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32 Upper Columbia Subbasin Assessment – Terrestrial

32.1 Focal Habitats: Current Distribution, Limiting Factors, and Condition

Vegetation in the Upper Columbia Subbasin is dominated by interior mixed conifer forest, ponderosa pine forests, eastside interior grasslands, and shrub-steppe habitats. Montane mixed conifer forest, upland aspen forest, and lodgepole pine forests are present in the high elevations along with montane coniferous wetlands. Timber management is an important land use in the Subbasin on Tribal, state, federal, and private timberlands. Agriculture and grazing are other dominant land uses, particularly within the Colville River valley, on the plateaus above Lake Roosevelt, and in the extreme southern portion of the Subbasin. The largest urban areas in the Subbasin boundary include Chewelah, Colville, Kettle Falls, Davenport, and Grand Coulee.

Figure 29.4 (Section 29) shows the current distribution of wildlife-habitat types in the Upper Columbia Subbasin, as adapted from IBIS (2003). Table 32.1 presents the acres of habitats by wildlife-habitat type and by subbasin focal habitat. Five focal habitats were selected for the IMP: wetlands, riparian, steppe and shrub-steppe, upland forest, and cliff/rock outcrops. The same habitats were selected as focal habitats for the Upper Columbia Subbasin (Ad Hoc Terrestrial Resources Tech Team May 5, 2003). Focal habitats comprise about 88 percent of the basin, including upland forests (67 percent), steppe and shrub-steppe (16 percent), and wetlands and riparian habitats (2 percent, excluding open water). Developed habitats, including agricultural and urban lands, currently comprise approximately 12 percent of the Subbasin. Cliff/rock outcrop habitats are not mapped in the IBIS system.

The IBIS data is based on satellite imagery at a scale that tends to under-represent habitats that are small in size or narrow in shape. Additional information on habitats and wildlife within the Upper Columbia Subbasin is available for selected ownerships and/or jurisdictions; these sources include the WDFW, WDOE, Colville Confederated Tribes, Spokane Tribe, USFS, and USFWS. Data from these sources has been used where available to provide more specific information on habitat and wildlife species distribution within the Subbasin.

Historical vegetation data for the Subbasin is not available at a scale similar to the current condition IBIS data. Native vegetated habitats in the Subbasin have been converted to developed habitats and have also been modified through changes to vegetation type and structure. Refer to the Section 4 for a discussion of historical vs. current habitat types in the IMP and factors influencing the distribution and quality of those habitats.

Table 32.1. Current Wildlife-Habitat Types in the Upper Columbia Subbasin

Wildlife-Habitat Type	Upper Columbia Current Acres	Percent of Total
Wetlands (Focal Habitat)		
Lakes, Rivers, Ponds, and Reservoirs	88,066	3.4%
Herbaceous Wetlands	685	0.0%
Montane Coniferous Wetlands	46,188	1.8%
Riparian and Riparian Wetlands (Focal Habitat)		
Eastside (Interior) Riparian Wetlands	2,132	0.1%
Steppe and Shrub-Steppe (Focal Habitat)		
Eastside (Interior) Grasslands	281,627	10.8%
Shrub-Steppe	140,874	5.4%
Upland Forest (Focal Habitat)		
Montane Mixed Conifer Forest	28,696	1.1%
Eastside (Interior) Mixed Conifer Forest	1,300,084	49.7%
Lodgepole Pine Forest and Woodlands	17,217	0.7%
Ponderosa Pine Forest and Woodland	372,742	14.2%
Upland Aspen Forest	26,078	1.0%
Alpine and Subalpine		
Subalpine Parklands	63	0.0%
Alpine Grasslands and Shrublands	4,741	0.2%
Developed		
Agriculture, Pasture, and Mixed Environs	303,262	11.6%
Urban and Mixed Environs	6,033	0.2%
Total	2,618,488	100.0%

(Source: Adapted from IBIS 2003)

32.1.1 Open Water, Wetlands, and Riparian Areas

The IBIS wildlife-habitat map (Figure 29.4) is based in part on National Wetlands Inventory (NWI) mapping, but does not utilize all of the wetland categories or show the full extent of very small mapped areas. The following discussion of open water habitats is based in part on the IBIS mapping and the corresponding Table 32.1. Figure 32.1 provides a more detailed mapping of wetlands, excluding open water habitats, based on WDOE mapping (WDOE 1999) using aggregated NWI wetland types. Table 32.2 summarizes the acreages of wetlands in the Subbasin by wetland category.

32.1.1.1 Open Water

Open water habitats of natural and human origin comprise 3.4 percent of land cover in the Upper Columbia Subbasin (IBIS 2003). Lake Roosevelt reservoir is the largest waterbody in the Subbasin, extending 151 miles from Grand Coulee Dam to the Canadian border (Creveling and Renfrow 1986). Other large waterbodies include Twin Lakes, Deer Lake, Waitts Lake, and Loon Lake. Major tributary rivers include the Colville, Kettle, Spokane, and San Poil rivers.

The federal hydrosystem project at Grand Coulee results in impoundment of 151 miles of the Columbia River, 11 miles of the Kettle River, 2 miles of the Colville River, and an estimated

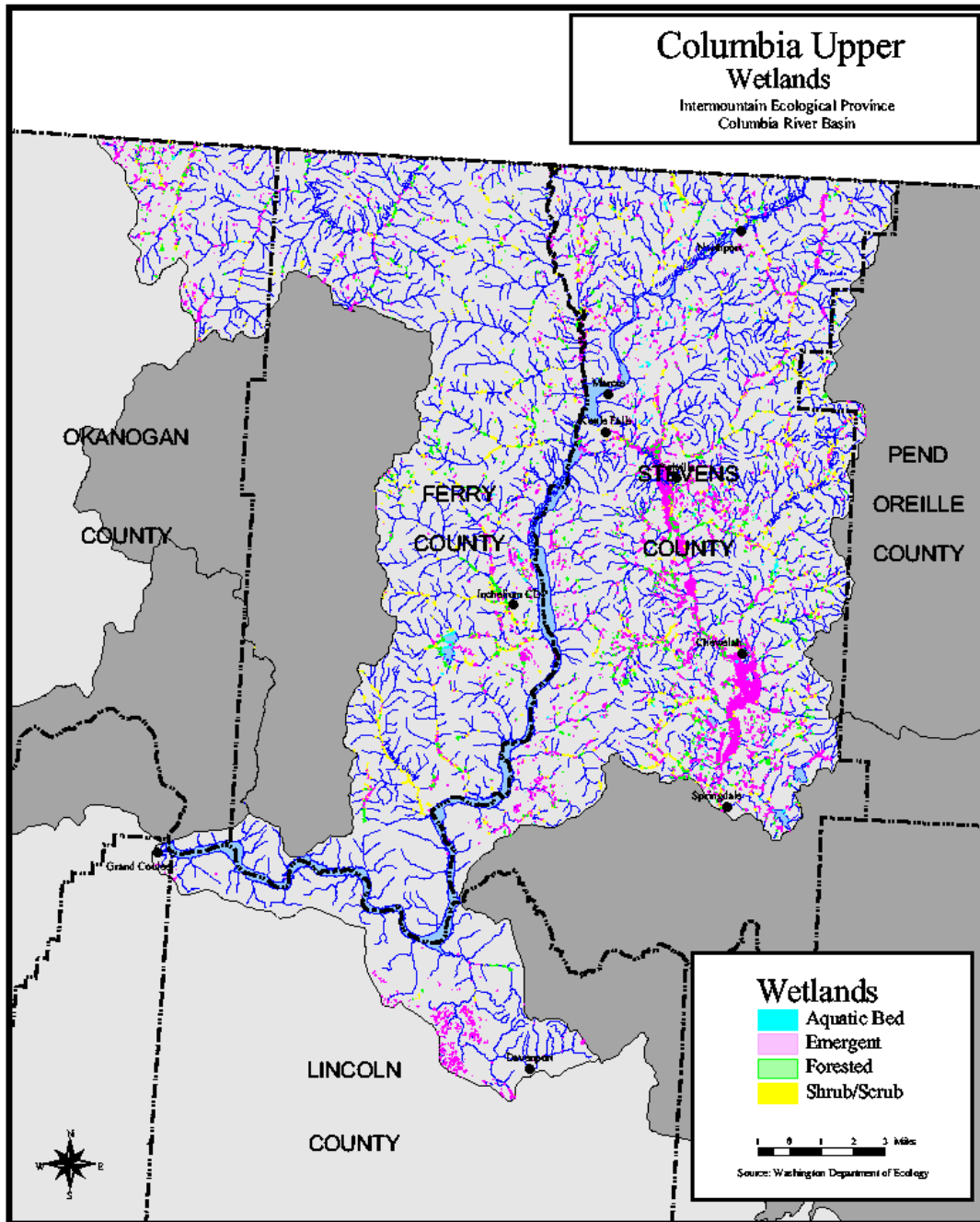


Figure 32.2

Figure 32.1 Wetland areas within the Upper Columbia Subbasin

20 to 30 miles of tributary streams. The San Poil River (12 miles) and Spokane River (28 miles) are also impounded by the dam; these areas are addressed in the San Poil Subbasin and Spokane Subbasin chapters. Timber management, agriculture, grazing, and urban/residential development also have influenced the Subbasin’s waterbodies.

32.1.1.2 Wetlands and Riparian Areas

Wetlands (excluding open water habitats) comprise approximately 1.8 percent of land cover in the Upper Columbia Subbasin (Table 32.2) Wetlands are dominated by emergent herbaceous habitats (70 percent of total wetland habitat); these wetlands are scattered throughout the Subbasin, with the largest complexes in the Colville River valley. Scrub-shrub wetlands comprise about 15 percent of total wetland habitat and are located along many stream drainages, including Ninemile, Wilmont, Hall, Deer, and Cedar creeks and the Little Pend Oreille River. Forested wetlands (13 percent) are also located along many major stream drainages and adjacent to Twin Lakes, Loon Lake, and Meadow Pond.

Table 32.2. Acres of Wetlands in the Upper Columbia Subbasin by Wetland Type

Wetland Type	Acres
Emergent	33,620
Scrub/shrub	7,243
Forested	6,331
Aquatic bed	941
Total all wetland types	48,135

(Source: WDOE 1999)

Riparian vegetation along Lake Roosevelt is extremely limited, due to steep side slopes, an extensive fluctuation zone, and effects of wave action (Creveling and Renfrow 1986). Inundation of the reservoir directly affected an estimated 224 to 234 miles of riparian habitat consisting of a narrow band of discontinuous vegetation with patches of willow-dominated scrub-shrub, and occasional forested segments, with cottonwood, ponderosa pine, hawthorne, and in the northern portion, additional conifer species. Emergent wetlands, formed in small backwater pockets and at the mouths of tributaries, were also inundated by creation of Lake Roosevelt.

During the approximately three-month winter drawdown period, the water surface elevation of Lake Roosevelt is as much as 80 feet below the full pool level. The fluctuation zone is largely unvegetated, and provides little wildlife value. Wave action, combined with the fluctuating water surface levels and unstable soils, has contributed to erosion of steep banks at numerous sites on the reservoir shoreline (refer to Section 32.1.4, below).

Riparian and riparian wetlands along tributary streams of the Subbasin also have been affected by other types of water resource developments, natural and human-caused fire events, draining of agricultural and grazing lands, timber management, roads, and residential development. Timber harvest has affected riparian habitats through removal of overstory dominant trees, alteration of plant community structure, and increased road density (USFS 2003a).

32.1.2 Steppe and Shrub-Steppe

Interior grassland habitat is an important land cover in the Upper Columbia Subbasin, occupying 11 percent of the total area; an additional 5 percent of the Subbasin is classified as shrub-steppe. The extent of grasslands and shrub-steppe has declined from historic conditions as a result of conversion to agricultural and developed lands. Approximately 12 percent of the Subbasin is currently in agricultural uses; much of this land was converted from grassland and shrub-steppe. A secondary effect of agriculture and grazing is the introduction of nonnative noxious weeds through seed sources and via roads and equipment. Remaining grassland and shrub-steppe habitats in the Subbasin are greatly modified from historic conditions by reduction of native plant species and increase in the cover of noxious weeds.

Construction of the Grand Coulee Project resulted in loss of an estimated 14,000 acres of shrub-steppe habitat for placement of project facilities and creation of the reservoir (Creveling and Renfrow 1986).

32.1.3 Upland Forests

Upland forests in the Upper Columbia Subbasin are dominated by eastside mixed conifer forests (50 percent of total land cover) and ponderosa pine (14 percent), with lesser amounts of lodgepole pine, upland aspen, and mountain mixed conifer (approximately 1 percent each).

Historically, ponderosa pine forests were more widespread than today, dominating the southern portion of the Subbasin. Timber harvest has been a primary land use in the forested portions of the Subbasin for over 100 years. In the southern portion of the Subbasin, including a large portion of the Colville Indian Reservation, harvest of mature, overstory ponderosa pine and concurrent fire suppression, have led to a shift from a single-layered canopy of pine to stands with multiple canopies and understories more typically supporting the less fire resistant Douglas fir, grand fir, and shrubs (Underwood 2000). In the more mesic mixed conifer forests in the northern portion of the Subbasin, most old-growth and mature stands have been replaced with stands of younger seral stage and less complex structure (Williams et al. 1995). Species composition has shifted to favor more shade-tolerant, and less fire-resistant, conifer species including Douglas fir, grand fir, and subalpine fir. Fire-dependent species such as lodgepole pine have been reduced in distribution.

Construction of Grand Coulee Dam directly affected about 25,000 acres of upland forest (Creveling and Renfrow 1986). The majority of this habitat consisted of ponderosa pine savannah and forest (52 percent), mixed savannah (30 percent), and mixed forest (12 percent). Woody riparian forest and broadleaf forest comprised the remaining 6 percent.

32.1.4 Other Terrestrial Resource Limiting Factors

As noted in the Section 4, numerous specific habitat elements (called key environmental correlates, or KECs, in IBIS terminology) influence the value of wildlife-habitat types to individual wildlife species. Habitat elements may include natural attributes, such as snags, downed wood, soil types, and also include anthropogenic features such as buildings, chemical contaminants, and roads. Information on site-specific habitat elements is critical to determination of habitat suitability for wildlife. However, data is not available at a subbasin-wide level for most habitat elements. Information on selected habitat elements that have

important influences on habitat quality and wildlife use has been compiled for this assessment, including road density and salmonid nutrients lost to the IMP.

32.1.4.1 Road Density

Figure 29.6 (Section 29) shows road density, by density class, for each sixth order watershed in the Upper Columbia Subbasin. The majority of the Subbasin is ranked as high road density (1.7 to 4.7 miles of road per square mile). Several watersheds in the southernmost portion of the Subbasin, in the eastern portion, and along Lake Roosevelt are ranked as moderate road density (0.7 to 1.7 miles of road per square mile). A single watershed in the vicinity of Davenport is ranked as low road density (0.1 to 0.7 miles of road per square mile).

High road densities are indicative of human land uses and activities. In the Upper Columbia Subbasin, high road densities are associated primarily with managed timberlands. Road density values in excess of 1.5 miles per square mile are considered suboptimal for mule deer and Rocky Mountain elk summer range; values greater than 0.5 miles per square mile (mule deer) and 1.0 miles per square mile (elk) are suboptimal for the species on their winter ranges (WDFW 1991). More than half of the Upper Columbia Subbasin currently supports road density levels considered suboptimal for these game species.

32.1.4.2 Loss of Salmonid Nutrient Base

Construction and operation of the Chief Joseph and Grand Coulee dams on the Columbia River prevented salmon and other anadromous fish from returning to the Upper Columbia Subbasin, including tributary rivers and streams that once supported salmon runs. Traditional Native American anadromous fishery sites at Grand Coulee, Rickey Rapids, Kettle Falls, and along the lower Spokane River were inundated by Lake Roosevelt (Scholz et al. 1985). The loss of anadromous fish affected not only subsistence and recreational use of the resource, but also affected salmon-dependent wildlife and modified nutrient input to the overall ecosystem.

Appendix E of the 1987 Columbia Basin Fish and Wildlife Program (Council 1987) presents the results of several alternative calculations to determine the loss of salmon within the Columbia River system due to hydropower development. Based on the pre-1850 run size, with no dams in place, the number of adults at spawning grounds in reaches above Chief Joseph Dam would total 3,175,000 fish, with sockeye comprising greater than 55 percent, summer Chinook 19 percent, and fall Chinook, spring Chinook, coho, and steelhead the remaining 26 percent.

Scholz et al. (1985) compiled information on salmon and steelhead run size and harvest above Grand Coulee Dam. The results of four different techniques to estimate adult run size of the total Columbia River were summarized, showing a range of 1.2 million to 35 million fish. The authors selected the catch-based estimation technique as the most reasonable estimate of total Columbia River run size, equaling 13.1 million fish. The percentage of the total run migrating to the Upper Columbia River was estimated at 5 percent Chinook, 8 percent sockeye, 3 percent coho, and 41 percent steelhead. Using the catch-based total run size, an estimate of run size into the Upper Columbia Basin, prior to major development, was calculated at 1.1 million fish. Minimum annual catch was estimated at 644,000 fish.

The loss of salmon to focal wildlife is discussed in Section 4.5.2 (Key Wildlife Species of the Intermountain Province).

32.1.4.3 Lake Roosevelt Shoreline Erosion

The Lake Roosevelt shoreline extends approximately 530 miles, about 70 percent of which consists of easily eroded unconsolidated sediments (USBR 2000). The sediments are alternately exposed during winter reservoir drawdowns, and inundated during full pool operation. The combination of wave action and water fluctuations has contributed to slope failures of these inherently unstable soils at many locations around the reservoir. The U.S. Bureau of Reclamation (USBR) reported that 129.5 miles of reservoir shoreline had been affected by landslides and erosion (USBR 1984); monitoring and mapping of these unstable slopes continues today (USBR 2000). The majority of these sites are located within the Upper Columbia Subbasin. Figure 29.5 shows the portion of Lake Roosevelt located within the Subbasin and highlights the areas of high erosion potential along the shoreline. Analysis of a 300-foot wide band, extending upslope from elevation 1,290 feet, shows that 14 percent of the area within the band is classified as high erosion potential, while about 12 percent of the area is bedrock.

Erosion of the Lake Roosevelt shoreline has the potential to affect terrestrial resources through loss of habitats, including shrub-steppe, grasslands, wetlands, and riparian shrubs and trees. Several bald eagle nest trees located on sand bluffs along the shoreline of Lake Roosevelt are currently threatened by bank erosion (S. Zender, WDFW, personal communication, April 2, 2004). Direct loss of wildlife could occur through effects to active nesting, denning, and burrow sites. To date, site-specific assessment of the effects of shoreline erosion on terrestrial resources has not been conducted.

32.1.5 Land Ownership and Gap Status

Land ownership in the Upper Columbia Subbasin is summarized in Table 32.3 based on the Gap Analysis Program (GAP), as provided by IBIS (2003). A map of ownership categories across the province is presented in Section 4, Figure 4.3. The Upper Columbia Subbasin is dominated by private ownership (47 percent). Approximately 29 percent of the Subbasin is federally-owned; the majority of this is National Forest System lands of the Colville National Forest. A small amount of Okanogan National Forest land is located in the far northwestern corner of the Subbasin. Tribal lands of the Colville Indian Reservation and the Spokane Reservation occupy about 17 percent of the Subbasin. State lands comprise about seven percent and are distributed in numerous locations in the Subbasin.

Relative protection levels of native habitats in the Upper Columbia Subbasin are shown in Table 32.4. No lands within the Subbasin are categorized as Status 1, High Protection. Habitats protected under Status 2, Medium Protection, comprise approximately 2 percent of the total. These lands include an estimated 35,330 acres of mixed coniferous forest and about 526 acres of montane coniferous wetlands, and are located in part at the Little Pend Oreille River National Wildlife Refuge east of Colville. Approximately 34 percent of lands in the Subbasin are ranked as Status 3, Low Protection, primarily National Forest System lands which allow resource extraction. U.S. Forest Service inventoried roadless areas are included in the Low

Protection category. Lands with no specified protection total over 64 percent and include both private and tribal ownerships.

Due to the scale of the IBIS and GAP mapping, small parcels may be incorrectly categorized in this analysis. It should be noted that the 4,533-acre Grizzly Mountain wilderness area is located on the Colville Indian Reservation (Underwood 2000). No commercial timber harvest is allowed within this area. The 100,587-acre Hellsgate Game Reserve is also located on the Colville Indian Reservation; this area is managed primarily for wildlife, including bighorn sheep.

Table 32.3. Land Ownership in the Upper Columbia Subbasin by Wildlife-Habitat Type

Wildlife-Habitat Type (acres)	Federal Lands	Native American Lands	State Lands	Local Gov't. Lands	Non-Gov't. Org. Lands	Private Lands	Water	Total
Wetlands (Focal Habitat)								
Lakes, Rivers, Ponds, and Reservoirs	5,388	30,541	749	0	0	51,376	0	88,054
Herbaceous Wetlands	1	0	21	0	0	662	0	684
Montane Coniferous Wetlands	3,747	5,078	1,079	0	0	36,281	0	46,186
Riparian and Riparian Wetlands (Focal Habitat)								
Interior Riparian Wetlands	0	57	0	0	0	1,859	0	1,917
Steppe and Shrub-Steppe (Focal Habitat)								
Interior Grasslands	73,070	35,132	22,842	0	0	150,533	0	281,577
Shrub-steppe	5,431	49,659	5,133	0	0	80,548	0	140,771
Upland Forest (Focal Habitat)								
Mesic Lowland Conifer-Hardwood Forest	0	0	0	0	0	0	0	0
Montane Mixed Conifer Forest	24,044	0	0	0	0	0	0	24,044
Interior Mixed Conifer Forest	584,547	171,865	124,259	0	0	419,131	0	1,299,802
Lodgepole Pine Forest & Woodlands	7,910	0	1,129	0	0	6,438	0	15,477
Ponderosa Pine Forest & Woodlands	33,856	121,504	23,629	0	0	193,704	0	372,693
Upland Aspen Forest	5,346	2,197	0	0	0	17,506	0	25,048
Alpine and Subalpine								
Subalpine Parkland	0	0	0	0	0	0	0	0
Alpine Grasslands and Shrublands	0	0	0	0	0	0	0	0
Developed								
Agriculture, Pasture, and Mixed Environs	6,983	30,289	6,753	0	0	259,136	0	303,161
Urban and Mixed Environs	0	0	587	0	0	5,194	0	5,781
Total Acres	750,323	446,324	186,183	0	0	1,222,367	0	2,605,196

(Source: Adapted from IBIS 2003)

Table 32.4. GAP Status of Lands in the Upper Columbia Subbasin by Wildlife-Habitat Type

Wildlife-Habitat Type (acres)	1 - High Protection	2 - Medium Protection	3 - Low Protection	4 - No Protection	Water	Total
Wetlands (Focal Habitat)						
Lakes, Rivers, Ponds, and Reservoirs	0	2,247	1,995	83,812	0	88,054
Herbaceous Wetlands	0	0	21	663	0	684
Montane Coniferous Wetlands	0	526	4,658	41,003	0	46,186
Riparian and Riparian Wetlands (Focal Habitat)	0					
Interior Riparian Wetlands	0	6	207	1,918	0	2,131
Steppe and Shrub-Steppe (Focal Habitat)						
Interior Grasslands	0	1,921	90,942	188,714	0	281,577
Shrub-steppe	0	2,742	5,759	132,270	0	140,771
Upland Forest (Focal Habitat)						
Mesic Lowland Conifer-Hardwood Forest	0	0	0	0	0	0
Montane Mixed Conifer Forest	0	68	24,870	3,726	0	28,664
Interior Mixed Conifer Forest	0	35,330	670,216	594,256	0	1,299,802
Lodgepole Pine Forest & Woodlands	0	117	8,863	8,230	0	17,210
Ponderosa Pine Forest & Woodlands	0	7,017	46,633	319,044	0	372,693
Upland Aspen Forest	0	75	6,184	19,813	0	26,071
Alpine and Subalpine						
Subalpine Parkland	0	0	58	5	0	63
Alpine Grasslands and Shrublands	0	0	4,433	282	0	4,715
Developed						
Agriculture, Pasture, and Mixed Environs	0	2,814	13,282	287,065	0	303,161
Urban and Mixed Environs	0	55	711	5,267	0	6,033
Total Acres	0	52,917	878,832	1,686,068	0	2,617,817

(Source: Adapted from IBIS 2003)

GAP Status Definitions (Source: USGS 2000):

Status 1 – High Protection: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.

Status 2 – Medium Protection: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.

Status 3 – Low Protection: An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or localized intense type (e.g., mining). It also confers protection to federally-listed endangered and threatened species throughout the area.

Status 4 – No or Unknown Protection: There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout.

32.2 Wildlife of the Upper Columbia Subbasin

32.2.1 Wildlife Occurring in the Upper Columbia Subbasin

The Upper Columbia Subbasin provides a wide range of wildlife-habitat types dominated by interior mixed conifer and ponderosa pine forests, with montane mixed conifer and lodgepole forests in the high elevations, and small areas of montane coniferous wetlands and alpine habitats.

There are approximately 356 terrestrial vertebrate wildlife species using these habitats, many of which are important for ecological, cultural, and/or economic reasons. Table 32.5 presents the terrestrial vertebrate wildlife species occurring within the Upper Columbia Subbasin. Due to the large number of wildlife species in the Subbasin, the following discussion focuses on wildlife species that are important indicators of habitat quality, those that represent other wildlife species, and those with special management status. For further information on the broader spectrum of wildlife species in the Subbasin, refer to the Lake Roosevelt Subbasin Summary (Underwood 2001).

Table 32.5. Number of Wildlife Species (and percent of Province total) in the Upper Columbia Subbasin

	Occurring Species (Percent of Province Total)	HEP/Priority Species	HEP/Priority Species Closely Associated With Herbaceous Wetlands	HEP/Priority Species Closely Associated With Riparian Wetlands	HEP/Priority Species That Feed Upon Salmon	Occurring Species That Feed Upon Salmon
Amphibians	12 (71%)	1	1	1	0	0
Birds	231 (84%)	10	1	3	2	53
Mammals	96 (95%)	9	1	3	4	24
Reptiles	17 (94%)	0	0	0	0	2
Total	356 (86%)	20	3	7	6	79

(Source: IBIS 2003)

32.2.2 HEP and Priority Species of the Upper Columbia Subbasin

Subbasin planners selected a group of wildlife species to represent the focal habitats and wildlife of the Upper Columbia Subbasin. Species used in the Grand Coulee Habitat Evaluation Procedures (HEP) study (Creveling and Renfrow 1986) were selected because they were used to assess the construction and inundation losses for the federal hydrosystem project, and because they will be used in the future to evaluate mitigation for the project. Additional wildlife species were selected due to their management, cultural, and or economic values in the Subbasin; these species also represent specific focal habitats. The list of HEP and priority species for the Subbasin, as well as federal and state-listed threatened and endangered species, is presented in Table 32.6.

Table 32.6. Federal and State Endangered/Threatened, HEP, and Priority Wildlife Species of the Upper Columbia Subbasin and Degree of Association¹ with Focal Habitats During Breeding

Common & Scientific Names	Federal/ WA Listing Status ²	HEP/ Priority Status ³	Focal Habitats				
			Cliff/ Rock Outcrop	Wetland	Riparian	Steppe/ Shrub-Steppe	Upland Forest
American beaver <i>Castor canadensis</i>	-	P(1,2,3)	-	<u>Close</u>	<u>Close</u>	-	-
Bald eagle <i>Haliaeetus leucocephalus</i>	T / t	P(1,3,4)	-	-	<u>General</u>	-	General
Bighorn sheep <i>Ovis canadensis</i>	-	P(1,2,3)	<u>General</u>	-	-	General	-
Canada goose <i>Branta canadensis</i>	-	HEP	General	Close	-	General	-
Canada lynx <i>Lynx canadensis</i>	T / t	P(4)	-	-	-	-	Close
Columbia spotted frog <i>Rana luteiventris</i>	-	P(1)	-	<u>Close</u>	<u>Close</u>	-	-
Fisher <i>Martes pennanti</i>	- / e	P(4)	-	General	-	-	Close
Golden eagle <i>Aquila chrysaetos</i>	-	P(1,3)	<u>Close</u>	-	General	General	General
Gray wolf <i>Canis lupus</i>	T / e	P(4)	-	-	General	General	General
Grizzly bear <i>Ursus arctos</i>	T / e	P(4)	-	-	-	-	General
Long-eared owl <i>Asio otus</i>	-	P(1)	-	-	<u>Close</u>	<u>Close</u>	Close
Mink <i>Mustela vison</i>	-	P(1,2)	-	<u>Close</u>	<u>Close</u>	-	-
Mourning dove <i>Zenaidura macroura</i>	-	HEP	-	-	<u>Close</u>	General	General
Mule deer <i>Odocoileus hemionus hemionus</i>	-	HEP	-	General	General	<u>General</u>	General
Pileated woodpecker <i>Dryocopus pileatus</i>	-	P(1)	-	General	General	-	<u>General</u>
Ruffed grouse <i>Bonasa umbellatus</i>	-	HEP	-	<u>General</u>	<u>Close</u>	-	<u>Close</u>
Sage grouse <i>Centrocercus urophasianus</i>	- / t	HEP	-	-	-	<u>Close</u>	-
Sharp-tailed grouse <i>Tympanuchus phasianellus columbianus</i>	- / t	HEP	-	-	-	<u>Close</u>	General
White-headed woodpecker <i>Picoides albolarvatus</i>	-	P(1)	-	-	General	-	<u>Close</u>
White-tailed deer <i>Odocoileus virginianus</i>	-	HEP	-	-	<u>Close</u>	General	<u>General</u>

(Sources: Upper Columbia Subbasin Work Team and IBIS 2003)

¹ **Close** = Animal dependent on the habitat for part or all of its life history requirements.

General = Animal adaptive and supported by numerous habitats.

² **E** = Federal Endangered. **T** = Federal Threatened. **e** = State Endangered. **t** = State Threatened.

- ³ **HEP** = Species evaluated via Habitat Evaluation Procedures loss assessment for Grand Coulee Dam (Creveling and Renfrow 1986).
P = Priority species designated as important because it is **(1)** ecological indicator for habitat or other animals, **(2)** game animal, **(3)** highly culturally prized, or **(4)** special status for management. Many priority species were selected to represent one or more focal habitat types; the habitat(s) a species represents is(are) indicated by underlined degree of association (e.g., close).

The province-wide status and trends of federal and state-listed threatened and endangered species are discussed in Section 4, Terrestrial Resources in the Intermountain Province. Subbasin-level information on occurrence of federal and state-listed species is provided in this section. The occurrence of HEP and priority species in the Subbasin is also discussed briefly below. Some species were selected primarily as indicators of wildlife guilds or of a focal habitat; for many of these species detailed information on status in the Subbasin is not available.

32.2.2.1 Federal and State Threatened and Endangered Species

Bald eagle. At least 23 nesting territories are located along the length of Lake Roosevelt within the Upper Columbia Subbasin (WDFW 2003b). Another six nesting territories occur at scattered sites in the Subbasin's southeast quadrant. The total number of nesting territories in the Subbasin is the second largest in the Province, after the Pend Oreille Subbasin. There are four winter roosts along the Columbia River, and one winter foraging area along the Colville River (WDFW 2003b).

Canada lynx. Since 1979, at least 49 records of lynx sightings or tracks have been recorded for the Subbasin (WDFW 2003b). All were in the northern half, and most are near the Subbasin periphery. Most records occurred at least ten years ago, with only one record after 1996. Little Pend Oreille, The Wedge, Kettle Range, and Vulcan-Tunk areas generally above 4,000 feet elevation are lynx management zones (LMZs) located partially or completely within the Subbasin (Stinson 2001). Denning habitat appears to be lacking on the Colville Reservation and foraging habitat has not fully developed within previously harvested and burned areas (Colville Confederated Tribes 2000).

Fisher. The Subbasin's only documented recent sighting of a fisher was reported in 1989 within the Emanuel Creek drainage of the Kettle River (WDFW 2003b).

Gray wolf. Seven wolf sightings or howlings have been reported since 1991, but only one after 1992 (WDFW 2003b). All occurred along the western, northern, or eastern periphery of the northern half of the Subbasin.

Grizzly bear. Between 1983 and 2001, seven sightings of grizzly bear were reported in this Subbasin (WDFW 2003b). One was an illegal kill in 1995. All occurrences were in the northern half near the periphery of the Subbasin.

Sage grouse. There are no current records of sage grouse presence in this Subbasin (WDFW 2003b). Construction of the Grand Coulee Project resulted in a loss of 2,746 Habitat Units for sage grouse; most of this loss occurred within the Upper Columbia Subbasin.

Sharp-tailed grouse. During the period from 1979 to 1997, the WDFW (2003b) reported 22 sightings of sharp-tailed grouse in the Subbasin; 16 of the sightings were lek sightings. One grouse population was documented in the northwest corner of the Subbasin; another population was recorded south of the Columbia River at the Subbasin's southern end. Construction of the Grand Coulee Project resulted in a loss of 32,723 sharp-tailed grouse Habitat Units, largely within the Upper Columbia Subbasin.

32.2.2.2 Grand Coulee HEP Species

Canada goose. Data from the WDFW (2004a) show that the Upper Columbia Subbasin accounts for approximately three percent of the state's goose hunting harvest and two percent of its goose hunting recreation (Appendix G). That statistic combines all goose species (Canada goose, snow goose, brandt, etc.). Construction of the Grand Coulee Project resulted in a loss of 74 goose nesting islands, many of which were located in the Upper Columbia Subbasin.

Mourning dove. This Subbasin accounts for about one percent of the state total for dove hunting harvest and two percent of the total for dove hunting recreation (WDFW 2004a, as summarized in Appendix G). The Grand Coulee Project construction caused the loss of 9,316 mourning dove HUs, largely within the Upper Columbia Subbasin.

Mule deer and white-tailed deer. Both mule and white-tailed deer are native to the Subbasin. White-tailed deer populations are relatively stable, while mule deer populations in northeastern Washington are below historic levels.

The WDFW management goal is to preserve, protect, perpetuate, and manage deer and their habitat to ensure healthy, productive populations (WDFW 2003c). The population goal for white-tailed deer is to maintain relatively stable population growth. The population goal for mule deer management is an increase in populations within limitations of available mule deer habitat. The WDFW recreation management objective for deer is to maintain or increase hunting opportunity and improve hunting quality. The current general, post-hunt minimum goal for buck:doe ratios in Washington is greater than 15 bucks per 100 does for most populations.

An estimate of deer hunting harvest and recreation in the Upper Columbia Subbasin is presented in Table 32.7. The data for mule deer and white-tailed deer are combined in this table. Approximately nine percent of Washington's deer harvest and seven percent of its deer hunting recreation occur in this Subbasin.

Table 32.7. Mule Deer and White-tailed Deer Hunting Harvest and Recreation Within the Upper Columbia Subbasin¹

Year	Harvest		Hunter-Days	
	Quantity	% of State Total	Quantity	% of State Total
1999	3,008	9.4	113,940	7.9
2000	4,046	10.8	79,407	8.4
2001	2,767	7.6	51,238	6.1
2002	2,736	8.1	56,147	6.7
Average	3,139	9.0	75,183	7.3

(Source: Appendix G)

¹ Includes all or portions of Washington Game Management Units 101, 105, 109, 121, and 133.

Construction of the Grand Coulee Project caused a loss of 27,133 mule deer Habitat Units and 21, 632 white-tailed deer Habitat Units; much of the loss occurred within the Upper Columbia Subbasin.

Ruffed grouse. Data from the WDFW shows that forest grouse hunting (ruffed grouse, blue grouse, and spruce grouse) occurs in all Washington counties of the Subbasin. The most harvest occurs in Stevens and Okanogan counties, while the least is in Lincoln County. The Upper Columbia Subbasin produces approximately 19 percent of Washington’s forest grouse hunting harvest and 13 percent of its grouse hunting recreation (Table 32.8).

Table 32.8. Forest Grouse (Ruffed Grouse, Blue Grouse, and Spruce Grouse) Hunting Harvest and Recreation Within the Upper Columbia Subbasin¹

Year	Harvest		Hunter-Days	
	Quantity	% of State Total	Quantity	% of State Total
1999	17,565	23.9	31,578	16.6
2000	29,084	19.6	53,802	13.5
2001	18,315	16.5	33,485	11.2
2002	21,741	15.7	35,035	10.6
Average	21,676	18.9	38,475	13.0

(Source: Appendix G)

¹ Includes portions of Chelan, Ferry, Lincoln, Okanogan, and Stevens counties.

Ruffed grouse lost 16,502 Habitat Units from construction of the Grand Coulee Project; the majority of the loss occurred within the Upper Columbia Subbasin.

Sage grouse. Refer to preceding section describing federal and state threatened and endangered species.

Sharp-tailed grouse. Refer to preceding section describing federal and state threatened and endangered species.

32.2.2.3 Other Priority Species

American beaver. Beaver are present throughout the Upper Columbia Subbasin. Trapping harvest is several times greater in Okanogan County than in Ferry or Lincoln counties. The

Subbasin harvest during 1999-2002 averaged approximately 28 beaver per year, approximately two percent of the state total (Appendix G). Harvest declined during those years, but it is not clear whether this was due to a population reduction, the passing of State Initiative 713 in 2000 (which banned the use of leg or body gripping traps), or other reasons such as a weak fur market or drop in nuisance complaints.

Bighorn sheep. Of eleven California bighorn sheep herds in Washington, two are present within the Upper Columbia Subbasin (WDFW 2003c). The Lincoln Cliffs herd borders the Columbia River in the Coulee Dam National Recreation Area northwest of Davenport. It presently numbers 95, but the desired size is 60-70 animals. The Vulcan Mountain herd is northwest of Curlew and presently numbers approximately 45 head (S. Zender, WDFW, personal communication, April 2, 2004), but the desired population is 80-110. The statewide population is currently 1,110 and the desired population size is 1,750-2,130.

WDFW management objectives include (1) improving habitat on at least 10 percent of the Vulcan Mountain herd range, (2) developing viewing opportunities for bighorn sheep herds, and (3) acquiring biological information that aids in bighorn management.

Columbia spotted frog. From 1991 to 1997, increased emphasis was placed on establishing distribution of the species and several reports of Columbia spotted frogs were recorded in the Subbasin (WDFW 2003b). All except one were in the northern half of the Subbasin and they included drainages on both sides of the Columbia River. No sightings have been reported to the Priority Habitats and Species database (WDFW 2003b) since 1997, but those records may not include information from the Colville Indian Reservation.

Golden eagle. There are approximately four nesting territories along the lower Columbia River, three territories near the upper Columbia River, and nine territories in the northwest corner of the Subbasin (WDFW 2003b). The WDFW and USFWS have begun a two-year effort to (1) increase monitoring of known golden eagle nests and (2) locate unrecorded nests in northeastern Washington (S. Zender, WDFW, personal communication, April 2, 2004).

Long-eared owl. No records of occurrence for this species in the Upper Columbia Subbasin have been submitted to the Priority Habitats and Species database (WDFW 2003b). However, Vial and Loggers (1998) list the long-eared owl as an uncommon resident in agriculture or forested lands of low to medium elevation.

Mink. Trapping reports during 1999-2002 average approximately one mink per year in the Subbasin (Appendix G). It is not clear whether this is due to a sparse population, the passing of State Initiative 713 in 2000 (which banned the use of leg or body gripping traps), or weak fur market. Prior to the trap type restrictions and increased conflict with trapping, mink were more commonly taken, especially in the low elevation streams and wetlands of the Colville Valley. In 1995, trappers reported taking four mink from northern Ferry County and sixteen from Stevens County (WDFW 1996).

Pileated woodpecker. At least one nesting sighting is known from the Upper Columbia Subbasin. It occurred in 1993 west of the Kettle River in the northwest corner of the Subbasin

(WDFW 2003b). Vial and Loggers (1998) list the pileated woodpecker as an uncommon resident in forested lands of low to timberline elevations.

White-headed woodpecker. Between 1978 and 2002, the WDFW (2003b) recorded at least six sightings in the southeast quadrant of the Subbasin, three of which were nest sites found in 1978. Vial and Loggers (1998) list the white-headed woodpecker as a rare resident in forested land of low to medium elevation, and in transitions zones of dry hillsides and open forest.

32.3 Summary of Terrestrial Resource Limiting Factors

32.3.1 Direct Effects of Federal Hydrosystem Projects

Development of the Grand Coulee Project resulted in direct loss of wildlife and wildlife-habitats in the Upper Columbia Subbasin. The habitat losses associated with construction of project facilities and inundation of project reservoirs were assessed in the Final Report on Wildlife Protection, Mitigation and Enhancement Planning for Grand Coulee Dam (Creveling and Renfrow 1986) through a Habitat Evaluation Procedures (HEP) study. The HEP evaluation species were selected based on their use of specific habitat types and structural elements, and to represent other wildlife species that use those habitats. The HEP study results are provided in terms of Habitat Units, which are units of value based on both quality and quantity of habitat. The study provides the number of habitat units to be provided in compensation for the construction losses and identifies potential mitigation areas.

Table 32.9 summarizes the loss of habitats as determined by Creveling and Renfrow. The loss of habitat value for individual wildlife species, as determined through the HEP study and expressed in Habitat Units (HUs), is summarized in Table 32.10. The current status of completed mitigation for the Grand Coulee Project is also presented; approximately 49 percent of the mitigation remains to be implemented.

Table 32.9. Acres of Habitat Types Affected by Grand Coulee Dam Project Construction and Inundation¹

Project	Habitat Type	Acres of Habitat Inundated
Grand Coulee	Islands	1,000
	Riparian lands	2,000
	Shrub-steppe uplands	14,000
	Forested uplands	25,000
	Agricultural lands	15,000
	Barren lands	13,000
Total		70,000¹

(Source: Creveling and Renfrow 1986)

¹ This figure includes the rivers' shorelines between the high and low water levels. USBR revised its figure for lands inundated by Roosevelt Reservoir to include only lands above the mean high water level. This revised figure is approximately 56,000 acres (Creveling and Renfrow 1986).

Table 32.10. Status of Mitigation for Construction and Inundation Wildlife Habitat Losses, Grand Coulee Project.¹

Grand Coulee Project	Species	Habitat Units lost	Habitat Units acquired	Percent complete
	Mourning dove	9,316	1,001	10.7%
	Mule deer	27,133	19,056	70.2%
	Riparian forest	1,632	234	14.3%
	Riparian shrub	27	131	100.0%
	Ruffed grouse	16,502	2,908	17.6%
	Sage grouse	2,746	7,432	100.0%
	Sharp-tailed grouse	32,723	16,854	51.5%
	White-tailed deer	21,632	9,064	41.9%
	Canada goose (nesting)	74 (islands)	-	0.0%
Total all species		111,785	56,680	50.7%

(Sources: BPA 2002; WDFW 2004b, CCT 2004)

¹ Note: This table shows the total HUs lost at the Grand Coulee Project; mitigation of this loss is to be coordinated between the San Poil, Spokane, and Upper Columbia subbasins.

The majority of habitat losses associated with the Grand Coulee Project occurred within the Upper Columbia Subbasin; portions of the San Poil and Spokane subbasins (as delineated for this plan) were also affected by creation of Lake Roosevelt. Terrestrial resources mitigation required for the Grand Coulee Project in the Upper Columbia is to be coordinated between the three wildlife management jurisdictions in these three subbasins: the Colville Confederated Tribes, Spokane Tribe, and WDFW. The total number of HUs to be acquired as mitigation for the Grand Coulee Project (111,785) is presented in corresponding tables in each of the three subbasin chapters. Note that this is a single, coordinated mitigation target rather than three independent subbasin targets.

The Grand Coulee construction losses for terrestrial resources were apportioned between the three wildlife management jurisdictions in these subbasins: the Colville Tribe, Spokane Tribe, and WDFW (Creveling and Renfrow 1986). To date, WDFW has acquired the greatest number of HUs (50,678 HUs acquired, approximately 89 percent complete per WDFW 2004b); the Colville and Spokane tribes each have a substantial number of HUs remaining to be acquired.

32.3.2 Operational Effects of Federal Hydrosystem Projects

Ongoing operation of the Grand Coulee Project affects terrestrial resources of the Upper Columbia Subbasin through:

- 1) continued erosion of shoreline habitats along the Lake Roosevelt;
- 2) ongoing absence of riparian vegetation, particularly woody species, along portions of the reservoir subjected to sustained drawdowns;
- 3) ongoing disturbance of wildlife and habitats (for example, nest sites, amphibian breeding sites) in the fluctuation zone of the reservoir;
- 4) periodic disturbance of habitats and species within transmission line rights-of-way due to maintenance activities; and

- 5) ongoing absence of anadromous fish in the Subbasin, resulting in loss of key food item for numerous wildlife species and important nutrient input for the riverine ecosystem.

Erosion sites along Lake Roosevelt have been inventoried and described by USBR (1984) and continue to be monitored (USBR 2000). The effects of erosion on wildlife and other terrestrial resources have not been determined. Other ongoing effects of operation of the Grand Coulee Project have not been assessed. Assessment and mitigation of the operational effects of the project are required under the Northwest Power Act, and these activities are considered a high priority by the Upper Columbia Subbasin Planning Team.

32.3.3 Secondary Effects of Federal Hydrosystem Projects and Other Limiting Factors

The federal hydropower system contributed to development in the Upper Columbia Subbasin primarily by providing an inexpensive source of power. The Upper Columbia Subbasin supports substantial agricultural land uses (12 percent of area) and high levels of timber management. Factors that currently limit terrestrial resources in the Subbasin are dominated by loss of habitat through conversion and modification, disturbance of wildlife species by humans and human activities, and interactions with nonnative plant and animal species.

32.4 Interpretation and Synthesis

The Upper Columbia Subbasin has been highly modified from historic conditions due to development and agriculture, which have converted about 12 percent of native habitat. Construction of the Grand Coulee Dam had major direct effects to the Columbia River riparian area, and tributary streams, through inundation of approximately 56,000 acres of land. Grand Coulee Dam, and the downstream Chief Joseph Dam, currently block all anadromous fish access to the Upper Columbia Subbasin and subbasins located upstream. Operation of the project continues to affect wildlife and wildlife habitats through altered hydrology; detailed assessments of operational effects have not been performed. Secondary effects of the project continue to impact wildlife of the Subbasin through human land uses and disturbance. Secondary effects of the power projects on development of the Subbasin are wide-reaching, including agriculture, grazing, timber management, and residential and urban development. Road densities are high throughout much of the Subbasin and protected lands are low in acreage.

Terrestrial resources mitigation related to the federal hydropower project at Grand Coulee is approximately 51 percent complete. Completion of the mitigation is the highest terrestrial resources priority of the Upper Columbia Subbasin Work Team, followed by assessment and mitigation of operational impacts of the hydrosystem projects.