For example, species that depend on snags and snag cavities, including several kinds of woodpeckers, ducks, owls, songbirds, bats, and other small birds and mammals, could experience declines from the reduction of existing snag levels either by wood cutters or by the elimination of future snags (risk trees) in harvest units.

With uneven-aged timber management practices, selective cutting would lead to a reduction in open wildlife habitat, to the detriment of big game species requiring forest edges and large open foraging areas. With even-aged management practices, clear cutting would reduce vertical canopy diversity in the forest, to the detriment of avian species requiring multi-storied forest habitat. Combining these timber management practices, as in Alternative A, could provide for a more moderate retention of habitat values, including varied degrees of thermal and security cover, forage availability, and vertical and horizontal diversity. The main concern is the effect continued logging would have on wintering big game populations. Wintering deer and elk would be affected in the long term by the continued alteration in the abundance and diversity of forage species in newly created openings, and the continued canopy cover alterations that reduce thermal characteristics on the forest floor. Near term effects for all wildlife species would include disturbance and displacement caused by noise and traffic during logging activities.

The process of securing and enhancing land for wildlife as proposed in Alternative B, would provide both immediate and long-term benefits for wildlife populations. Immediate benefits include the protection of habitat qualities present at the project area and the termination of commercial timber harvesting and livestock grazing practices that decrease wildlife habitat values. In areas heavily altered by timber harvesting and grazing, land protection exclusively for wildlife purposes would maintain existing habitat values and ensure that wildlife populations are not further reduced. In slightly disturbed areas, the halt of competing land management practices would be sufficient in itself to improve habitat conditions and increase healthy wildlife populations.

Enhancement activities such as planting native vegetation, silvicultural practices to provide optimum tree canopy cover, controlled burning, and installation of water collection tanks, as proposed in Alternative B, would be completed in a manner and time frame that would least disturb the wildlife present. Disturbances due to noise or construction are expected to be of short duration and localized in nature. Near-term disturbance of wildlife should be offset within one growing season by the greatly increased habitat values. To avoid recurring disturbances, reconstruction of habitats would be designed to minimize the amount of annual operation and maintenance required. Monitoring and evaluation

activities such as visual surveys of wildlife and wildlife habitat would have no known adverse environmental effect.

Because the HEP models identified road-associated human disturbances as an extremely adverse effect on deer populations, permanent and seasonal road closures would be implemented in Alternative B. The immediate effect of permanently closing some primitive roads would be to reduce disturbance of wildlife populations due to year-round noise levels, dust, soil erosion, poaching, vandalism, and litter impacts, and the actual number of people entering the project area. In the long term, reseeded roads would provide additional food and cover on acreage previously unavailable for wildlife usage. Seasonal closures of secondary roads would further control human entry and reduce stress on deer, elk, and eagle populations during critical wintering, fawning and calving periods.

4.2.2.1 Potential Wildlife Effects by Cover Type

Upland pine and fir forest: Under Alternative A, upland forest cover conditions and dependent wildlife species would continue to decline due to alteration of canopy cover conditions and disturbance from continued timber harvesting.

Alternative B would protect existing habitat values, and allow improvement in wildlife populations. Raptors would benefit in the near-term by increases in prey populations. In the long-term, existing old-growth pine would be maintained and increased in the project area over time. This would benefit wintering deer and elk, and provide nesting and hunting perches for bald eagle, osprey, and other raptors. Two corvid species, gray jay and Clark's nutcracker, would benefit for the same reasons. Primary cavity nesters, such as pileated and other woodpeckers, would increase with the addition in numbers of larger snags, and with the increase in old-growth trees that are used for foraging perches and nest sites. Secondary cavity nesters, such as the western bluebird, would also benefit in the same manner.

Riparian forest, shrub, and herb: Under Alternative A, riparian plant cover conditions and dependent wildlife species would continue to decline due to continued competition from grazing livestock.

In Alternative B, excluding livestock by fencing the project area perimeter would increase riparian plant cover and provide wildlife benefits within a single growing season. As hardwood trees re-establish and mature, cavity-dependent birds such as wood ducks and Lewis' woodpeckers would be provided with increased nesting habitat. Perching birds and raptors would also benefit from increased diversity of forest layers. Improved riparian shrub and herb conditions would increase nesting, feeding and cover habitat for bird species such as yellow warblers and ruffed grouse, and for mammals such as mule deer and cottontail rabbits. Long-term riparian habitat improvement through planting efforts, and an increase in beaver ponds, would benefit songbirds such as yellow warbler, and nesting waterfowl and herons.

Shrub-steppe and grassland: Under Alternative A, shrub-steppe and grassland cover conditions and dependent wildlife species would decline due to continued competition from grazing livestock.

In Alternative B, excluding livestock by fencing the project area perimeter would increase shrub and bunchgrass cover and quickly produce positive grassland habitat. Within 5 years, additional elk forage could be expected in grasslands. Because moisture limits growth rates, observable improvement in upland shrub (such as bitterbrush) and old-growth conifer cover would result only over the long-term. These rates could be somewhat increased through management such as planting of shrubs and thinning of conifer. Due to slow improvements in bitterbrush and old-growth conifer, a noticeable increase in deer populations could take longer, possibly 10-20 years. Fire suppression in bitterbrush habitat types as proposed in this alternative would better protect existing winter habitat conditions and provide some immediate benefit to existing deer populations. Gallinaceous birds, such as turkey and ruffed grouse, would experience benefits in the near term from increased native grass and shrub growth. An increase in mature quaking aspen trees would benefit all grouse species by providing deciduous cover and winter forage.

4.2.3 Threatened or Endangered Species

Wintering bald eagles are the only Federally listed species in the project area. In a letter dated March 25, 1994, the USFWS concurred that no adverse effects on bald eagles are anticipated as a result of the Project. Over time, bald eagle and other raptor populations should directly benefit from improved perching and foraging opportunities that are provided as old-growth forest and riparian habitat conditions improve. An increase of bald eagle nesting sites may result in increased nesting activities.

Because the primary food of wintering bald eagle populations in the project area is fish and deer, an increase in wintering deer numbers would increase bald eagle foraging and feeding opportunities. Additionally, protecting the large conifer forest cover type from logging practices would encourage recruitment of more old-growth pine stands, and help ensure that the number of available hunting perches and roost sites for eagles are maintained and/or increased over time.

It is anticipated that near-term adverse effects on wintering bald eagles would be minimal. To minimize any potential adverse effects, it is recommended that the majority of initial habitat enhancement work in riparian areas occur from late April through October (a time when bald eagles are not present). To further reduce potential disturbance of bald eagles, public access into the project area by motorized vehicles would be allowed only when bald eagles are not present.

4.3 Social, Economic, and Cultural Resources

4.3.1 Cultural Resources

Archaeological, cultural, and historic resources must be carefully managed to prevent resources from being destroyed. In addition, information collected from sites discovered during management activities must be properly handled to preserve historic and cultural values.

4.3.1.1 Archaeological Sites

The effect of ground disturbing activities associated with Alternative A, such as continued timber harvest, cattle grazing and recreational development, has a high potential to affect cultural resources. Activities having the most adverse effects are skidding, slash piling, and road construction. The degree of disturbance would depend on the type of equipment used, weather conditions, soil type, and the number of times the ground is disturbed. The near-term direct impacts to artifacts could include alteration of an artifact through compositional changes, breakage, vertical and horizontal displacement, and loss or removal from the archaeological record. Indirect impacts could be caused by soil erosion and the uncovering of a site after harvesting activities have ceased. Potentially, this could occur a month later or even years afterwards. In the long-term, additional road construction associated with commercial timber harvests might increase the opportunities for developing and viewing of interpretive sites, but would also increase the risk of vandalism. Under existing Federal and Tribal regulations, site visits and field surveys by the Tribal Cultural Representative are required to prevent adverse effects. Cultural resource surveys would continue prior to all timber harvests (and other activities) prior to ground disturbing activities.

The wildlife enhancement activities, as proposed in Alternative B, would have a reduced potential for affecting cultural resources because fewer ground disturbing activities would occur. In the long term, native vegetation restoration and silvicultural activities designed to increase wildlife habitat could simultaneously serve to protect, preserve, stabilize, or enhance archaeological sites. As in Alternative A, cultural surveys would be conducted by Spokane Tribal staff in an effort to prevent adverse effects and to meet Federal and Tribal requirements. Four categories of mitigative actions are recommended when or if cultural resource sites are identified: (1) total avoidance of known cultural resources by wildlife enhancement actions; (2) the creation of buffer zones designed to protect sites from looting and/or other negative impacts; (3) stabilization of endangered sites and locations; and (4) revegetation of those areas impacted by logging, cattle grazing, and/or other development activities. As explained in greater detail, this would include:

(1) Avoidance (Protection): Site-specific surveys shall be used to determine which areas must be totally avoided because of their historic and cultural importance to the Spokane Indian Nation. In such areas, either no activities would be allowed or activities would be restricted to specific actions identified by the Tribal Cultural Representative. For example, areas where pit houses or burial sites are located should be avoided.

(2) Buffer Zones (Preservation): Buffer zones shall be established to increase protection of sensitive sites where little human activity is desired. The establishment of thick native shrub and forest species is recommended for establishing these barriers. Because the buffers would be composed of natural vegetation, they should not draw undue attention to those areas they are protecting.

(3) Stabilization: Stabilization of sensitive cultural resource sites shall be used in areas where the sites are in danger of being lost because of past land use practices. Sites near eroding river or creek banks, for example, can be stabilized to varying degrees by the re-establishment of riparian vegetation. Wildlife enhancement activities as proposed in Alternative B should be designed whenever possible to provide wildlife benefits while stabilizing historic or cultural sites. Such opportunities provide an example of the compatibility of wildlife habitat restoration goals with those that increase protection for the historic and cultural resources of the Spokane Indian Nation.

(4) Revegetation (Enhancement): Revegetation shall be conducted in a manner similar to stabilization, but would be used in areas where logging, cattle grazing, or other land use activities have removed the ground cover. The goal of revegetation would be to provide wildlife habitat and to protect a cultural resource site from looting or vandalism. Food, medicine, and materials sites should also be revegetated to provide areas within the project area that can be used for traditional gathering. This method presents an opportunity for wildlife and historic and cultural resource goals to be achieved simultaneously.

4.3.1.2 *Native Food Plants and Medicines*

Under Alternative A, continuing commercial timber harvesting practices would favor early successional plant species, and unharvested areas would continue to favor subclimax and climax species. Some diversity of forest habitats could be maintained, and native plant species used for traditional food and medicinal plants would be perpetuated. However, timber harvest could result in a decline of those native plants with near-climax and old-growth habitat requirements.

Overall, Alternative B would provide a wider range of habitat, especially for native plants associated with climax succession. Although plants with seral (mixed shrub and tree) habitat requirements may decline in riparian zones, use of fire should continue to provide

some early successional age-classes. In the long term, Alternative B would provide increased food and medicine plants associated with the older age-class forest, which is more limited on the Reservation than early successional vegetative types. In this alternative, road management and chemical control would reduce noxious weeds in the near term, thus favoring native food and medicinal plants. Increased riparian acreage as a result of this alternative would also result in increased variety and numbers of plants required for traditional uses.

4.3.2 Land Management/Economic Programs

Under Alternative B, only three uses would be affected: commercial timber harvesting, grazing, and development. These activites would be halted within the project area. BPA would purchase the timber, grazing, and development rights to preserve the project area for wildlife purposes and to allay income losses to the Tribe. The Tribe would agree to preserve wildlife habitat values. The terms and conditions of these transactions would be established in a long-term BPA/Spokane Tribe management agreement. Hunting, gathering, fishing, and all other recreational uses would not be prohibited.

4.3.2.1 Timber Program

Alternative A would permit the continuing cut of timber at present harvest rates. Present income levels to the Tribe and adverse effects on wildlife and wildlife habitat would continue.

Alternative B would drastically change the timber program. Harvest would occur only to meet wildlife objectives. Trees would be cut only to thin dense stands, speed development of old-growth conditions, or to create openings for species such as sharp-tailed grouse. Over a 10-year implementation period, an estimated 1.8 million board feet could be removed to meet wildlife objectives. This would represent a potential reduction in allowable cut of 93 percent. This amount could vary slightly due to any necessary salvage sales in the event of fire or disease.

Under Alternative B, the Tribe would see up to a 93 percent reduction in the timber harvest level and in the associated timber revenues that are produced from the project area. No adverse effects are expected because BPA would purchase the timber rights necessary to preserve the forest for wildlife purposes and allay income losses to the Tribe. The Tribe would agree to preserve wildlife habitat values by signing the long-term BPA/Spokane Tribe management agreement.

4.3.2.2 *Range Management*

Alternative A would allow range leases for grazing of livestock to continue. Present income levels to the Tribe and adverse effects on wildlife and wildlife habitat would continue.

Alternative B would terminate all grazing by domestic livestock. No adverse effects are expected because BPA would purchase the grazing rights to preserve range and open lands for wildlife purposes and allay income losses to the Tribe. The Tribe would agree to preserve wildlife habitat values by signing the long-term BPA/Spokane Tribe management agreement.

4.3.2.3 Fire Management

Prescribed burns would be used by BIA staff in both alternatives to simulate the natural role of fire in the successional process. No long-term adverse effects on vegetation, air quality, or wildlife are expected because this practice replicates the natural fire regime that existed before logging and fire suppression were introduced. Controlled burning under both alternatives would provide habitat benefits by creating or maintaining openings and would reduce the amount of available fuel sources, thus reducing the risk of large uncontrolled wildfires.

BIA fire management staff would remain responsible under both alternatives for fire suppression activities in the project area. Presently, fire suppression policy under Alternative A does not include wild fire suppression in the bitterbrush habitat type. In Alternative B, BIA staff would suppress all project area wildfires including those in the bitterbrush cover type. This would increase protection for both existing and restored winter range and provide immediate benefits to wintering deer populations. No adverse effects on the existing BIA fire suppression program are expected. This is because increased costs of fire protection would be funded as part of Project operation and maintenance requirements, as defined in the terms of the Spokane Tribe/BPA Management Agreement.

4.3.2.4 *Recreation*

No adverse effects on recreation are expected in either alternative. Existing levels and types of recreation would not change under Alternative A. Water-based recreation is dependent on reservoir levels. Visitor use by the general public would continue to increase. Upland recreation, including fishing, hunting, and gathering on the Reservation, would remain available to Tribal members and non-members with appropriate permits and/or licenses. Other dispersed Reservation recreational activities such as horseback riding and camping would remain available to Tribal members and their guests.

In Alternative B, all previous recreational activities would continue. Because timber harvest activities would no longer generate noise, dust, visual, or traffic impacts, recreational experiences would improve. Permanent closure of some primitive roads and seasonal closures of primary and secondary roads would occur in this alternative. Without competition from motor vehicles, the quality of nonmotorized recreation experiences may improve due to less crowding, and reduced noise, dust, visual, vandalism, and litter. Because of restrictions on motorized access, the existing visitor use levels, patterns, and

motorized activities in the project area may change or move to other areas of the Reservation.

4.3.2.5 *Transportation*

In Alternative A, no restrictions on use of the extensive road system in the project area would occur. Additional secondary and primitive roads would likely be constructed for timber harvesting purposes.

Although existing road systems would be closed with soil berms and steel gates, and naturally reseeded, road surfaces would not be ripped or re-contoured in Alternative B. This is an important factor in retaining their use for emergency fire management access and as recreational trails. The main Blue Creek campground road would remain open to provide access except for a December 1-March 31 seasonal closure that would occur during the peak of eagle, deer, and elk winter use. Due to little or no recreational use of the Blue Creek campground during the winter season, adverse road closure effects are not expected.

CHAPTER 5: COMPLIANCE WITH ENVIRONMENTAL PROTECTION STATUTES

Consistent with the requirements of NEPA and the implementing regulations issued by the Council on Environmental Quality (40 C.F.R. 1500), this assessment includes a review of project compliance with relevant statutes and the executive orders listed below.

5.1 Federal Statutes Applicable to the Proposed Action

- **Endangered Species Act, 16 U.S.C. 1531 et seq.**

BPA consultation with the USFWS pursuant to Section 7 of the Endangered Species Act has been completed. The USFWS concurred in a letter dated March 25, 1994, that adverse effects on listed species are not anticipated.

- **Cultural Resource Legislation, Executive Order 11593; Archaeological and Historical Preservation Act of 1966 as amended, 16 U.S.C. 469 et seq., Public Law 92-291**

A cultural resource reconnaissance survey of the project area was conducted by Eastern Washington University archaeological staff in 1985. The report indicates a high probability of the presence of prehistoric and historic resources of significance within project area locations (Ross, 1985). BPA has contacted the Washington State Historic Preservation Office (SHPO) to request a search of the State data base. Cultural resource field surveys of the project area will be undertaken prior to any habitat enhancement activities. These surveys will follow the Spokane Indian Tribe management and research protocols, and the Federal and state guidelines established for such surveys. No ground disturbing activities will be conducted until field surveys are completed. If a cultural or historical resource is discovered during a field survey, BPA, Spokane Tribe, and BIA will report findings and discuss mitigation measures with the appropriate SHPO authorities. The Spokane Tribe, BPA, and BIA will avoid enhancement activities that will adversely impact historical or cultural resources.

- **Clean Air Act, as amended, 42 U.S.C. 7609 et seq.**

Prescribed burns and vegetation management activities would be limited in extent or size and conducted in accordance with EPA Class I airshed guidelines. Prescribed burning activities would continue to be coordinated with the Eastern Regional Office of the Washington Department of Ecology and the local Fire Districts. Project-related traffic would decrease from existing conditions. No permanent emission sources would be constructed.

- **Resource Conservation and Recovery Act, 42 U.S.C. 6910 et seq.**

This Act regulates the storage, use, and disposal of solid and hazardous waste. It is the policy of the Spokane Tribe, BPA, and BIA to perform an Environmental Land Audit (ELA) or equivalent examination prior to the purchase of any real property (e.g., fee title, easements, or leases as appropriate). The purpose of the ELA is to determine whether contaminants are located within the boundaries of the subject property or whether there is a risk of offsite contaminants migrating onto the subject property. To ensure that contaminant concerns have been addressed adequately, the highest level of ELA (Level I, II, III or combination) would be conducted, as appropriate, prior to securing property for the Project.

- **Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 136 et seq.**

This Act regulates the manufacture and use of pesticides. Herbicides (a form of pesticide) would be used to control incompatible weedy vegetation within the project area. Only EPA approved herbicides would be used, and only according to manufacturers' labels. Herbicides would be employed by licensed applicators only on an as-needed basis and would not be stored on site.

5.2 Tribal Requirements Applicable to the Proposed Action

All activities would occur in compliance with requirements of the Spokane Indian Tribe Land and Natural Resources Policy Plan. Activities that may affect natural resources would be done in compliance with the policies and programs of the Spokane Tribe Department of Natural Resources.

This project would be conducted in consultation and coordination with the following Tribal programs and departments falling within the Department of Natural Resources:

- Spokane Indian Tribe, Department of Natural Resources
  - Spokane Indian Tribe, Timber Program
  - Spokane Indian Tribe, Land Enterprises
  - Spokane Indian Tribe, Environmental Protection
  - Spokane Indian Tribe, Fisheries and Water Resources
  - Spokane Indian Tribe, Water Code
  - Spokane Indian Tribe, Cultural Resources

CHAPTER 6: CONSULTATION AND COORDINATION

6.1 Coordination

A Revised Preliminary EA was sent to the State of Washington Department of Ecology Clearinghouse, and the Spokane Tribe for review and comment on October 24, 1994. The comment period closed on November 7, 1994. BPA received a total of three comment letters in the initial public review and an additional comment letter in the extended review period. All comments were considered and incorporated, as appropriate, into the Final EA.

6.2 Agencies and Persons Contacted

The following individuals were contacted for information regarding the development of this document:

Bonneville Power Administration	Joe DeHerrera, John Rowan, Robert Shank, Robert Walker
Spokane Indian Tribe	Joe McCrea, Rudy Peone, Mary Verner, Mark Wynne
Bureau of Indian Affairs	June Boynton, Donna Bruce, Gerry George, Ted Hensold, Don Motanic, Kevin Ritzer, Stanley Speaks
Upper Columbia United Tribes/ Eastern Washington University	James Alto, Chris Merker, John Ross
U.S. Fish and Wildlife Service	Jodi Bush, Dave Frederick, Dawn Zebley
Washington Department of Ecology	Susan Billings, Deborah Cornett
Washington Office of Archaeology and Historic Preservation	Robert Whitlam

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APPENDICES

APPENDIX A

BLUE CREEK WINTER RANGE
GRAND COULEE DAM WILDLIFE MITIGATION

HABITAT EVALUTION PROCEDURES

Modified Habitat Evaluation Procedures Workbook
Blue Creek Range
by:

Ronald L. Peters
Christopher Merker

Upper Columbia United Tribes
Fisheries & Wildlife Research Center

Project Number 91-062

HABITAT EVALUATION PROCEDURES
BRIEFING PAMPHLET

BLUE CREEK RANGE

GRAND COULEE DAM WILDLIFE MITIGATION
Sept. 24, 1991

PROJECT SCOPE

Conduct a baseline analysis of wildlife habitat values using the Habitat Evaluation Procedures(HEP).

OBJECTIVES

The objective is to rate the quality of the habitat for lands being considered for acquisition or management as mitigation for losses to wildlife due to damages caused by construction of Grand Coulee Dam.

PROCEDURES

1.) An interdisciplinary evaluation team will be assembled to conduct a site survey and collect data on habitat type, quantity, quality, and wildlife use under existing conditions.

2.) A "habitat suitability model" for each indicator species and a composite model will be provided. Each model will provide information and descriptions of key "life requisites" and graphs illustrating the relationships between these requisites(variables) and habitat quality.

3.) Based on this information, personal knowledge, professional judgment, and group discussion each member will rate the habitat as it relates to the given variables.

4.) Team members will discuss their ratings for the habitat variables. If they are widely different then the team member should discuss his/her rational for that decision.

5.) The teams rating for each variable shall be from the consensus all team members. If no consensus value can be agreed upon the value will be deferred to the team expert or a simple average of the teams ratings will be used.

INTRODUCTION

The following habitat evaluation procedures models have been modified for the Blue Creek Winter Range wildlife mitigation project on the Spokane Indian Reservation. The target species considered in this manual are White-tailed Deer (Odocoileus virginiana), Sharp-tailed Grouse (Tympanuchus phasianellus columbianus), and beaver (Castor canadensis).

The white-tailed deer model focuses on two life requisites, food and cover. Both of the life requisites are divided into a set of three variables. The first three variables focus on different types of cover and the second three focus on different types of food and its availability. Either of these two life requisites can be limiting thus, the model is driven by the outcome of either set of variables.

In our sharptail model production drives the population, so nesting and brooding cover are most important. In the shrub steppe this means grass/forb (herbaceous) and shrub cover is of primary importance. We believe winter food is of secondary importance, while shrub and tall herbaceous plants will provide winter cover.

In our beaver model water and food drive the population. Cover and reproductive needs are assumed to be identical with water requirements. If any of the two life requisites are void the habitat is considered unsuitable for beaver. The model predicts that either of the two sets of variables can be considered limiting if they are not satisfied to a certain degree.

The models described in this manual are for all cover types found within the range of the individual species.

The object of this manual is to give you an opportunity to work with the models we are going to use, and to get an idea of what we are going to do in the field on September 24, 1991. I hope this is adequate for your needs at this time. I will be happy to answer any questions regarding the model format and variable descriptions. If you have questions or comments you may call me (Ron Peters) at 509-359-7049 between the hours of 10 am. and 5 pm. Monday Friday.

WHITE-TAILED DEER MODEL
DESCRIPTIONS OF GRAPHS AND VARIABLES

V1 HORIZONTAL CONCEALMENT

Horizontal concealment (hiding cover) is considered to be optimim when 90% of an adult standing deer is hidden at distances equal to or less than 200 feet. The variable will be defined as the amount of a standing deer that is covered at 200 feet. If 80 % or better is covered this will be considered optimum.

V2 OVERSTORY CANOPY COVER

Overstory or thermal cover is considered to be vegetation used by deer to help maintain comfortable body temperatures with minimal energy expenditure (Jageman, 1984). Overstory canopy cover (thermal cover) is considered optimum if canopy closure is greater than 60%. The literature describes mean canopy closure of 70% to be optimum for areas in Northern Idaho, but values ranging from 50 -70 % for different areas have been reported.

V3 WIDTH OF COVER

If large openings or agricultural fields are in the habitat area the width of cover between the various openings or fields becomes important. An SI value of 1 is placed on this variable if the width of cover is greater than 400 feet. If the width of cover is less the value to white-tailed deer decreases (Kaumheimer, personnal comm.).

V4 SHRUB CANOPY COVER

Shrub cover refers to the % coverage of shrubs, forbs, and grasses. This essentially determines the foraging potential for the deer. It has been reported that by fall deer were subsisting entirely on browse (Roberts, 1956; Jageman, 1984).

V5 SHRUB COMPOSITION

Shrub composition describes the type of browse present in an area. If an area is comprised of preferred browse species then it will receive a high rating. However, this does not have a lot of impact on the overall model equation because deer can survive on several different species of browse in any one location.

V6 SHRUB DIVERSITY

Shrub diversity is an important component to deer survival. Diversity will allow some food to be available in any situation. This is important for survival in the odd winter with exceptional amounts of snow, or extremly cold temperatures.

V7 DENSITY OF OPEN ROAD PER SQ. MILE

The relationship between miles of open road and potential deer use is such that 0-1 mile/ sq. mile receives an SI value of 1.0, 1-2 miles = 0.8, 2-3= 0.6, 3-4= 0.4, 4-6= 0.2, and anything equal to or greater than 6= 0.0.

EQUATIONS

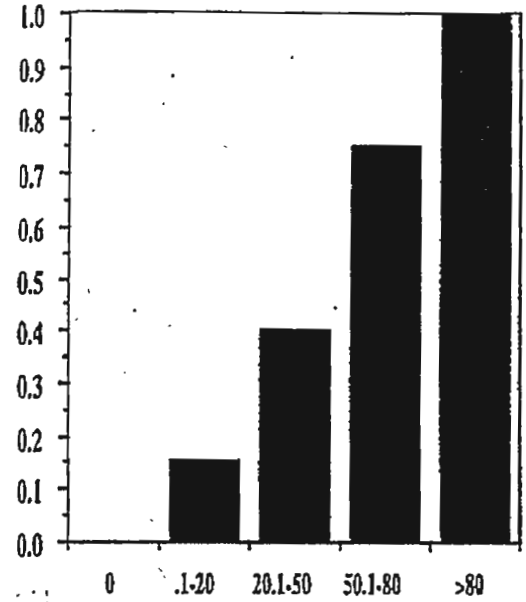
The equations are based on certain life requisites. They are 1.) Food, and 2.) Cover. V1, V2, and V3 are cover variables. V4,V5, and V6 are food variables. V7 is a special road disturbance variable and is the only variable which can be limiting. The equation for determining the suitability index is as follows:

$$[V_1 \times V_2 \times V_3]V_7 = \text{Cover HSI}$$

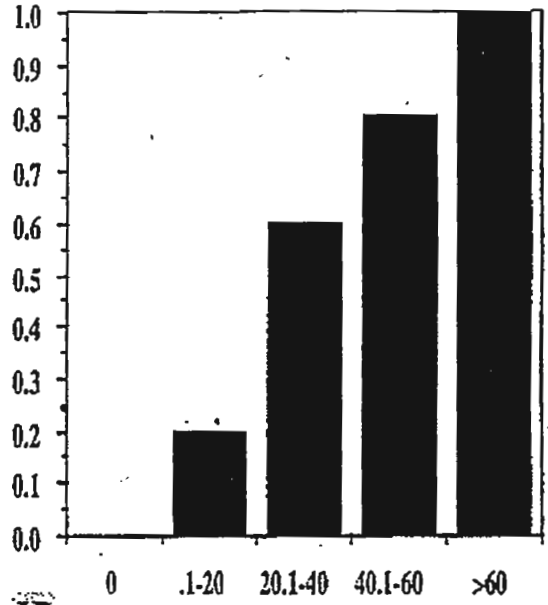
$$[[2(V_4 + V_6) + v_5]/5]V_7 = \text{FoodHSI}$$

The HSI rating for the individual cover types will be determined by figuring the equations (food vs cover) and whichever one is the lowest will be considered the limiting factor and will be the overall HSI.

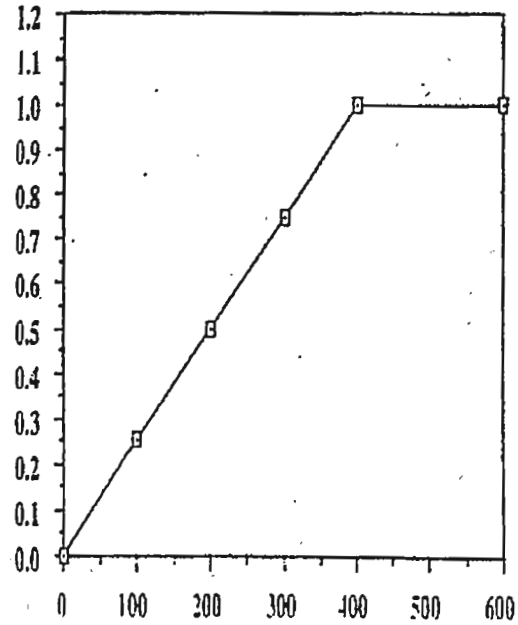
WHITE-TAILED DEER MODEL



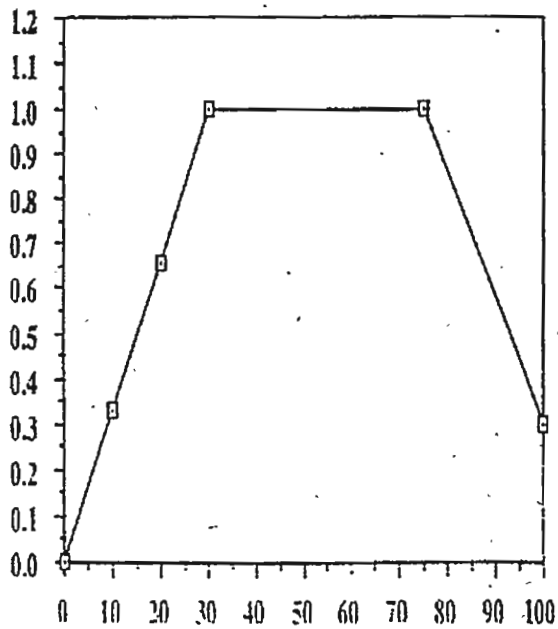
V1 HORIZONTAL CONCEALMENT (%)



V2 OVERSTORY CANOPY COVER (%)

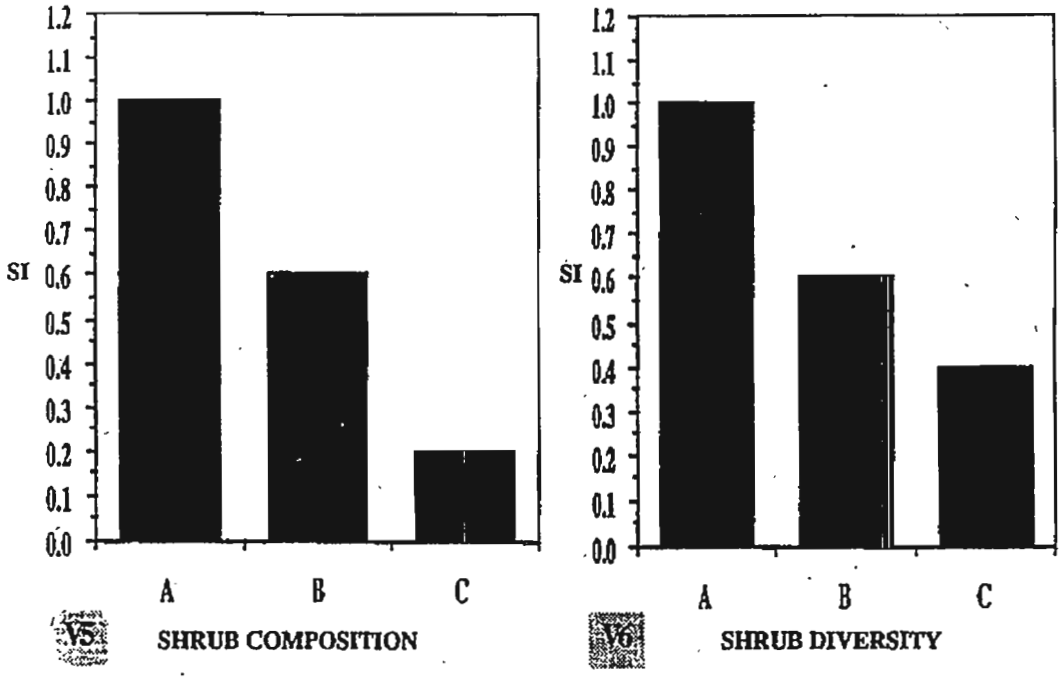


V3 WIDTH OF COVER (ft)



V4 %SHRUB COVER < 5 ft.

WHITE-TAILED DEER MODEL



DETAILED DESCRIPTION OF GRAPHS

Shrub Composition

A= Western Redcedar, Ceanothus, Willow, Serviceberry, Chokecherry, Red-osier dogwood, Maple, Kinnikinnick, Oregon Grape

B= Cottonwood, Snowberry, Aspen, Ponderosa Pine, Grand Fir, Hawthorn, Spiraea, White Pine

C=Ninebark, Oceanspray, Alder, Blackberry, Mockorange, Lodgepole Pine, Elderberry, Menziesia, Thimbleberry, Western Larch

Shrub Diversity

A= 3 species

B= 2 species

C= 1 species

SHARP-TAILED GROUSE MODEL
DESCRIPTIONS OF VARIABLES AND GRAPHS

V1 % SHRUB CROWN COVER

Sharp-tails can exist without shrubs but prefer a mid percentage of shrub cover as optimal. Openings are important, especially for broods, so dense shrub is sub-optimal.

V2 MEAN HEIGHT OF HERBACEOUS VEGETATION

This is primarily a measure of secure nesting cover for hens. Eleven to twenty-five inches is optimum as it provides hiding cover, but is not so tall so as not to preclude rapid escape. Taller cover however still has value, especially to wintering birds. Hence, tall cover never goes to a SI value of 0.0.

V3 HERBACEOUS COVER

Herbaceous cover is preferred for nesting, as well as brooding. Both forbs and insects are in high numbers, and available at ground level, for growing chicks and nesting hens. A preferred mid-range is optimum. The birds cannot exist without any herbacious cover, hence an SI= 0.0. However, they can exist in 100% grass/forb, i.e. without shrubs, but certainly not at optimum. Hence. we have set 100 % cover at an SI= 0.2.

V4 MEAN HEIGHT OF SHRUBS OR HERBS WHICHEVER IS GREATER

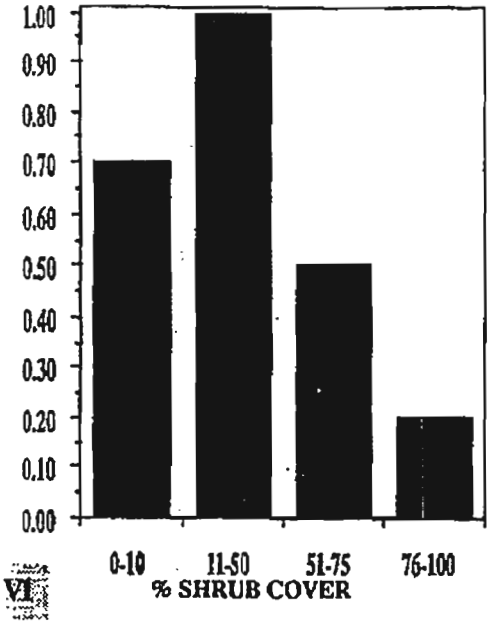
Shrubs represent several things to sharp-tails. They offer some nest cover to hens, brood cover especially during hot summer days, escape cover, and food in the winter. Optimum SI= 1.0 is at 5 feet or greater, primarily for effective cover and for food which will be above the snow in the winter. However, if the height of herbaceous vegetation is adequate for summer/winter cover then it will also be considered in this component of the the model.

EQUATIONS

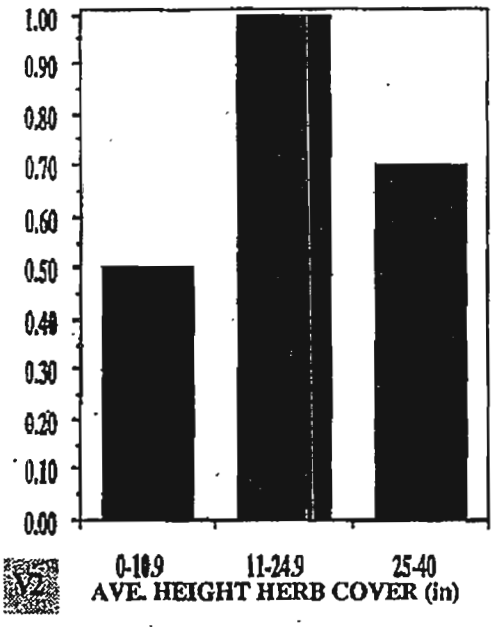
The equation is a simple arithmetic mean. It is not weighted for any particular variables. We believe these birds are very adaptable given proper cover requirments. The equation is as follows:

$$\frac{V_1 + V_2 + V_3 + V_4}{4} = \text{HSI}$$

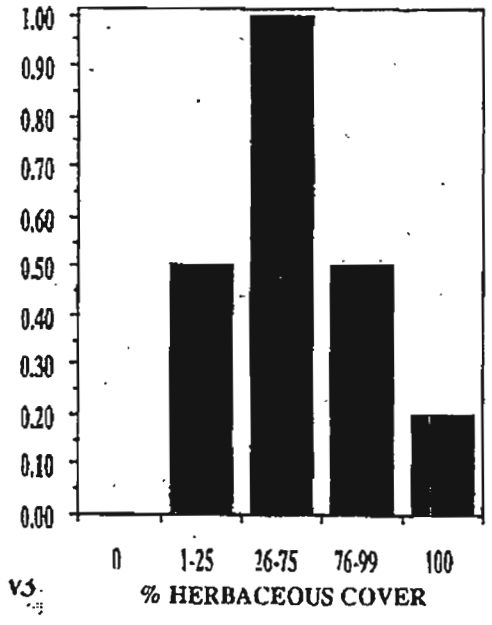
SHARP-TAILED GROUSE
SHRUB STEPPE- SUMMER AND WINTER RANGE



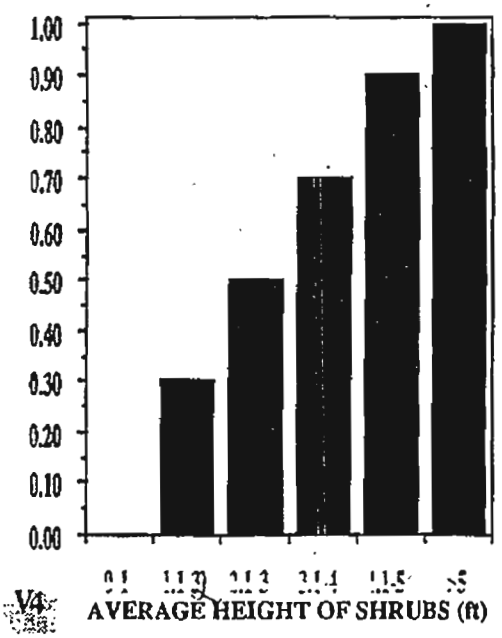
V1



V2



V3



V4

BEAVER MODEL
DEFINITIONS OF VARIABLES

V1 PERCENT TREE CANOPY CLOSURE

The percent of the ground surface shaded by a vertical projection of the canopies of woody vegetation that is greater than or equal to about 5 m (16.5 ft.) in height. It is assumed that a tree and/or shrub canopy closure between 40-60% is an indication of optimum food availability (Allen, 1982). Stands with greater than 60% canopy closure are assumed to be less suitable due to the decreased accessibility of food. Extremely dense stands result in an increased likelihood of cut trees hanging up in adjacent trees (Allen, 1982).

V2 PERCENT OF TREES IN THE 1-6 INCH SIZE CLASS

Optimum dbh of trees should run between 1 and 6 inches. This seems to be the preferred size class. Larger trees are avoided generally unless nothing else is available.

V3 PERCENT SHRUB CROWN COVER

The percent of the ground shaded by a vertical projection of the canopies woody vegetation of about 5 m (16.5 ft.) in height. Food value within a cover type is a function of density, size class, and species composition. Under some conditions shrubs of optimum size and density can provide an adequate amount of food during all seasons. It has been noted though that most use of shrubs occurrs just after green-up in the spring.

V4 AVERAGE HEIGHT OF SHRUB CANOPY

The average height from the ground surface to the top of those shrubs that comprise the upper most shrub canopy. To be of optimum value shrubs should be at least 2 m (6.6 ft) tall.

V5 SPECIES COMPOSITION OF WOODY VEGETATION

A.) Woody vegetation dominated (greater than or equal to 50%) by one or more of the following species: aspen, willow, cottonwood, or alder.
B.) Woody vegetation dominated by other deciduous species.
C.) Woody vegetation dominated by coniferous species.
It has been shown that beaver show a preference to the types of woody tree stems utilized in a certain area. However, many different types of trees will be used but to varying degrees.

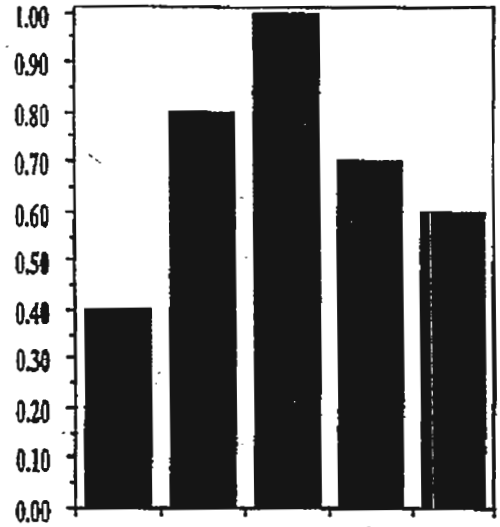
V6 PERCENT STREAM GRADIENT

The vertical drop in meters or feet per kilometer or mile of stream or river channel. Beavers can usually control water depth and flow, however, larger rivers or streams with a high gradient cannot be controlled and are considered unsuitable as beaver habitat (Allen, 1982).

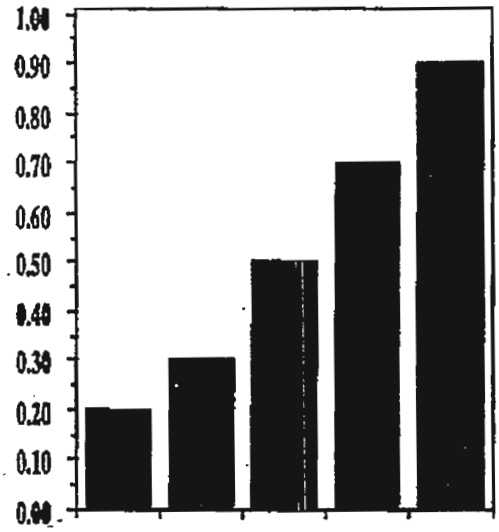
V7 AVERAGE WATER FLUCTUATION ON AN ANNUAL BASIS

A.) Small fluctuations that have no effect on burrow or lodge entrances.
B.) Moderate fluctuations that effect burrow or lodge entrances.
C.) Extreme fluctuations or water absent during part of the year.
Beavers require a permanant supply of water and prefer a seasonably stable water level. This stable water level provides cover for feeding and reproduction. If water is absent at any time during the year it is considered unsuitable for beaver (Allen, 1982).

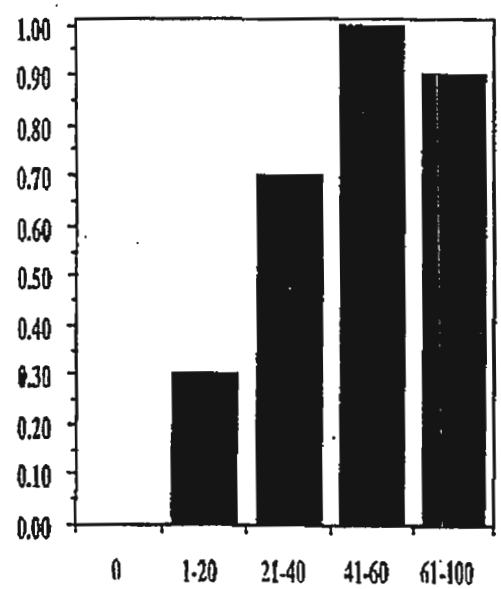
BEAVER
RIVERINE HABITAT MODEL



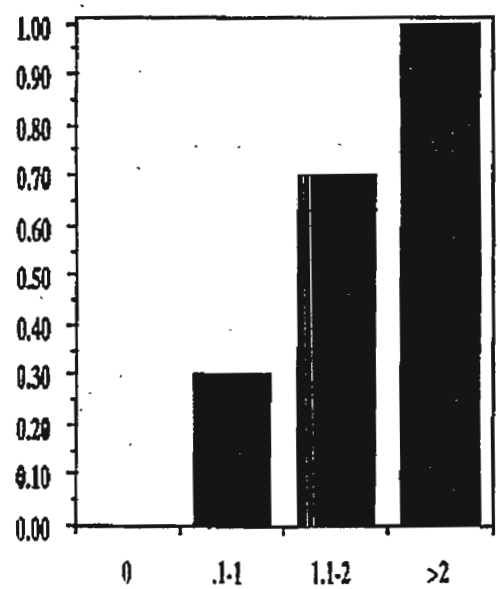
V1 PERCENT TREE CANOPY CLOSURE



V2 PERCENT OF TREES IN THE 1-6 INCH DBH SIZE CLASS

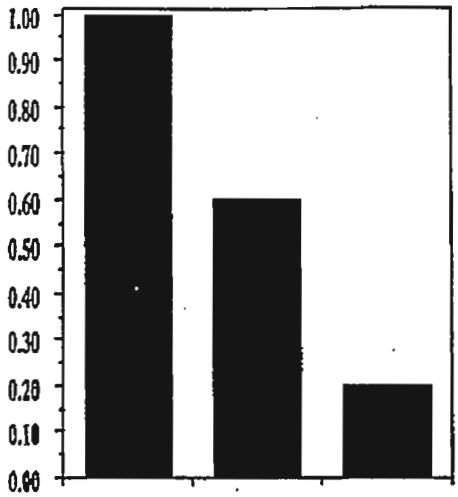


V3 PERCENT SHRUB CROWN COVER

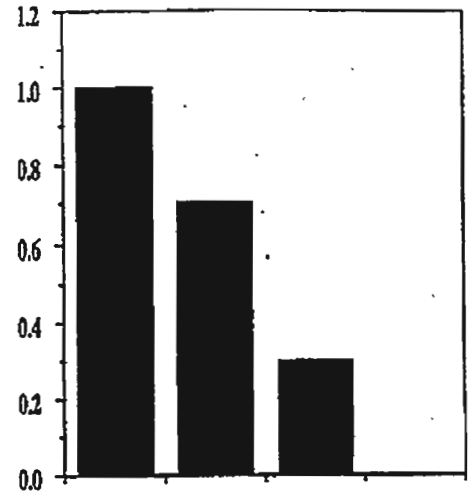


V4 AVERAGE HEIGHT OF SHRUB CANOPY

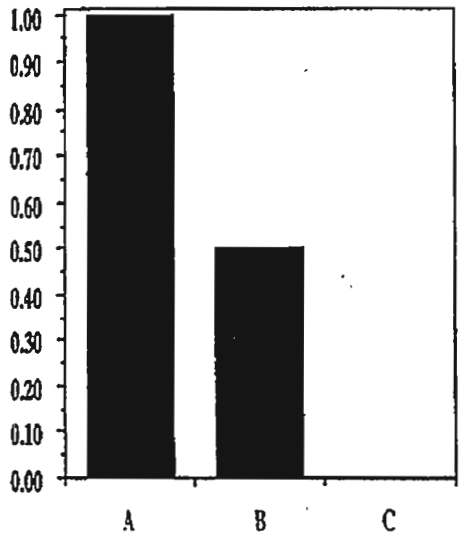
BEAVER
RIVERINE HABITAT MODEL



V5 SPECIES COMPOSITION OF WOODY VEGETATION (TREES AND/OR SHRUBS)



V6 PERCENT STREAM GRADIENT



V7 AVERAGE WATER FLUCTUATION ON AN ANNUAL BASIS

EQUATIONS

Based on the limiting factor concept, the HSI is equal to the lowest life requisite value obtained for either food or water.

Winter food = $\frac{a+b}{1.5}$

Where a= woody vegetation value within 100m (328 ft.) from the waters edge. The equation for determining this is:

$[(V_1 X V_3) X V_5] + [(V_2 X V_4) X V_5]$

and b= woody vegetation value within 100m. (328 ft.) to 200m (656 ft.) from the waters edge. The equation for this is :

$.5[(V_1 X V_2) X V_5] + [(V_3 X V_4) X V_5]$

Water – V6 or V7, whichever is lowest

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ACKNOWLEDGEMENTS

We wish to thank Paul Ashely, Dept. of Wildlife, for his help in critiquing this manual.

BLUE CREEK SPECIES LIST
APPENDIX B

LIST OF SPECIES FOUND ON PROJECT

GRASSES	
Idaho fescue	Festuca idahoensis
Bluebunch wheatgrass	Agropyon spicaturn
Needle-and-thread	Stipa comata
Cheat grass	Bromus tectorum
Sandberg bluegrass	Poa sandbergii
Pinegrass	Calamagrostis rubescens
Prairie junegrass	Koeleria cristata
Reed canary grass	Phalaris arundinacea
FORBS	
Spreading dogbane	Apocynum androsaemifolium
Indian paintbrush	Castilieja spp.
Rattlesnake plantain	Goodyera oblongifolia
Sedges	Carex spp.
Yarrow	Achillea millefolium
Arrowleaf balsamroot	Balsamorhiza sagittata
Bisquitroot	Lomatium spp.
Buckwheat	Eriogonum spp.
Bitterroot	Lewisia rediviva
Lupine	Lupinus spp.
Dalmation toadflax	Linaria dalmatica
Diffuse knapweed	Centaurea diffusa
Yellowstar thistle	
Spotted knapweed	
Russian knapweed	
SHRUBS	
Antelope bitterbrush	Purshia tridentata
Gray rabbitbrush	Chrysothamnus nauseosus
Serviceberry	Amelanchier Ainifolia
Wax currant	Ribes cereum
Oceanspray	Holodiscus discolor
Redstem ceanothus	Ceanothus sanguineus
Ninebark	Physocarpus malvaceus
Common snowberry	Symphoricarpus albus
Myrtle boxwood	Pachystima myrinites
Douglas hawthorne	Crataegus douglasii

SHRUBS - Continued

Red-osier dogwood	Comus stolonifera
Nootka rose	Rosa nutkana
Mockorange	Philadelphus lewisii
Oregon grape	Berberis repens
Sitka alder	Alnus sinuata
Chokecherry	Prunus virginiana
Smooth sumac	Rhus glabra
Blue elder	Sambucus glauca
Scouler willow	Salix scouleriana

TREES

Ponderosa pine	Pinus ponderosa
Douglas fir	Pseudotsuga menziesii
Black cottonwood	Populus trichocarpa
Quaking aspen	Populus tremuloides
Water birch	Betula occidentalis
Western larch	Larix occidentalis

MAMMALS

Mule deer	Odocolleus hemionus
Whitetail deer	Odocolleus virginianus
Elk	Cervus elaphus
Moose	Alcea alces
Mink	Mustela vison
Cougar	Felis concolor
Bobcat	Felis rufus
Badger	Taxidea taxus
Coyote	Canis latrans
Cottontail rabbit	Sylvilagus nuttalli
River otter	Lontra canadenslo
Black bear	Urus americana
Beaver	Castor canadensis
Muskrat	Ondatra zibethica
Striped skunk	Memphitis mephitis
Yellow-bellied marmot	Marmota flaviventris
Bushytail woodrat	Neotoma cinerea
Red squirrel	Tamiasciurus hudsonicus
Flying squirrel	Glaucomys sabrinus

BIRDS

Canada goose	Branta canadensis
Mallard	Anas platyrhynchos
Green-winged teal	Anas crecca
Great blue heron	Ardea herodias
American coot	Fulica americana
Turkey	Meleagris gallopavo
Ruffed grouse	Bonasa umbellus
Blue grouse	Dendragapus obscurus
Gray partridge	Perdix perdix
California quail	Callipepla califonica
Goshawk	Accipiter gentilis
Coopers hawk	Accipiter cooperi
Red-tailed hawk	Buteo jamaicensis
Bald eagle	Haliaeetus leucocephalus
Golden eagle	Aquila chrysaetos
Osprey	Pandion haliaetus
Merlin	Falco columbarus
American kestrel	Falco sparverius
Great-horned owl	Bubo virginianus
Belted kingfisher	Ceryle alcyon
Mourning dove	Zenaida macroura
Pileated woodpecker	Dryocopus pileatus
Lewis woodpecker	Melanerpes lewis
Hairy woodpecker	Picoides villosus
Northern flicker	Colaptes auratus
Horned lark	Eremophila alpestris
Tree swallow	Tachyineta bicolur
Common raven	Corvus corax
Stellers jay	Cyanocitta stelleri
Clarks nutcracker	Nucifraga columbiana
Gray jay	Perisoreus canadensio
Western meadowlark	Sturnella neglecta
Yellow-rumped warbler	Denroica coronata
Grasshopper sparrow	Ammodramus savannarum
Spotted sandpiper	Actitus colchicus

REPTILES

Western rattlesnake	Crotalus viridis
Gopher snake	Pituophis nelanoleucus
Western skink	Eumeces skiltonlanus

APPENDIX C

GLOSSARY OF TERMS

Age Classes

A grouping of trees according to their age, usually in broad categories, used for growth projection and prediction purposes.

Ambient Air

Literally, the air moving around us; the air of the surrounding outside environment.

Animal Unit (AU)

An animal unit is a 1,000 pound mature cow, or its equivalent based on an average daily forage consumption of 26 pounds dry matter per day.

Animal Unit Month (AUM)

The forage requirement for one month (26 pounds x 30.5 days = 800 pounds).

Available Fuel

The portion of the total combustible material that fire will consume under given conditions. This would include materials such as duff, wood, herbaceous, or forest litter.

Browse

That part of the current leaf and twig growth of shrubs, woody vines, and trees available for animal consumption.

Canopy

The more or less continuous cover of branches and foliage formed by the crowns of trees and other woody growth.

Cavity

A hollow excavated in trees usually by birds or other natural phenomena; used for roosting and reproduction by many birds and mammals.

Clearcut

An even-aged cutting method in which the entire standing crop of trees from an area is harvested at one time.

Climax

The culminating stage in plant succession for a given environment; the vegetation is in a highly stable condition. The final or stable biotic community in a developmental series; it is self-perpetuating and in equilibrium with the physical habitat.

Compaction

The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

Cover

Vegetative or physical features of the environment used by wildlife for escape, hiding, or shelter from the elements.

Cultural Resources

The physical remains of sites, structures, or objects used by humans in the past. They may be historic, prehistoric, archaeological, or structural.

Cutting Cycle

The planned, recurring lapse of time between successive harvests in a forest stand.

Diversity

The distribution and abundance of different plant and animal communities and species within a given area.

Ecosystem

An association of interactive organisms and their environment perceived as a single entity.

Endangered Species

Any species that is in danger of extinction throughout its range as determined by the Secretary of the Interior or the Secretary of Commerce. All Federal agencies are required to utilize their authority to carry out programs for the conservation of endangered and threatened species listed pursuant to the endangered Species Act (PL97-304). Species listed endangered by State wildlife agencies, but not on the Federal list, are generally added to the list of "sensitive species" and managed appropriately.

Environmental Assessment

A concise public document for which a Federal agency is responsible that serves to (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid an agency's compliance with the National Environmental Policy Act when no environmental impact statement is necessary. The document includes brief discussions of the need for the proposal, the alternatives as required by Sec. 102 (2)(e), environmental impacts of the proposed actions and alternatives, and a listing of agencies and persons consulted.

Erosion

Detachment and movement of soil or rock fragments by water, wind, ice, and gravity.

Even-Aged Forest

A forest crop or stand composed of trees having no, or relatively small, difference in age.

Fire Intensity

The severity of a given fire. Low intensity fires average flame lengths under four feet and high intensity fires average flame lengths over four feet.

Fire Risk

A chance of fire starting from natural or human causes.

Forage

The edible vegetation for wildlife or livestock produced seasonally or annually in a given area.

Forest Cover Types

A classification of forest land based on the species making up the majority of live trees.

Fuels

Any material that will carry and sustain a forest fire.

Habitat

The natural environment of a plant or animal. In wildlife management the major constituents of habitat are food, water, cover, and living space.

Habitat Type

An aggregate of all the land areas potentially capable of producing similar plant communities at climax.

Habitat Unit

Habitat Evaluation Procedure (HEP) analysis was used to determine base line habitat conditions and to estimate existing habitat units in the Blue Creek project area. One habitat unit is equivalent to one acre of optimum habitat for a given indicator species.

Historic

Refers to that period of time for which written documents exist.

Hydrograph

A graph of a stream or river discharge that occurs at a certain point and over a period of time.

Intermittent Stream

A waterway which flows during moist periods but is dry the remainder of the year.

Native vegetation

Plants originating or occurring naturally in an area.

Noxious Weeds

Undesirable plant species.

Plant Succession

The process of vegetative development whereby an area becomes successively occupied by different plant communities of higher ecological orders.

Perennial Stream

A stream that flows year round.

Prescribed Burning

Controlled application of fire to wildland fuels in either their natural or modified state, under such conditions of weather, fuel moisture, soil moisture, etc., as allows the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further planned objectives such as wildlife habitat management.

Raptors

Birds of prey with a strong notched beak and sharp talons, as the eagle, hawk, owl, etc.

Riparian Vegetation

Vegetation located along the banks of a stream, pond, or spring, that serves as a narrow edge community between aquatic and upland plant communities. Provides valuable cover, foraging, and nesting, habitat for a variety of species from birds to mammals.

Selective Cut

The periodic removal of mature trees individually or in small groups from an uneven-aged forest.

Seral

One of a series of stages that follow each other in an ecological succession prior to the climax state.

Shrub-steppe Vegetation

An upland vegetation cover type that is an aggregate of native and rangeland plant communities. These upland plant communities can be identified in the project area by the presence of bitterbrush, rabbitbrush, and bluebunch wheatgrass associations.

Skid Trail

Any trail over which logs are dragged to a landing.

Slash

The wood residue left on the ground after harvesting, windstorms, fire, or road building. It includes non-utilized logs, uprooted stumps, broken or uprooted stems, tops, branches, leaves, etc.

Snag

A non-living standing tree. The interior of the snag may be sound or rotted.

State Implementation Plan (SIP)

A plan required by the Clean Air Act and prepared by an Air Quality Regulatory Agency, which describes how the state will attain and maintain air quality so as not to violate National Ambient Air Quality Standards.

Stumpage

The value of timber as it stands uncut in the woods.

Threatened Species

Any species listed in the Federal Register which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Trust land

Any area of land which has been set aside by the Federal government for the use, occupancy or benefit of Indians, even if it is not part of a Reservation.

Winter Range

Habitat used by wildlife species during the winter months to provide food and shelter.

Yarding

The moving of logs from the stump where cut to a central concentration area or landing.