SECTION 4 – Table of Contents

4 Terrestrial Resources in the Intermountain Province

4.1 Terrestrial Resource Assessment Methods

4.1.1 Habitat Assessment Methods

4.1.1.1 Vegetation-Wildlife Associations

Wildlife-habitat types of the Intermountain Province are described in this Section based on the system developed by Johnson and O'Neil (2001). The researchers involved in the Wildlife-Habitat Relationships project evaluated 287 plant alliances, based on the national vegetation classification system of Grossman et al. (1998). These plant alliances were combined into 85 vegetative groups and supplemented with categories for marine habitats, agricultural lands, and urban sites, for a total of 119 cover types. The cover types were linked to use levels of 541 native breeding wildlife species and analyzed using multivariate statistics to determine similar habitats based on species' associations. The end-product was a total of 32 wildlife-habitat types for Oregon and Washington. This system was later expanded to include Idaho (IBIS 2003).

4.1.1.2 IMP Focal Habitats

Wildlife-habitat types occurring in the Intermountain Province were grouped into six habitat categories (Table 4.1). The Intermountain Province selected four of the six habitat categories as focal habitats (Terrestrial Resources Ad-Hoc Technical Group Meeting May 5, 2003). Wetlands, riparian habitats, and steppe/shrub-steppe habitats were selected because they have been substantially affected by construction and operation of the FCRPS projects. These habitats are of high value to native plants and wildlife species and make up a relatively low proportion of the total habitat in the province. Upland forested habitats were also selected as focal habitats. Upland forests are dominant habitats in the province, and have been affected by construction, operation, and secondary effects of hydro project development. The Intermountain Province planners also considered cliff and rock outcrop habitats focal habitats. These habitat types are not represented as habitat types in the Johnson and O'Neil system, but rather are considered fine scale habitat elements occurring within other, more widespread, habitat types.

4.1.1.3 Habitat Area Estimates, Current and Historic

The Interactive Biodiversity Information System (IBIS) provided maps of the defined wildlife-habitats in the Intermountain Province and its six Subbasins. The current condition map is based on 1999 satellite imagery, prepared at a scale of 1:100,000, with a pixel size of 25 meters (82 feet). The historic condition map was created at a scale of 1:1,000,000 with a pixel size of 1000 meters (3,280 feet). The historic map was prepared without benefit of aerial photography or satellite imagery, using written accounts, vegetation models, and expert opinions.

Table 4.1 presents the list of wildlife-habitat types present in the Intermountain Province and provides a brief description of each habitat type. Detailed descriptions of the habitat types can be found in Johnson and O'Neil (2001) and IBIS (2003).

Table 4.1. Abridged descriptions of wildlife-habitat types of the Intermountain Province

Wetlands (IMP Focal Habitat)	
Lakes, Rivers, Ponds, and Reservoirs	Natural and human-made open water habitats.
Herbaceous Wetlands	Emergent herbaceous wetlands with grasses, sedges, bulrushes, or forbs; aquatic beds with pondweeds, pond lily, other aquatic plant species; sea level to upper montane.
Montane Coniferous Wetlands	Forest or woodland dominated by evergreen conifers; deciduous trees may be co-dominant; understory dominated by shrubs, forbs, or graminoids; mid- to upper montane.
Riparian and Riparian Wetlands (IMP Focal Habitat)	
Eastside (Interior) Riparian-Wetlands	Shrublands, woodlands and forest, less commonly grasslands; often-multilayered canopy with shrubs, graminoids, forbs below.
Steppe and Shrub-Steppe (IMP Focal Habitat)	
Westside Grasslands	Native bunchgrass dominated, with forbs, mosses, or lichens; occasionally with shrub or tree cover.
Eastside (Interior) Grasslands	Dominated by short to medium height native bunchgrass with forbs, cryptogam crust.
Shrub-Steppe	Sagebrush and/or bitterbrush dominated; bunchgrass understory with forbs, cryptogam crust.
Upland Forests and Woodlands (IMP Focal Habitat)	
Western Juniper and Mountain Mahogany Woodland	Western juniper and/or mountain mahogany dominated with bunchgrass or shrub-steppe understory.
Westside Lowland Conifer-Hardwood Forest	Conifer dominated forest typical of west side, western hemlock and Douglas-fir dominated; understory dominated by shrubs, swordfern, forbs and grasses.
Montane Mixed Conifer Forest	Coniferous forest of mid-to upper montane sites with persistent snowpack; several species of conifer; understory typically shrub-dominated.
Eastside (Interior) Mixed Conifer Forest	Coniferous forests and woodlands; Douglas-fir commonly present, up to 8 other conifer species present; understory shrub and grass/forb layers typical; mid-montane.
Lodgepole Pine Forest and Woodlands	Lodgepole pine dominated woodlands and forests; understory various; mid- to high elevations.
Ponderosa Pine Forest and Woodland	Ponderosa pine dominated woodland or savannah, often with Douglas-fir; shrub, forb, or grass understory; lower elevation forest above steppe, shrub-steppe.
Upland Aspen Forest	Quaking aspen dominated woodland or forest with shrub, forb, or grass dominated understory; rocky sites or moist microsites.
Alpine and Subalpine (Non-focal Habitat)	
Alpine Grasslands and Shrublands	Grassland, dwarf-shrubland, or forb dominated, occasionally with patches of dwarfed trees.
Subalpine Parklands	Ground layer of dwarf-shrubland, graminoids, forbs, moss, or lichens with tree layer of 10-30 percent canopy cover.
Developed (Non-Focal Habitat)	
Agriculture, Pasture, and Mixed Environs	Cropland, orchards, vineyards, nurseries, pastures, and grasslands modified by heavy grazing; associated structures.
Urban and Mixed Environs	High, medium, and low (10-29 percent impervious ground) density development.

(*Source*: Johnson and O'Neil 2001, IBIS 2003)

4.1.1.4 Habitat Ownership

The IBIS database also was used to determine land ownership categories and Gap Analysis Program (GAP) management status of lands within the province. The GAP identifies and classifies components of biological diversity to determine which components already occur in protected areas, and which are under-represented or not present in protected areas. These IBIS products are based on a different land cover source than the wildlife-habitat types; individual vegetation types were grouped to match the IBIS wildlife-habitat types as closely as possible, but the acres within each wildlife-habitat category do not match in all cases.

4.1.2 Limitations of the Habitat Assessment Methods

The current conditions map is limited in its ability to accurately represent habitats that are in small patches or corridors less than 25 meters wide. It also may under-represent small patches of habitats that occur at or near the canopy edge of forested habitats. Wetlands, riparian areas, small and/or linear aquatic habitats, and habitats of characteristically patchy and infrequent occurrence are likely somewhat underrepresented on this map.

Due to the much larger pixel size and less extensive information base, the historic map is even more limited in its ability to accurately represent habitats that are located in small patches or narrow corridors. Habitat types that may be substantially underrepresented on this map include herbaceous wetlands, montane coniferous wetlands, interior riparian wetlands, upland aspen forest, alpine and subalpine habitats, and small aquatic habitats such as lakes, rivers, and ponds.

The IMP Oversight Committee recognizes the assumptions and limitations of the IBIS analysis. However, the data provide a good indication of the trends in habitat abundance and distribution from the historic to current condition for those habitat types that are well represented. Due to the limitations and inaccuracies associated with the IBIS mapping, the IBIS historic and current maps were not used for subbbasin-level analyses.

The following discussion is based in part on the IBIS wildlife-habitat information. Supplementing the IBIS data is information on historic and current habitat distribution, condition, and trends available in other published reports and documents.

4.1.3 Wildlife Assessment Methods

IBIS was used to determine the general occurrence of terrestrial vertebrate species in the province. In addition, IBIS was used to determine specific ecological functions of selected focal wildlife species in the province. The IBIS system relates species to the structural conditions and habitat elements of wildlife-habitat types and indicates important attributes of the species' life histories and key ecological functions.

The IBIS database indicates wildlife species occurrence based on wildlife-habitat presence. Most of the wildlife occurrence data is categorical and is not quantified or verified locally. Habitats that are under-represented by the mapping methods will also under-represent occurrence of wildlife species closely associated with the habitat. Conversely, a species may be shown to occur in a habitat, even though the structural conditions within the habitat to support the species are absent. Due to these sources of error, the Oversight Committee chose not to use the IBIS wildlife species occurrence data

for the historic condition. General species occurrence data for the province is derived from the IBIS database; assessments of key wildlife are supported through citation of current, local information on populations and habitats in the province.

4.2 Historic Focal Habitat Conditions

4.2.1 Historic Distribution of Focal Habitats

Table 4.2 and Figure 4.1 present the acres and distribution of wildlife-habitat types in the Intermountain Province under the historic (c. 1850) condition.

4.2.1.1 Wetlands

Open water habitats comprised about 2.6 percent of all habitats in the Intermountain Province historic condition, including the Columbia River and its tributaries (Table 4.2 and Figure 4.1). The Columbia River flowed over 160 miles within the province. Major tributaries included the Pend Oreille, Kettle, Spokane, San Poil rivers. Large lakes with significant inflows and outflows included Coeur d' Alene Lake, Lake Pend Oreille, Priest Lake, plus numerous smaller lakes.

Herbaceous wetlands and montane coniferous wetlands are not represented in the historic mapping due to scale inaccuracies; however, these wetland types were likely present in quantities equal to or greater than the current condition. Montane coniferous wetlands would have been present at mid- to upper elevations along streamcourses or adjacent to other wetlands (Chappell et al. 2001). These forested wetlands were characteristically of relatively small size and patchy distribution, occurring within large tracts of montane mixed conifer forest, or, less often, lower elevation conifer forests. These wetlands typically included tree, shrub, and grass/forb strata, and provided a broad range of forest habitat elements in proximity to seasonal or permanent water sources.

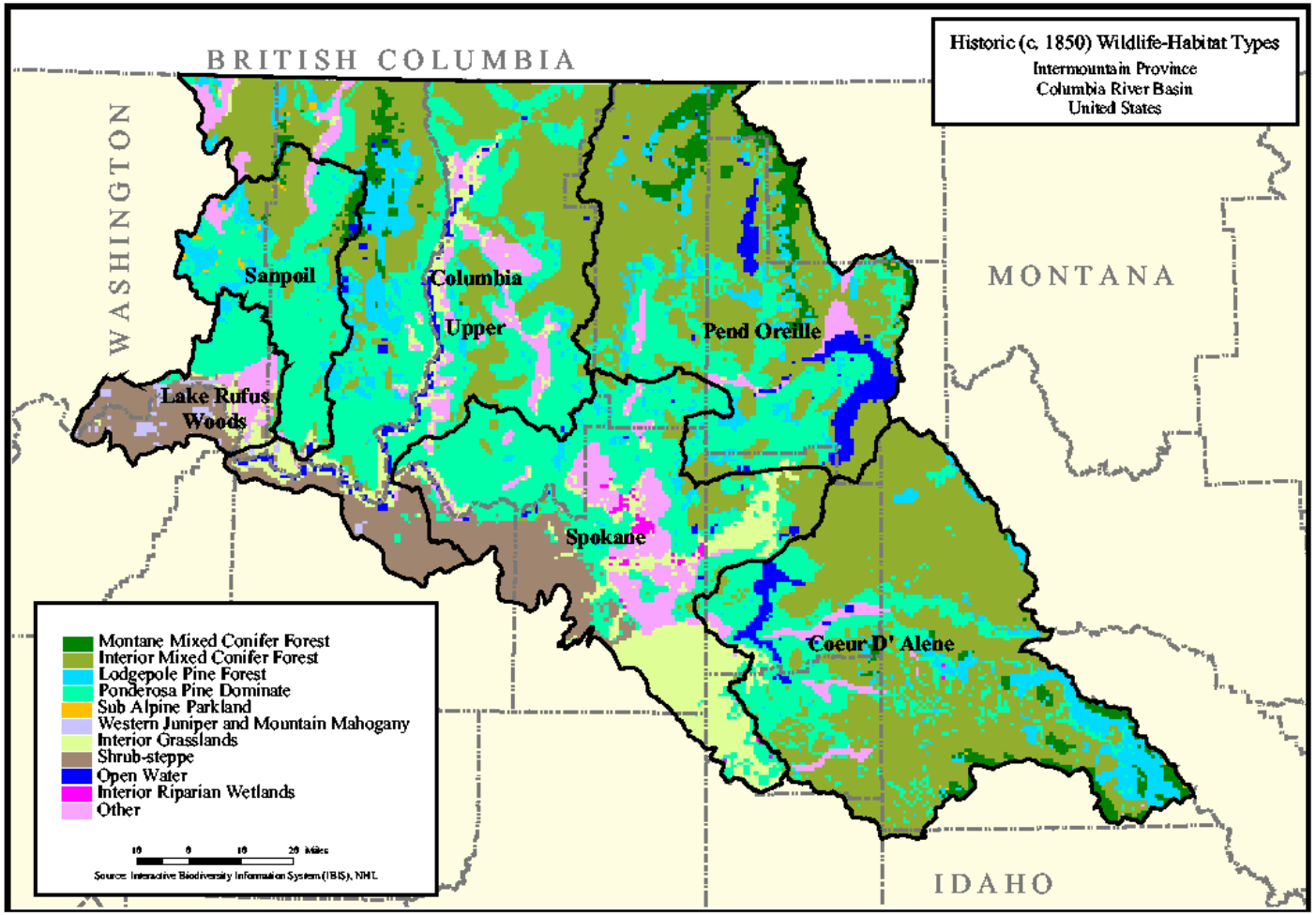

Figure 4.1. Historic wildlife-habitat types

Figure 4.1

Table 4.2. Historic and current wildlife-habitats of the Intermountain Province

	Total Historic	Total Current	Change Historic to Current	Percent Change	Historic percent of Total	Current percent of Total
Wetlands (Focal Habitat)						
Lakes, Rivers, Ponds, and Reservoirs	258,150	317,155	59,005	22.9%	2.6%	3.2%
Herbaceous Wetlands	N/A	9,750	N/A	N/A	N/A	0.1%
Montane Coniferous Wetlands	N/A	107,082	N/A	N/A	N/A	1.1%
Riparian and Riparian Wetlands (Focal Habitat)						
Eastside (Interior) Riparian-Wetlands	37,358	22,825	-14,533	-38.9%	0.4%	0.2%
Steppe and Shrub-Steppe (Focal Habitat)						
Eastside (Interior) Grasslands	865,563	702,944	-162,619	-18.8%	8.6%	7.0%
Shrub-Steppe	641,208	501,195	-140,013	-21.8%	6.4%	5.0%
Western Juniper and Mt. Mahogany Woodland	39,197	0	-39,197	-100.0%	0.4%	0.0%
Upland Forest (Focal Habitat)						
Westside Lowland Conifer-Hardwood Forest	0	107,576	107,576	+	0.0%	1.1%
Montane Mixed Conifer Forest	348,317	335,895	-12,422	-3.6%	3.5%	3.3%
Eastside (Interior) Mixed Conifer Forest	3,780,619	5,203,399	1,422,780	37.6%	37.7%	51.9%
Lodgepole Pine Forest and Woodlands	702,101	142,803	-559,298	-79.7%	7.0%	1.4%
Ponderosa Pine Forest and Woodland	3,337,778	1,138,396	-2,199,382	-65.9%	33.3%	11.4%
Upland Aspen Forest	N/A	18,884	18,884	N/A	N/A	0.2%
Alpine and Subalpine						
Alpine Grasslands and Shrublands	N/A	85,436	85,436	N/A	N/A	0.9%
Subalpine Parklands	16,882	11,423	-5,459	-32.3%	0.2%	0.1%
Developed						
Agriculture, Pasture, and Mixed Environs	0	1,226,578	1,226,578	+	0.0%	12.2%
Urban and Mixed Environs	0	95,712	95,712	+	0.0%	1.0%
Total[1]	10,027,173	10,027,053			100.0%	100.0%

(*Source*: IBIS 2003)

N/A: Historic condition data not available due to mapping scale and lack of source data; change and percent change not calculable.
+ : Indicates habitat type not present in historic condition; percent change not calculable.
[1] : Totals for historic and current condition do not match due to different mapping scales.

Herbaceous wetlands would have been present in all habitats at elevations below subalpine, on sites where seasonal to semi-permanent water sources provided year-round soil saturation (Chappel et al. 2001). These wetlands varied in size from small, isolated sites to extensive marshes. In the IMP, large emergent wetlands were present along many rivers where they drained to or from natural lakes; for example, the Pend Oreille River at Lake Pend Oreille supported over 2,300 acres of marshlands prior to hydroelectric project construction (Martin et al. 1988). Although limited to emergent or aquatic herbaceous vegetation, these wetlands provided wildlife value through roots and shoots, seed production, security cover for aquatic and terrestrial species, and breeding habitat.

Wetlands provide a large number of important functions affecting habitat, hydrology, and water quality: reduction in flooding impact, water quality enhancement, groundwater effects, primary and secondary biological productivity, and creation of habitat for fish, wildlife, and

plants (Novitzki et al. 1994). Wetland habitats support a diverse array of species closely or occasionally linked to wetland use, including waterfowl, wading birds, amphibians, numerous mammalian wildlife species, fish, and rare, threatened, and endangered species. (Refer to Section 4.5 for additional information on wildlife species relationships to wetland habitats.)

4.2.1.2 Riparian and Riparian Wetlands

Eastside riparian wetlands, dominated by woody vegetation, are estimated to have occupied less than one percent of the historic landscape (Table 4.2). This habitat type is under-represented by the historic mapping, due to the narrow, linear configuration of riparian zones. These habitats would have been present along the Columbia River and its tributaries, including intermittent streams, wherever aspect, slope, soils, and hydrology combined to allow seasonal soil saturation (Chappell et al. 2001). These wetlands would also have been located along seeps within eastside mixed conifer forest, ponderosa pine forest and woodlands, and shrub-steppe habitats.

Riparian habitats in the Intermountain Province varied greatly in structure, including single and multi-canopy forests, woodlands, and shrublands (Chappell et al. 2001, Kovalchik 2001). Tree layers may have included black cottonwood, quaking aspen, paper birch, and other deciduous species at lower elevations. In shrub-steppe habitats, ponderosa pine or Douglas-fir would have been the typical dominant species. At higher elevations, conifers were more dominant in riparian zones, interspersed with deciduous trees and shrubs. A wide variety of shrubs, both hydrophytic species and those tolerant of drier conditions, may have been present.

The high value of riparian habitat to wildlife is well-documented (Brown 1985, Thomas 1979, Raedeke 1988). These habitats currently support a disproportionate level of use by wildlife, and would have served the same function historically. Kauffman et al. (2001) estimate that 53 percent of wildlife species occurring in Oregon and Washington use riparian zones, which comprise only 1 to 2 percent of habitats. Diverse vegetative structure, a wide variety of habitat elements, proximity to water, and microclimate all contribute to the importance of riparian zones as wildlife habitat. Riparian zones also function as important travel corridors for wildlife migration and dispersal.

Riparian floodplain communities are dependent on large scale events including channel migration, flooding, and formation of depositional areas, to create suitable habitat for the establishment of riparian pioneering species such as cottonwood and willow (Hughes et al. 2001, Winward 2000). Flow variations continue to exert a primary influence after seeds have reached suitable sites and germinated; inadequate or excess soil moisture and high flows can cause mortality of small seedlings (Amlin and Rood 2002, Braatne and Jamieson 2001; Scott et al. 1997). High water events allowing groundwater recharge can be important to the maintenance of established cottonwood stands (Braatne and Jamieson 2001).

4.2.1.3 Steppe and Shrub-Steppe

Eastside grasslands (8.6 percent) and shrub-steppe (6.4 percent) were present along the southern portion of the Intermountain Province in the historic condition (Table 4.2, Figure

4.1). The most extensive grasslands were in the southern portion of the Spokane Subbasin. Grasslands occurred in patchy distribution throughout the Upper Columbia and San Poil Subbasins and extended along the Columbia River corridor.

Eastside grasslands occurred in very dry, hot locales on both plateaus and canyons, mostly below the ponderosa pine and western juniper mountain mahogany woodland zones, based on classifications by Daubenmire (1970) and Chappell et al. (2001). Grassland structure was a single, herbaceous layer of short- to medium-height grasses and forbs; however, the habitat ranged from sparsely to densely vegetated. Bunchgrasses dominated, providing an irregular, patchy distribution of cover within the habitat. A presumably important feature of native grassland habitats was the presence of a cryptogam crust composed of bacteria, lichens, mosses, and algae (PNL 2003).

Shrub-steppe habitats were typically located at elevations below ponderosa pine forests and western juniper-mountain mahogany woodlands, and were often present in a mosaic with Eastside grassland habitats. Shrub cover varied greatly, with sagebrush species as the dominant shrubs. Grass and forb cover, mostly between individual shrubs, also varied in extent, with a large number of both annual and perennial forb species potentially present, based upon current classification by Dobler et al. 1996. Cryptogam crusts were presumably typical on non-vegetated soils in good condition shrub-steppe habitats (PNL 2003).

4.2.1.4 Upland Forests and Woodlands

Interior mixed conifer forests dominated the northern and eastern portions of the Intermountain Province in the historic condition (37.7 percent of total; Table 4.2). This forest habitat extended across the province, and was contiguous with forests located to the east, west, and north into present-day Canada. Montane mixed conifer forests (3.5 percent) and lodgepole pine forests and woodlands (7 percent) interrupted the extensive tracts of mixed conifer forest on sites at mid-montane to montane elevations that retained a persistent winter snowpack.

Ponderosa pine dominated forests and woodlands (33 percent) were distributed widely across the central and southern portion of the Intermountain Province, transitional from the higher, moister, coniferous forests to the arid steppe and shrub-steppe habitats (Figure 4.1). Western juniper and mountain mahogany woodlands (less than one percent) were present only in scattered locations within shrub-steppe or ponderosa pine habitats.

Eastside (interior) mixed conifer forest was located on a broad range of mid-elevation ranges, primarily from about 3,000 to 5,500 feet (Chappell et al. 2001). Douglas-fir was the most common species, but at least eight other conifer species may also have been present. Structure varied from single layer forest canopy in younger seral stages, to multi-canopy forests in late and old seral stages. Shrub layers were dominated by deciduous shrubs, and a wide variety of graminoids and forbs were present. Montane mixed conifer forests were located at higher elevations, and were typically dominated by Pacific silver fir, mountain hemlock, subalpine fir, or other conifer species, often with Douglas-fir as a codominant (Chappell et al. 2001). Both types of coniferous forest habitat provided structural diversity, a

patchwork of ages and stand complexity, snags, downed wood, and other habitat elements, used by a variety of wildlife species.

Lodgepole pine stands occurred at mid- to high elevations, typically subject to cold and relatively dry conditions, but also on poorly drained depressions (Franklin and Dyrness 1988). Lodgepole is strongly associated with disturbance by fire (Chappell et al. 2001). Stands of lodgepole varied from open canopy to closed canopy, with a single canopy layer until later seral stages within which shade-tolerant understory trees had developed. Understory species were dominated by shrubs or graminoids, depending on site conditions. A variety of wildlife species were associated with lodgepole stands, perhaps most notably in the Intermountain Province, the lynx. Lynx are now known to be highly dependent upon snowshoe hares, which tend to be abundant in relatively young lodgepole stands with very high stem density (Stinson 2001).

Ponderosa pine habitats ranged from open savannah to more dense woodlands, with well-spaced overstory trees, based upon analysis by Chappell et al. (2001). Understory species included conifers, shrubs of various heights, and grasses and forbs. A multi-level canopy would have been interspersed with openings between the dominant conifers. Structure was diverse, and many habitat elements such as snag cavities, logs, and dense shrub cover would have been present. Few wildlife species were restricted to ponderosa pine habitats, but numerous species used the habitat.

4.2.1.5 Non-Focal Habitat Types

Alpine grasslands and shrublands, subalpine parklands, and upland aspen forests were likely present in the historic condition in relatively small amounts. Urban and agricultural habitats were essentially non-existent in the province in the historic condition.

4.2.2 Factors Limiting Historic Focal Habitats

The distribution of vegetation across the Intermountain Province in the historic condition was determined by a combination of factors including geology, soils, and climate. Wildlife-habitats were also affected by naturally-occurring disturbance events of both small and large scale. These disturbance events served both to influence the distribution of habitats and to shape the structural characteristics of habitats within the province.

4.2.2.1 Fire

The vegetated landscape of northeastern Washington and northwestern Idaho was frequently disturbed by fire in historic times (Daubenmire and Daubenmire 1968). Fire intervals in the inland northwest between 1540 and 1940 were studied by Barrett et al. (1997). Ponderosa pine habitats had the shortest interval of the habitats studied, with low-intensity fires occurring every 20 years on average. Grasslands and shrub-steppe also had frequent, low intensity fires, averaging about every 25 years. Conifer forests may be subject to low intensity fires, but are more often affected by moderate to high intensity fires. Eastside mixed conifer forests experienced a fire interval of 30 to 100 years. Fire-scarred trees, stumps and logs, and charcoal deposits in soil are frequently observed in forests within the province (Williams et al. 1995). While most fires are believed to have been naturally-occurring, evidence documents the practice of setting fires to grasslands and shrub-steppe habitats by

Native Americans. This practice promoted the growth of culturally important plants such as camas (Agee 1993).

Fire was important in maintaining the structure and plant species composition of grasslands and shrub-steppe, removing accumulated dry plant material, reducing cover of some woody species, and promoting the germination and development of other plant species.

Fire was also important in species composition and structure of ponderosa pine habitats. Frequent underburning removed accumulated dead materials, reduced shrub cover, and maintained the open understory of savannah or woodland habitat. Ponderosa pine has several adaptations to survival in a fire-prone environment, including self-pruning and thick, heat resistant bark.

Lodgepole pine depends on fire for release of seed from its cones and for openings in which to germinate and grow. Fire can rejuvenate early and mid-seral stage lodgepole stands, providing new canopy openings and promoting germination. In the absence of fire, mature lodgepole stands are eventually replaced by shade-tolerant understory conifers.

In eastside mixed conifer and montane mixed conifer stands, fire was less likely to affect the overall distribution of the habitat, but maintained a strong influence on stand age and structure. In these forested habitats, fire was less frequent, but often more severe in intensity. Fire often resulted in the partial or complete removal of large stands of trees, allowing early seral stages to develop in patches across the landscape. Fire contributed to the maintenance of a mosaic of stands of multiple ages within the larger matrix of the forest habitat.

Wetland and riparian habitats were less influenced by fire than other, more xeric habitats. However, fires could sweep through wetlands and riparian habitats surrounded by, or adjacent to, other fire-prone habitats. Marsh areas may be burned by wildfire, particularly during the dry seasons.

4.2.2.2 Wind

In forest habitats of the historic landscape, windthrow was a recurring source of disturbance. This factor was not distributed evenly across the landscape, but tended to be located in specific areas defined by topography and wind patterns (McComb 2001). Windthrow caused small to large canopy openings in forested habitats, allowing early successional species to develop and promoting stand age diversity across the landscape.

4.2.2.3 Debris slides

Landslides were a local disturbance factor along canyons and steep slopes in mountainous terrain. Avalanches were another source of disturbance in steep mountainous habitat. These disturbances tended to be repetitive and promoted the development of early successional and/or slide tolerant vegetation.

4.2.2.4 Insects and Disease

Insect infestations and other diseases are important influences on forest stands in the Intermountain Province currently (Williams et al. 1995) and would have influenced the

historic stand structure as well. Root and stem fungi, mistletoes, and insects may have worked in combination with forest fire or other disturbance events, causing outbreaks when trees were in weakened conditions. The end result of these various pathogens was to cause local and patchy death and decay, including windthrow, within forest stands. Stand structure, and habitat elements such as snags, cavities, and downed wood, were all affected by local insect and disease outbreaks.

4.2.2.5 Human influence

In the historic condition of the Intermountain Province, circa 1850, human influence is assumed to have been minimal at the landscape level, as it predated most European settlement. Native American influence included low level and low density of disturbances associated with hunting and gathering. Human-induced fire was known to occur (Barrett and Arno 1982); the extent of its effects, over and above those of natural wildfire, are difficult to assess. The Oregon Trail, with associated grazing of livestock and hunting with guns, was actively used in the 1840s and 1850s. The effects of this use were relatively intense and localized along the trail near present-day Walla Walla, south of the Intermountain Province; however, its existence likely contributed to European presence within the province.

4.3 Current Focal Habitat Conditions

4.3.1 Current Distribution of Focal Habitats

Table 4.2 and Figure 4.2 present the acres of habitat types in the province under current (1999) conditions. As previously noted, both the historic and current conditions maps are limited in their ability to represent certain habitat types. Caution should be exercised when comparing acreages of wetland, riparian, open water, alpine/subalpine, and other habitats of small or linear mapping units. Habitats that occur in small patches, narrow bands, and at or near the edge of tree canopy, such as wetlands and riparian areas, are not accurately represented via remote-sensing based mapping. Also, due to development of the historic and current maps at different scales, the total acreages for the historic and current conditions do not match exactly.

4.3.1.1 Wetlands

Open water habitats, including rivers, lakes, ponds, and reservoirs, currently comprise about 3.2 percent of the habitats in the Intermountain Province (Table 4.2 and Figure 4.2). Open water habitats have increased in area from the historic condition, due primarily to the creation of river impoundments for hydroelectric, irrigation, and flood control projects. The federal hydropower reservoirs of Albeni Falls, Grand Coulee, and Chief Joseph dams total about 84,543 acres. Grand Coulee Dam is the single largest reservoir in the Intermountain Province, with a surface area of approximately 70,000 acres at full pool. Other water resource developments in the province include Boundary Dam, Box Canyon, and the five hydroelectric developments comprising the Spokane River Project.

Herbaceous wetlands are widely distributed across the province and are often associated with rivers, lakes and streams. The area of these wetlands has been reduced from historic levels due to draining and filling, agriculture, grazing, inundation by reservoirs, altered hydrology through regulation of flows, and by reduction in numbers of beaver (Chappell et al. 2001,

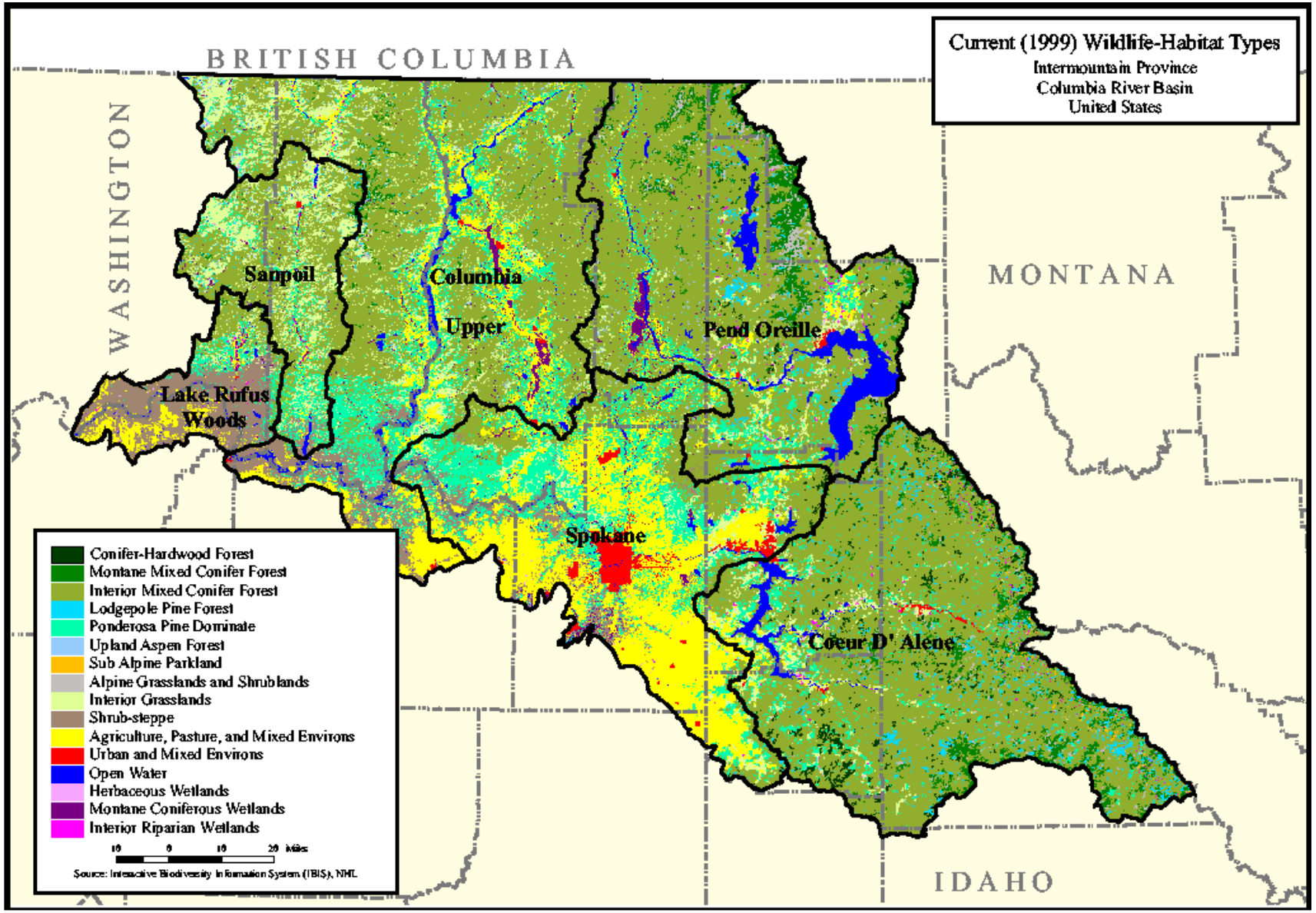

Figure 4.2. Current (1999) wildlife-habitat types

Naiman 1988). Currently, herbaceous wetlands comprise an estimated 0.1 percent of all habitats in the province.

Montane coniferous wetlands are estimated to make up about 1.1 percent of habitats in the Intermountain Province. These forested wetlands have been subject to fewer of the lower elevation practices such as grazing, agriculture, residential and hydroelectric development, and are believed to have declined only slightly in area since historic times (Chappell et al. 2001). Commercial timber harvest and road-building have affected these wetlands through direct impacts of vegetation removal and through secondary effects to site hydrology.

4.3.1.2 Riparian and Riparian Wetlands

Riparian zones, including riparian wetlands, currently total about 0.2 percent of province habitats. Table 4.2 shows a reduction of about 39 percent from the historic condition. Riparian habitats have declined in area due to the effects of agriculture, grazing, timber harvest, and development of hydroelectric, irrigation, and flood control projects. Reduction in beaver populations has likely affected riparian habitats. It should be noted that riparian habitats are under-represented in the historic condition mapping due to mapping scale and source data limitations. Decreases in this habitat type may be greater than shown in this analysis.

The Chief Joseph and Grand Coulee dams inundated over 200 miles of the Columbia River, and portions of many significant tributary streams and rivers. Riparian habitat and wetlands were inundated along many of these river and stream reaches. Loss of riparian habitat and wetlands also occurred due to construction of the federal hydropower project at Albeni Falls. The impoundment influences 23 miles of the Pend Oreille River (ISU 2004) and about 3.4 miles of the Clark Fork River (Entz and Maroney 2001); it also increased the area of Lake Pend Oreille by over 10,000 acres (Entz and Maroney 2001). Other hydroelectric projects located in the province also have influenced riparian habitat conditions, including Boundary Dam, Box Canyon Dam, and the Spokane River Project. The function of remaining riparian and wetland habitats is in many cases lower than the historic condition. Timber harvest and grazing have caused changes in the soil structure and vegetation cover of riparian zones; loss of mature trees and reduction in large-diameter standing dead and downed trees are examples of changes to the habitat elements in riparian zones. Roads, agriculture, and other human developments are often located here because of topography or proximity to water. Another influence on wetlands is the regulation of hydrology within river systems. In regulated rivers, the range of variation of flows has often been reduced and altered seasonally, which in turn may affect both the recruitment and persistence of riparian vegetation, particularly cottonwood and willow (Scott et al. 1997, Braatne and Jamieson 2001).

4.3.1.3 Steppe and Shrub-Steppe

Grasslands in the Intermountain Province are estimated to have decreased in area by 19 percent from the historic condition. Grasslands have been modified through both dryland and irrigated agriculture, grazing, urbanization, and construction of dams for hydroelectric power, irrigation, and flood control. Grasslands have also been reduced in

extent due to the suppression of natural wildfire, which controlled many types of trees and shrubs. A U.S. Biological Services study of endangered habitats (Noss et al. 1995) reported that the Palouse grasslands, located mainly south of the Spokane Subbasin, have decreased to less than one percent of the original habitat; over 94 percent of the grasslands have been converted to cropland, hay or pasture.

Both the Chief Joseph and Grand Coulee projects resulted in inundation of steppe habitat; this habitat is reported in combination with shrub-steppe in the project habitat loss assessments.

The quality of remaining grasslands has decreased since the historic period. Grazing and agriculture have resulted in soil condition changes, the introduction of non-native annual grasses and other weeds, and the resultant loss of native bunchgrasses, forbs, and cryptogam crusts. Fire prevention has allowed invasion of shrubs and conversion to shrub-steppe habitats.

Shrub-steppe habitats have decreased in area 22 percent from the historic condition, primarily due to agriculture and grazing, and to a lesser extent to inundation by impoundments. In a study of the central Columbia Basin of Washington, Dobler et al. (1996) determined that about 40 percent of the original shrub-steppe habitat remains. This study included Douglas, Grant, and Lincoln counties, located in the western portion of the Intermountain Province. West (2000) evaluated the disturbance regimes of shrub-steppe habitats and determined that about 11 percent has been converted to agricultural and developed uses and about 25 percent to annual, non-native grasslands.

The Chief Joseph and Grand Coulee FCRPS projects inundated shrub-steppe habitat in the IMP.

The quality of remaining shrub-steppe habitat is severely reduced from the historic condition. Dobler et al. (1996) noted that remaining shrub-steppe in the central Columbia Basin is highly fragmented and reduced in shrub cover, which lowers its values to wildlife. West (2000) determined that no pristine sagebrush steppe habitat remains; over 60 percent is in moderate to highly disturbed condition.

4.3.1.4 Upland Forests and Woodlands

Westside lowland coniferous forest, a western Washington habitat not displayed in the historic condition, shows an increase of 107,576 acres in the current condition (Table 4.2). This mapped habitat represents Douglas-fir, western hemlock, and other species of relatively mesic sites that have regrown on harvested sites (IBIS 2003).

Eastside mixed conifer forest shows a gain of 38 percent from the historic condition (Table 4.2). Forest management and fire suppression have been primary influences on these stands, promoting shade-tolerant species such as white fir and reducing the occurrence of shade intolerant coniferous habitats such as lodgepole pine (Chappell et al. 2001, USFS 2003a). Urbanization and construction of dams for hydroelectric, flood

control, and irrigation have also reduced the acreage of mixed conifer forests. All three of the FCRPS projects in the Intermountain Province inundated mixed conifer forest.

The quality of mixed conifer forest has shifted from a mix of seral stages to a young-seral stage dominated managed habitat. Late and old seral stages were preferentially harvested and once under management, stands are not permitted to reach late stages. Young seral stages have higher stem density, lower diversity and cover of understory species, and fewer large diameter snags and downed wood, all of which provide essential elements of wildlife habitat.

Lodgepole pine forest has decreased an estimated 80 percent from the historic condition (Table 4.2). These forests have been affected by timber harvest, associated roads, fire suppression, and to a limited extent by grazing and construction of dams. Because this habitat generally occurs at elevations above 3,000 feet, it is unlikely that it was directly affected by inundation of any of the federal dams in the province.

Ponderosa pine habitats show a decrease of 66 percent from the historic period. These habitats have been reduced in area by urbanization, grazing, agriculture, timber harvest, and development of hydroelectric, irrigation, and flood control projects. Both the Chief Joseph and Grand Coulee projects inundated significant areas of ponderosa pine.

The quality of ponderosa pine habitats has been influenced by fire suppression, timber management, grazing, and other human activities (Chappell et al. 2001, USFS 2003a). Fire suppression has resulted in denser understory of grasses, shrubs, and understory conifers in contrast to the natural, savannah condition. Because of the resulting fuel buildup, wildfires often consume larger areas with greater intensity and subsequent soil and/or vegetation damage. Grazing selectively reduces the grass component of the understory, promoting shrubs and conifers. Timber management has resulted in the removal of overstory dominants, promoting younger seral stages, and reduction in abundance and diameter of snags and downed wood.

Upland aspen forest shows an increase of almost 19,000 acres in the current condition (Table 4.2). This is likely a function of the difference in mapping scales between the historic and current maps, as this habitat tends to be in isolated small stands that would have been missed at the mapping scale for historic condition. In general, the trend in upland aspen forest is a reduction in area and age-class distribution, due primarily to fire suppression and conifer encroachment (Chappell et al. 2001). Heavy browsing by livestock can also limit regeneration of aspen stands.

Western juniper and mountain mahogany woodlands are absent in the current condition mapping, a complete loss of the habitat type. In the Intermountain Province, the habitat was located primarily in the Lake Rufus Woods and Upper Columbia Subbasins in areas affected by hydroelectric project development, grazing, and agriculture (IBIS 2003).

4.3.1.5 Non-Focal Habitat Types

Alpine and subalpine habitats are generally above the zones of the primary human influences, and are not believed to have changed substantially in area since the historic period (Chappell et al. 2001). However, composition and density of subalpine forest habitats has been affected by current fire suppression.

Urban habitats make up about one percent of the total habitat cover in the current condition. Agriculture, pasture, and mixed development habitats make up 12 percent.

4.3.2 Federal Special Status Plant Species and Habitats

Plant species with special status under the Federal Endangered Species Act (ESA), known or potentially occurring in the Intermountain Province, are shown in Table 4.3. Three species are listed as threatened under the ESA and one species is a candidate for listing.

Slender moonwort (*Botrychium lineare*) has been documented on the Colville National Forest (USFS 1999) and is known from a single historical collection in the Upper Priest Lake area (ICDC 2003).

Water howellia (*Howellia aquatilis*) is known from ponds in Spokane County in Washington and the Palouse River drainage in Latah County in Idaho (in the Columbia Plateau Province adjacent to the IMP) (WNHP 2003, ICDC 2003). A Kootenai County population originally reported from the Spirit Lake area in 1892 (Shelly and Moseley 1988) is presently considered extirpated (ICDC 2003).

Spalding's catchfly (*Silene spaldingii*) has been documented in Lincoln and Spokane counties, Washington (WNHP 2003). This species is endemic to moist grasslands of the Palouse prairie region of Washington and adjacent portions of Oregon and Idaho.

Ute ladies' tresses (*Spiranthes diluvialis*) is a rare orchid that has been documented in Okanogan and Chelan counties in Washington (Moseley 1998; Chelan PUD 2000). These sites are located within the Columbia Cascade Province which is adjacent to, and west of, the IMP. The species has also been documented along the Snake River in eastern Idaho (Moseley 1998).

Table 4.3. Federal special status plant species of the Intermountain Province

Scientific Name Common Name	Federal ESA Status[1]	USFS R1/ R6 / BLM Status[2,3]	WA Status[1]	ID Status[3]	Occurrence in IMP
Botrychium lineare Slender moonwort	Candidate	S / S / Type 1	Threatened	Historical occurrence	Documented Idaho / Washington
Howellia aquatilis Water howellia	Threatened	/ S /	Threatened	Critically imperiled	Documented Idaho / Washington
Silene spaldingii Spalding's silene	Threatened	/ S / Type 1	Threatened	Critically imperiled	Documented Washington
Spiranthes diluvialis Ute ladies' tresses	Threatened	/ S / Type 1	Endangered	Critically imperiled	Documented west of IMP in Washington

[1] WNHP 2003
[2] USFS 1999
[3] ICDC 2003

Definitions:

Federal ESA Status:

Endangered – Species in danger of extinction throughout all or a significant portion of its range; protected under ESA.

Threatened – Species likely to become endangered within the foreseeable future throughout all or a significant portion of its range; protected under ESA.

Candidate – Species considered for possible addition to the list of endangered and threatened species.

Species of concern – Species for which the FWS does not have sufficient information to support a listing proposal at this time.

USFS Regions 1 and 6

Sensitive - Taxa identified by the Regional Forester for which viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

USDI
Bureau of Land Management

Type 1 - Threatened, Endangered, Proposed, and Candidate species under Federal ESA.

Idaho State Status

Historical - Historical occurrence (formerly part of the native biota with the implied expectation that it might be rediscovered.)

Critically imperiled - Critically imperiled because of extreme rarity or because some factor of its biology makes it especially vulnerable to extinction (typically 5 or fewer occurrences).

Washington State Status:

Endangered – Any taxon in danger of becoming extinct or extirpated from Washington within the foreseeable future if factors contributing to its decline continue.

Threatened – Any taxon likely to become endangered in Washington within the foreseeable future if factors contributing to its population decline or habitat degradation continue.

A large number of other plant species are designated as threatened, endangered, or sensitive in Idaho and Washington, or as sensitive by the U.S. Forest Service. These species are not addressed in this assessment. However, site-specific actions under the Intermountain Province Management Plan will address special status species occurrence

in accordance with state law and U.S. Forest Service policy on National Forest System lands.

Washington State Priority Habitats occurring in the Intermountain Province include steppe, shrub-steppe, old-growth and mature forests, aspen stands, freshwater wetlands and fresh deepwater, riparian, caves, cliffs, talus, snags, and logs. Several of these latter habitats are fine scale features, occurring within broader habitat types on the landscape (referred to as habitat elements by Johnson and O'Neil 2001). Rural natural open space is also a Washington State priority habitat occurring in the province (WDFW 2003b).

4.3.3 Factors Limiting Current Focal Habitats

The factors currently limiting wildlife-habitat types in the Intermountain Province can all be linked to human activities: direct effects of land uses on habitats and indirect effects of land uses that promote other human activities and/or alter natural disturbance processes. Habitats have been modified in structure by grazing and timber harvest, converted to other habitat types by agriculture and other development, and have been altered through modification of natural disturbance events such as flooding and fire.

The Homesteading Act of 1862 brought a rush of settlers to the Columbia Basin (Dobler et al. 1996). By 1900 the acreage of dry land wheat under cultivation had reached its maximum level, where it remains today. Grazing was a natural corollary of homesteading and cropping, and expanded quickly throughout the west. Timber management and urbanization occurred at a slower pace initially, but accelerated during the latter part of the twentieth century. Development of water resource projects for power, irrigation, and flood control began in earnest in the Intermountain Province in the mid-twentieth century, with construction of Grand Coulee, Albeni Falls, and Chief Joseph dams.

4.3.3.1 Changes in Land Use Practices

Four major anthropogenic activities currently shape the IMP: agriculture, timber management, water use, and urbanization. Other secondary areas include: mining, fire suppression, introduction of exotic species, and use of chemicals and pesticides.

Agriculture and Grazing

Dry land and irrigated agriculture resulted in conversion of large areas of grassland, shrub-steppe, and ponderosa pine habitats to vegetative monocultures. Frequent tillage and pesticide application may have affected fertility of soils and survival of sensitive wildlife (Edge 2001). Grazing influenced these same habitat types.

Timber Harvest

Timber harvest affected ponderosa pine, mixed conifer, lodgepole pine, upland aspen, and montane mixed conifer forests throughout the IMP. Conversion of one type of forested habitat to another has occurred, but the largest effects have been on species composition and stand structure. Except in quaking aspen woodlands, younger seral stages, with less structural diversity and fewer wildlife habitat elements, make up a greater proportion of the forested landscape than under the historic condition (Chappell et al. 2001, USFS 2003a).

Water Resource Projects

Construction of dams for hydropower, flood control, and irrigation has caused direct loss of wildlife habitats. Operation of these projects also affects wildlife habitat through reservoir fluctuations and altered flow regimes in rivers up- and downstream of the dams. Salmon, which provided a substantial nutrient source for a wide variety of wildlife species, were blocked from the Intermountain Province by Grand Coulee and Chief Joseph dams. In addition to the three FCRPS projects, Albeni Falls, Grand Coulee, and Chief Joseph, hydroelectric projects within the province include: Meyers Falls on the Colville River, Boundary and Box Canyon on the Pend Oreille River, five dams associated with the Spokane River Project on the Spokane River, and the Upriver and Little Falls projects on the Spokane River. Waneta and Sevenmile projects are located on the lower Pend Oreille River in Canada. Water control structures without hydroelectric generation facilities include the Priest Lake outlet dam.

Marine-derived nutrients and organic matter from Pacific salmon are known to make large contributions to riparian vegetation (Ben-David et al. 1998; Helfield and Naiman 2001; Bartz 2002). The proportion of salmon-derived nitrogen in riparian plants varies by species and by distances up to 200 feet from the channel, but it can be as much as 33 percent of the plant total. In Alaska, Sitka spruce basal area and stem density were greater where salmon are present, and trees grew to large size at a rate three times faster (Helfield and Naiman 2001, Bartz 2002).

Indirect effects on wildlife habitats of hydroelectric project development include the increased pressure on big game and other terrestrial wildlife by subsistence and sport hunters, in the absence of a salmon resource. The availability of water for irrigation and cheap power accelerated the rate of conversion of upland native habitats to irrigated agriculture. With the salmon resource blocked by the dams, other occupations were sought. Development of the timber management and irrigated agriculture industries may have been intensified by the need for income-generating work by displaced salmon fishers. The hydropower projects also supported the expansion of a reservoir-based recreation industry.

The effects of the FCRPS on wildlife habitats and the status of the wildlife mitigation effort are described in Sections 4.4 Historic Wildlife and 4.5 Current Wildlife, below. Refer also to the individual subbasin terrestrial assessments.

Urbanization

The center of urbanization in the Intermountain Province is the Spokane Valley. The cities of Spokane, Spokane Valley, Post Falls, and Coeur d' Alene and surrounding environs comprise the largest population center in the province. Smaller urban areas are scattered throughout the province and include Coulee Dam, Republic, Colville, and Newport, Washington, and Sand Point, Priest River, and Kellogg, Idaho.

Wildlife habitat can be lost, degraded, or fragmented by development, and human presence can create or increase animal harassment (Ferguson et al. 2001).

4.3.3.2 Changes in Natural Disturbance Regimes

Changes in human land use, activities, and population densities resulted in other direct and indirect effects on wildlife habitats (Chappell et al. 2001). Many of the human actions served to modify the rates and effects of naturally-occurring disturbance events.

Wind

Forest stand susceptibility to windthrow has been altered from historic times through management of timber stands and fire suppression. Timber harvest can alter localized wind patterns or open up dense forests where individual trees have not needed to be wind firm, leading to increased windthrow of remaining stands. Localized windfall of overmature trees is an expected component in late and old successional stands; younger seral stages are often more homogeneous, lacking canopy openings that can be wind-created.

Debris Slides

Above the timberline, human activity has had little effect on rates of land and snowslides. Timber lands and road construction on moderate to steep slopes has led, in some instances, to increased rates of slope failure. Fluctuating reservoir water levels frequently result in localized areas of shoreline instability and water turbidity.

Forest Insects and Disease

Little is known about historic insect and disease rates. It is believed that current infestations are often promoted by stand conditions that have been created by fire suppression and timber management activities.

Wildfire

Until recently, modern fire suppression reduced the frequency and extent of wildfires. Human activities have caused more wildfire ignitions during extreme burning weather, and/or prioritized suppression efforts toward society's capital investments rather than wild habitats.

Invasive Species

The range and frequency of human travel since Europeans settled the province has allowed accidental or purposeful introduction of non-native plants and animals. Foreign plants such as cheatgrass and spotted knapweed have harmed native vegetation by changing plant community composition, abundance, structure, and succession (Moseley et al. 1999, Sheley et al. 1999). Foreign animals such as European starling or domestic cat have threatened indigenous fauna by predation, nest competition, transmission of disease or parasites, hybridization, and competition for food or space (Witmer and Lewis 2001).

4.3.3.3 Land Ownership and GAP Analysis

Figure 4.3 and Table 4.4 show the distribution of wildlife-habitat types within land ownership categories in the Intermountain Province. Privately-owned lands comprise about 46 percent of lands in the province. Federal lands make up the second-largest category, with 33 percent of lands. Tribal lands comprise 12 percent and state lands 7

percent of the province. Note that privately-owned lands within tribal reservation boundaries are not depicted on this map.

Figure 4.4 shows the GAP management-protection status for lands in the Intermountain Province. Table 4.5 presents acres of wildlife-habitat types by GAP management-protection status. The majority of the province (58 percent) is in the “no or unknown” protection status category, representing primarily privately-owned lands with no specific habitat protections. Low protection status lands comprise another 39 percent, reflecting primarily the multiple use mandate of the U.S. Forest Service on National Forest System lands, allowing both resource extraction and wildlife habitat protection. This designation includes U.S. Forest Service Roadless Areas. Only one percent of province lands are protected at a medium protection status, and less than one percent is managed under the high protection status, which includes Wilderness Areas. It should be noted that this data is derived from relatively coarse-scale information; additional habitat protections may exist that are not reflected here.

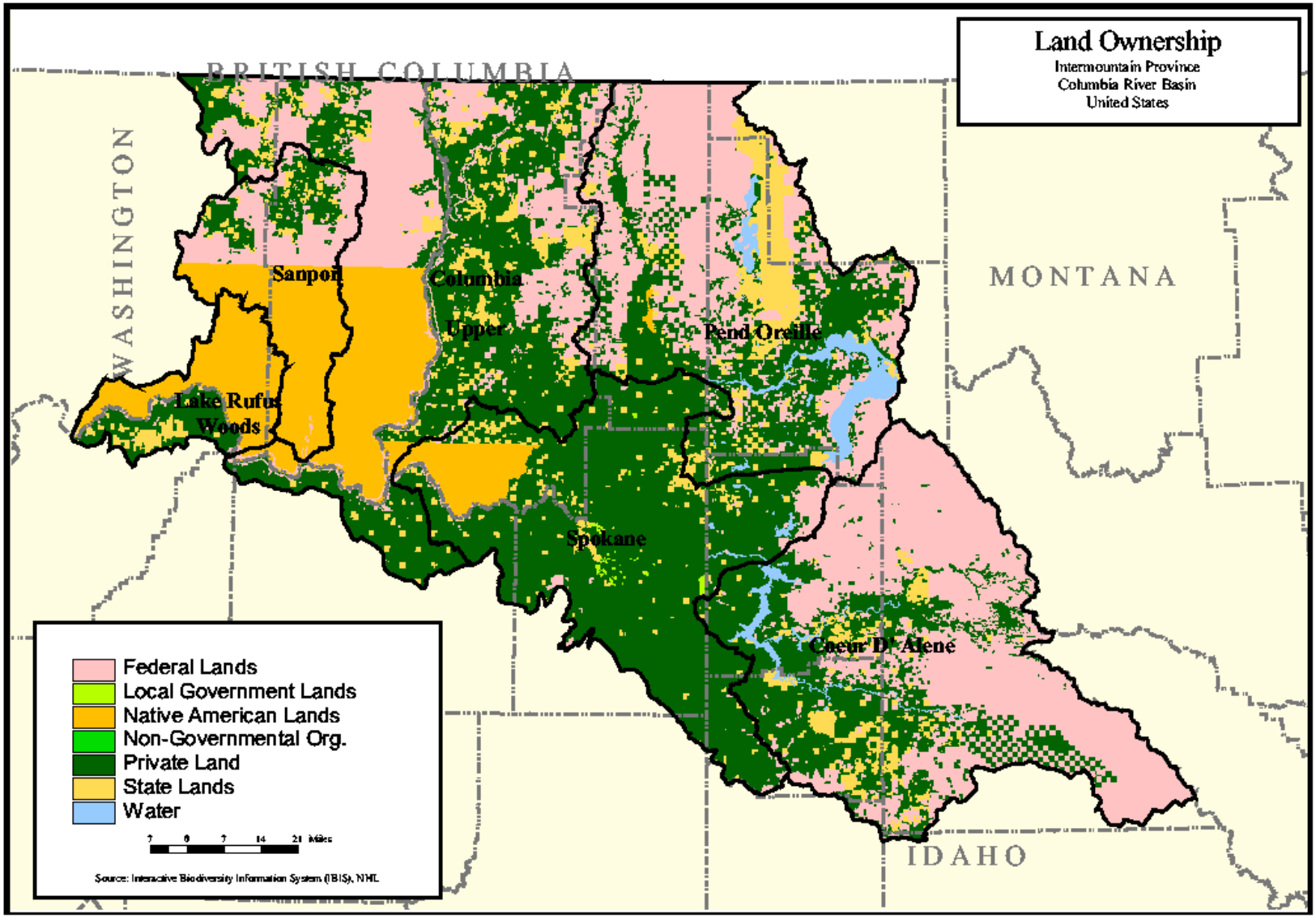

Figure 4.3. Land ownership

Figure 4.3

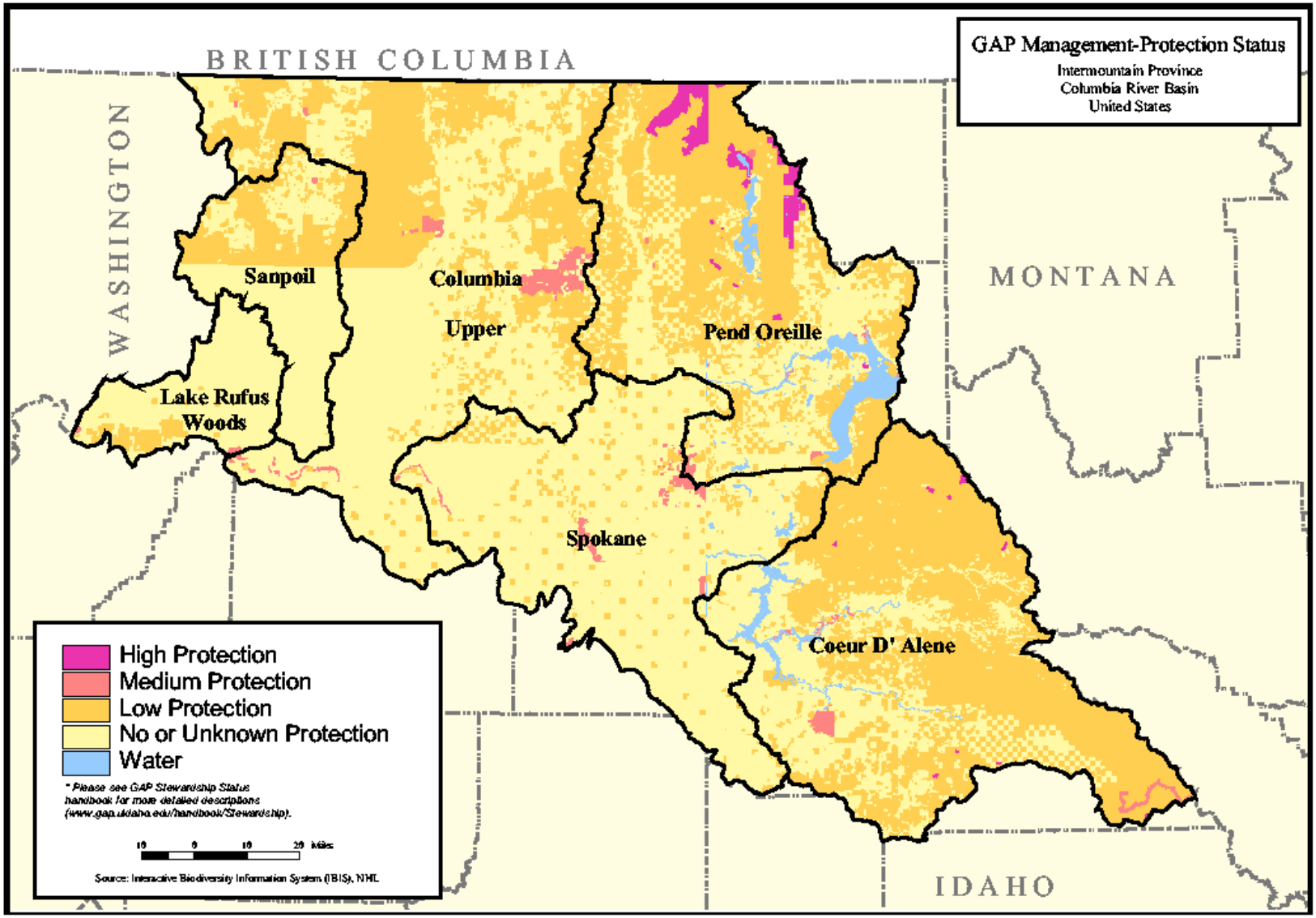

Figure 4.4. GAP Management-protection status

Figure 4.4

Table 4.4. Land ownership in the Intermountain Province by wildlife-habitat type

Wildlife-Habitat Type (acres)	Federal Lands	Native American Lands	State Lands	Local Government Lands	Non-Governmental Organization Lands	Private Lands	Water	Total
Wetlands								
Lakes, Rivers, Ponds, and Reservoirs	11,997	42,854	7,691	172	0	109,940	159,888	332,542
Herbaceous Wetlands	653	626	392	0	0	9,075	134	10,879
Montane Coniferous Wetlands	9,132	15,693	2,824	327	0	86,092	3	114,069
Riparian and Riparian Wetlands								
Interior Riparian Wetlands	9,681	3,594	1,682	0	0	14,078	249	29,283
Steppe and Shrub-Steppe								
Interior Grasslands	136,724	141,201	43,182	136	0	441,305	0	762,548
Shrub-steppe	12,310	212,783	28,304	116	0	243,579	0	497,092
Upland Forest								
Mesic Lowland Conifer-Hardwood Forest	63,091	0	14,542	0	0	29,825	0	107,458
Montane Mixed Conifer Forest	249,323	5,998	41,847	0	0	42,645	0	339,812
Interior Mixed Conifer Forest	2,547,212	418,659	443,728	931	112	1,659,714	0	5,070,355
Lodgepole Pine Forest and Woodlands	114,579	5,443	13,126	1	2	38,936	0	172,086
Ponderosa Pine Forest and Woodlands	96,255	283,961	63,574	2,626	0	696,602	0	1,143,019
Upland Aspen Forest	14,794	7,936	1,733	1	0	26,941	0	51,405
Alpine and Subalpine								
Subalpine Parkland	11,808	23	3	0	0	1,046	0	12,880
Alpine Grasslands and Shrublands	50,133	335	15,761	0	0	20,404	0	86,633
Developed								
Agriculture, Pasture, and Mixed Environs	13,894	68,182	25,303	916	0	1,093,954	0	1,202,250
Urban and Mixed Environs	1,143	250	1,602	1,167	0	90,693	0	94,855
Total Acres	**3,342,729**	**1,207,536**	**705,294**	**6,394**	**113**	**4,604,827**	**160,274**	**10,027,168**

(*Source*: IBIS 2003)

Table 4.5. GAP status of lands in the Intermountain Province by wildlife-habitat type

	GAP Status Class					
Wildlife-Habitat Type (acres)	**High Protection**	**Medium Protection**	**Low Protection**	**No Protection**	**Water**	**Total**
Wetlands						
Lakes, Rivers, Ponds, and Reservoirs	486	5,088	8,911	154,117	166,949	335,551
Herbaceous Wetlands	23	81	1,025	9,621	140	10,890
Montane Coniferous Wetlands	39	961	12,539	100,406	21	113,966
Riparian and Riparian Wetlands						
Interior Riparian Wetlands	132	439	10,805	17,617	304	29,297
Steppe and Shrub-Steppe						
Interior Grasslands	243	3,877	174,769	583,856	0	762,745
Shrub-steppe	0	7,133	29,719	460,320	0	497,172
Upland Forest						
Mesic Lowland Conifer-Hardwood Forest	728	1,882	75,106	29,826	0	107,542
Montane Mixed Conifer Forest	34,834	403	255,211	49,301	0	339,750
Interior Mixed Conifer Forest	36,059	68,946	2,881,909	2,080,915	0	5,067,829
Lodgepole Pine Forest and Woodlands	1,700	458	125,487	44,355	1	172,002
Ponderosa Pine Forest and Woodlands	142	16,774	149,086	977,054	0	1,143,055
Upland Aspen Forest	80	157	16,447	34,688	0	51,371
Alpine and Subalpine						
Subalpine Parkland	134	61	11,620	1,066	0	12,882
Alpine Grasslands and Shrublands	9,734	157	55,776	21,009	0	86,675
Developed						
Agriculture, Pasture, and Mixed Environs	0	4,547	62,617	1,134,461	0	1,201,625
Urban and Mixed Environs	0	848	2,442	91,528	0	94,818
Total Acres	**84,333**	**111,812**	**3,873,469**	**5,790,141**	**167,413**	**10,027,170**

(*Source*: 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.

4.4 Historic Wildlife

Habitat mapping of the historic condition (Figure 4.1) provides an estimate of habitat occurrence and distribution across the Intermountain Province, and from habitat presence, wildlife species occurrence can be inferred. The historical population sizes of the various wildlife species are much more difficult to estimate with any degree of accuracy. For the purposes of this assessment, it is assumed that historical wildlife populations were at relative equilibrium with their environment, which at that time included some anthropogenic influences. Due to a lack of available data on historical population sizes on most of the 400 plus wildlife species that occurred in the province, this section focuses on species that have been extirpated from the province since the c. 1850 historic reference period. Information on population trends for priority wildlife species, including species at risk of extirpation and those reintroduced to the province, is provided in Section 4.5 Current Wildlife.

4.4.1 Extirpated Species

4.4.1.1 Bison

Bison (*Bos bison*) are believed to have been present historically in Idaho and eastern Washington based on archaeological and historic evidence (Iten et al. 2001). Although records indicate that bison were widespread in Idaho, Oregon, and Nevada, they are not believed to have been abundant. Records indicate a limited number of occurrences at sites within the Intermountain Province. Bison were extirpated from Oregon and Washington prior to the time of construction of the FCRPS projects. Private game ranching has increased the numbers of bison in recent years, but reintroduction to the wild has not occurred in Idaho or Washington.

4.4.1.2 Pronghorn Antelope

The pronghorn antelope (*Antilocapra americana*) was extirpated in Washington prior to most European settlement, although archeological and ethnographic records substantiate their sparse existence up to the early 1800s (Iten et al. 2001). Fencing, habitat loss, competition with domestic livestock, unregulated hunting, climate change, introduced disease, and an influx of predators are thought to have contributed to the decline. Beginning in 1938, re-introductions were attempted but none survived to self-sustaining levels and all have disappeared now.

4.4.1.3 Trumpeter Swan

Trumpeter swans (*Cygnus buccinator*) were once abundant and widespread in North America, breeding from Alaska south to Oregon and eastward. Commercial trade, sport hunting, and habitat destruction reduced their numbers to near extinction by 1920, and fewer than 70 swans were known to exist worldwide by 1932. As populations neared extinction, the species' traditional migration patterns and knowledge of important winter and spring habitats were lost to the gene pool, and have not yet been re-learned. In Washington, no nesting was confirmed until 1967-1969, and these successful instances were from birds introduced at Turnbull National Wildlife Refuge in Spokane County in 1963 (Johnson and O'Neil 2001).. In British Columbia, relative few pairs are currently known to breed, and only in the northern portion. Current limiting factors are illegal shooting, collisions with utility lines, predators, lead poisoning, human disturbance during breeding, and degradation or loss of wetland habitat (USFWS 2003a, Testy 1993).

4.4.1.4 Yellow-Billed Cuckoo

Based on historic accounts, yellow-billed cuckoo (*Coccyzus americanus)* was common very locally in Washington, generally uncommon and local in scattered drainages of the arid and semiarid portions of Idaho (for example, Coeur d' Alene in 1895), and probably uncommon and very local in British Columbia (USFWS 2000a; Laymon 2000). In Washington, the last confirmed breeding records of this neotropical migrant bird were in the 1930s, and the species may now be extirpated from the state. In Idaho, this bird is a rare breeder, mostly in the southern portion. In British Columbia, the species disappeared in the 1920s. Loss and degradation of deciduous riparian habitats in the western United States appears to be a primary factor in these declines. Overgrazing, displacement of favorable vegetation by alien plants, river water management, logging, and pesticides are the primary causes.

4.5 Current Wildlife

There are approximately 413 terrestrial vertebrate wildlife species that are known or suspected to occur within the IMP and 90 percent of them reproduce there (Table 4.6). Migratory birds with documented occurrence but less than 5 documented breeding records in the state comprise the remaining 10 percent.

Table 4.6. Number of wildlife species in the Intermountain Province

	Idaho		Washington		Province Total	
	Occur	Breed	Occur	Breed	Occur	Breed
Amphibians	13	13	14	14	17	17
Birds	273	224	273	223	276	233
Mammals	89	89	101	100	101	101
Reptiles	16	16	18	18	18	18
Total	391	342	406	355	412	369

(*Source*: IBIS 2003)

Of the 413 species that occur, 118 were selected as focal wildlife species for the Intermountain Province because they meet one or more of the following criteria:

- Federally-listed or candidate for listing as endangered or threatened;
- State classified as endangered or threatened;
- Habitat Evaluation Procedures (HEP) analysis species that lost habitat from FCRPS projects in the Intermountain Province;
- Important game, economic, subsistence, or cultural species;
- Ecological indicator or functional specialist species.

Focal wildlife species are defined as target species for efficiently guiding the management and monitoring the health of environments, habitats, and landscape elements in an entire ecological community (IBIS 2003). Appendix C provides a list of the 118 focal wildlife species for the Intermountain Province. These species were used in the province-level IBIS analysis of terrestrial resources. Species used in the HEP analyses of

the Albeni Falls, Grand Coulee, and Chief Joseph projects are discussed in more detail in Section 4.5.2.

4.5.1 Focal Species by Habitat Type

Johnson and O'Neil (2001) provide information on the degree to which a wildlife species is tied to a specific habitat type. Three degrees of association between wildlife and habitats are identified: closely associated, generally associated, and present. A "closely associated" species is widely known to depend on a habitat for part or all of its life history requirements. A "generally associated" species exhibits a high degree of adaptability and may be supported by a number of habitats. A "present" species demonstrates occasional use of a habitat. Close ties to one or more focal habitats show a strong dependence on the habitat for species persistence. Table 4.7 summarizes the focal habitats to which the 118 focal wildlife species of the Intermountain Province are closely related. Refer to Appendix D for a listing of focal wildlife species closely and generally associated with focal habitats.

Table 4.7. Focal wildlife species closely associated with focal habitats (breeding)

Habitat	Amphib.	Bird	Mammal	Reptile	Total
Cliff/Rock Outcrop	0	2	0	0	2
Wetland	7	17	7	0	31
Lake, river, pond, and reservoir	7	7	4	0	18
Herbaceous	6	11	4	0	21
Montane coniferous	4	0	2	0	6
Riparian – Eastside (Interior)	5	15	10	0	30
Steppe/Shrub-Steppe	0	13	6	0	19
Westside grassland	0	3	0	0	3
Eastside (interior) grassland	0	9	4	0	13
Shrub-steppe	0	10	5	0	15
Upland Forest	0	15	9	0	24
Western juniper/Mtn. mahogany	0	1	1	0	2
Westside lowland conifer-hardwood	0	7	4	0	11
Montane mixed conifer	0	2	5	0	7
Eastside (interior) mixed conifer	0	7	8	0	15
Lodgepole pine	0	4	3	0	7
Ponderosa pine	0	7	1	0	8
Upland aspen	0	0	0	0	0
Total Focal Species	7	69	39	3	118

(*Source*: Adapted from Johnson and O'Neil 2001)

Wetlands are essential breeding habitat to 31 focal wildlife species, and supportive during breeding to another 29 focal wildlife (Appendix D). Three of the 31 species – northern leopard frog, American white pelican, and sandhill crane – are state classified as endangered or threatened. Five of the 31 species – Canada goose, mallard, redhead, mink, and muskrat – are Habitat Evaluation Procedures (HEP) species for existing FCRPS projects in the Intermountain Province.

Riparian habitats are essential for breeding to 30 focal wildlife species, and supportive during breeding to another 39 focal wildlife (Appendix D). Two of the 30 – northern leopard frog, and pygmy nuthatch – are state classified as threatened or endangered. Nine

of the 30 are HEP species evaluated in existing FCRPS projects of the Intermountain Province. Those HEP species are: mallard, mourning dove, ring-necked pheasant, ruffed grouse, spotted sandpiper, yellow warbler, mink, muskrat, and white-tailed deer.

Grasslands are essential breeding habitat to 14 focal wildlife species, and supportive during breeding to another 27 focal wildlife (Appendix D). Four of the 14 – ferruginous hawk, sage grouse, sharp-tailed grouse, and upland sandpiper – are state classified as threatened or endangered. Three of the 14 – sage grouse, sharp-tailed grouse, and ring-necked pheasant – are HEP species evaluated in existing FCRPS projects of the Intermountain Province.

Shrub-steppe habitats are essential for breeding to 15 focal wildlife species, and supportive during breeding to another 28 focal wildlife (Appendix D). Three of the 15 – ferruginous hawk, sage grouse, and sharp-tailed grouse – are state classified as threatened or endangered. Two of the 15 – sage grouse and sharp-tailed grouse – are HEP species evaluated in existing FCRPS projects of the Intermountain Province.

Upland forests are essential breeding habitats to 24 focal wildlife species, and supportive during breeding to another 51 focal wildlife (Appendix D). None of the 24 are HEP species evaluated in existing FCRPS projects of the Intermountain Province.

Cliff or rock outcrop habitats are essential for breeding to two focal wildlife species: golden eagle and peregrine falcon (Appendix D). The peregrine falcon is classified as endangered by the State of Idaho. Another 22 focal wildlife are supported during breeding by these habitats. Neither of the two essential habitat species was evaluated as a HEP species at existing FCRPS projects of the Intermountain Province.

4.5.2 Key Wildlife Species of the Intermountain Province

Key wildlife species for the Intermountain Province were selected as a subset of the province-wide focal species. Key species include federally-listed species, Washington and Idaho state-listed species, HEP species, and priority species identified by each Subbasin. The following Sections present information about key wildlife species and describe the links between the key species, focal habitats of the province, and effects of the federal hydropower system. Listed species of wildlife are described in terms of population status and distribution across the province; limiting factors and management direction are summarized at the province level. HEP and other priority wildlife species vary from Subbasin to Subbasin, dependent upon the particular HEP evaluation relating to the Subbasin and other management and stakeholder priorities. Occurrence data, where available, for these species is presented in the Subbasin chapters.

4.5.2.1 Federally-Listed Wildlife Species

Two terrestrial vertebrate species possibly occurring in the province are listed as endangered under the Federal Endangered Species Act (ESA); four species are listed as threatened (Table 4.8).

Table 4.8. Federally threatened and endangered wildlife species of the Intermountain Province

Common Name	Scientific Name	ESA Status
Bald eagle	*Haliaeetus leucocephalus*	Threatened
Canada lynx	*Lynx canadensis*	Threatened
Gray wolf	*Canis lupus*	Threatened
Grizzly bear	*Ursus arctos*	Threatened
Woodland caribou	*Rangifer tarandus*	Endangered
Pygmy rabbit	*Brachylagus idahoensis*	Endangered

(*Source*: USFWS 2003b, WDFW 2003b, IDFG 2003)

Bald Eagle

Population Status and Trend

The bald eagle is federally-listed as threatened and state classified as endangered in Idaho and threatened in Washington. It can be found in all forested parts of Idaho and Washington throughout the year. In the dry shrub-steppe habitat of Washington's Columbia Basin, nesting rarely occurs away from large rivers with large trees (Stinson et al. 2001). Seventy percent of the bald eagle tree nests located near rivers in Washington are within 600 feet of the shoreline. During winter, reservoirs and major tributaries of the Columbia River in eastern Washington become significant bald eagle habitats where birds hunt waterfowl and night-roost in groups of three or more birds. Because the bald eagle hunts fish and waterfowl at water bodies and nests, roosts, or perches in nearby large trees, it is generally associated with riparian and upland forests.

Historical populations along the Columbia River in eastern Washington are estimated to have included approximately 86 nests, based on an average of 0.10 nests per river mile (Stinson et al. 2001). The current population includes about 70 nests. Populations within the state are recovering and have exceeded most target levels established by the Pacific States Bald Eagle Recovery Plan (USFWS 1986; Stinson et al. 2001). On Lake Roosevelt, the number of nesting territories increased from two in 1988 to 24 in 2000, and productivity during 1994-2000 averaged 1.69 young per occupied territory (Murphy 2000). The bald eagle is present in all Subbasins of the Intermountain Province; Subbasin-specific information is presented in the following Sections.

Nest sites in Washington are state-protected under the Bald Eagle Protection Rule (WAC 232-12-292) and WDFW management guidelines. Current management is directed toward preparation of bald eagle management plans when land use activities are proposed at or adjacent to nesting territories or communal roosts (Watson and Rodrick 2002).

The bald eagle provides two key ecological functions: it controls terrestrial vertebrate populations through predation or displacement, and is a primary creator of aerial structures possibly used by other organisms (Johnson and O'Neil 2001).

The bald eagle has a strong and consistent relationship (*i.e.* direct consumer at specific stages in its life history or at specific seasons) with the smolt/immature/adult, spawning, or carcass stages of salmonid life history. Grand Coulee and Chief Joseph dams blocked access to over 550 miles of the Columbia watershed for salmon spawning (Creveling and

Renfrow 1986, Kuehn and Berger 1992). The Albeni Falls hydropower project caused the loss of 4,508 HUs as bald eagle breeding habitat and 4,365 HUs wintering habitat, of which at least 301 HUs (7 percent) and 314 HUs (7 percent), respectively, have since been replaced (Martin et al. 1988, BPA 2002). Although hatcheries produce fish for human harvest, they generally have not replaced the carcasses that once provided food for eagles. Species benefiting from mitigation for bald eagle are numerous and include white pelican, Columbia River Tiger beetle, gulls, terns, shorebirds, mallards, and common loon (CCT 2004a).

Limiting Factors

The greatest threats to nesting or wintering bald eagles are human activities that (1) permanently alter habitat (for example, loss of nest trees, roost trees, perch trees, or screening buffers, especially if long-term replacement is not planned), (2) disturb eagles to the point of reproductive failure or reduced vigor (for example, discernible human noise or presence), and (3) introduce chemical or elemental contaminants. Because private lands near shorelines are prized for residential development, it is potentially troublesome that approximately two-thirds of Washington's bald eagle nesting territories are located on private land.

Canada Lynx

Population Status and Trend

The Canada lynx is a federal and state of Washington threatened species. There is little historical information about its numbers in Washington, but the species may have been more abundant in the late 1800s and declined after the turn of the century (Elton and Nicholson 1942). Trapping and other modern data identify the lynx as occurring in Ferry, Pend Oreille, and Stevens counties (Stinson 2001). The lynx is also present in Idaho's Kootenai and Benewah counties (IDFG 2001). The Canada lynx is closely associated with high elevation forests, especially those dominated by lodgepole pine, subalpine fir, or Engelmann spruce. The lynx's key ecological function is consumer (predator) of herbivorous vertebrates, primarily snowshoe hare.

The Pend Oreille, San Poil, and Upper Columbia Subbasins overlap at least one of the six Lynx Management Zones (LMZs) or subsequent Lynx Analysis Units established by the Washington Department of Fish and Wildlife (Stinson 2001). Even though LMZs do not encompass all areas potentially used by lynx, habitat management within these zones is expected to hold the greatest promise for supporting lynx populations. The state of Washington's recovery strategy is to (1) survey and monitor for lynx, (2) manage habitat to improve conditions for lynx over time, (3) protect lynx by minimizing human-caused mortality, (4) undertake research to improve lynx recovery, (5) maintain a lynx data and information system, (6) develop public information and education materials and programs, and (7) coordinate/cooperate recovery activities with landowners and other public agencies.

Canada lynx habitat was not directly affected by construction of the FCRPS projects in the Intermountain Province. Indirect effects of the projects which have affected high elevation forests include increased timber harvest, road development, and increased hunting and recreation pressure.

Limiting Factors

Lynx are affected by (1) prey availability — especially snowshoe hare — that is influenced by cyclic populations and habitat loss from timber harvest or insect infestation, (2) roading which facilitates other carnivores and humans to reach formerly remote areas during winter, and (3) susceptibility to trapping, especially for kittens and yearlings. Ruggiero et al. (2000) estimate that a density of 0.5 snowshoe hares per hectare (0.2 hares/acre) is minimum for lynx persistence.

Gray Wolf

Population Status and Trend

The gray wolf is federally-listed as threatened, plus state-listed as endangered in Kootenai, Shoshone, Bonner, and Boundary counties of Idaho and all counties of Washington. Elsewhere in Idaho, the state considers the species an experimental non-essential population.

According to Hall and Kelson (1959), the gray wolf historically occurred throughout all of Idaho and the eastern quarter of Washington. Currently, the wolf is reported from all Subbasins within the province (WDFW 2003b, IDFG 2001). The closest known wolf pack, a non-breeding pair named the Marble Mountain pack, is on the central border between Benewah and Shoshone counties of Idaho and away from any IMP Subbasin (Mack and Holyan 2003). The wolf has a general association with riparian, steppe/shrub-steppe, and upland forest habitats.

The federal recovery plan sets a threshold for possible delisting when at least 10 wolf pairs breed in three or more consecutive years in each of three recovery areas: Central Idaho, Northwest Montana, and Greater Yellowstone (USFWS 1987). None of the six Subbasins in the Intermountain Province occur within a wolf recovery area, but the Coeur d' Alene Subbasin does border on the Central Idaho Recovery Area. Idaho is on record as wanting the federal government to remove wolves from the state due to severe impacts upon the human populace (Idaho Legislative Wolf Oversight Committee 2002). In the four listed counties, state efforts at management, control, monitoring, and ESA listing vary by whether the number of central Idaho wolf packs is above or below 15.

This carnivore contributes at least four key ecological functions: (1) consumer or predator of herbivorous vertebrates, (2) controller of terrestrial vertebrate populations through predation or displacement, (3) creator of large burrows used by other wildlife, and (4) creator of feeding opportunities for other carnivores and scavengers. The wolf has a recurrent relationship (routine but occasional direct consumer, often in local areas and providing 5 to 50 percent of diet) with the carcass and fry/fingerling/parr stages of salmonid life history (IBIS 2003).

Gray wolf is not thought to have been directly affected by construction of the federal hydropower system. Indirectly, development and other human land uses related to the source of low cost energy, may have affected the quality of gray wolf habitat in the province.

Limiting Factors

The gray wolf is limited by (1) human-induced mortality from livestock and human development conflicts, hunting, poisoning, or trapping, plus (2) canine parvovirus and distemper, especially among juveniles (USFWS 1987).

Grizzly Bear

Population Status and Trend

The grizzly bear is federally-listed as threatened, plus state classified as threatened in Idaho and endangered in Washington. Its historic range in North America extended from the mid-plains westward to the California coast and included the states of Idaho and Washington. At the time of the Lewis and Clark expedition, grizzlies flourished along rivers and streams (Wright 1909). Currently, the grizzly is known in all Subbasins except Lake Rufus Woods and is generally associated with upland forest habitats.

There are seven federal Grizzly Bear Recovery Plan Zones (USFWS 1993a). Most of the Pend Oreille Subbasin is within the Selkirk Recovery Zone, and it also borders the Cabinet/Yaak Recovery Zone. The Coeur d' Alene Subbasin borders the Bitterroot Recovery Zone. The other Subbasins in the Intermountain Province are outside any recovery zone. Federal recovery efforts in the Selkirk Recovery Zone include (1) population monitoring, (2) coordinated protection enforcement, (3) selective pest control, (4) reduction in human disturbance or habitat loss from timbering, livestock grazing, energy/mineral development, recreation, or land use zoning, and (5) public awareness.

The grizzly provides at least six key ecological functions: (1) consumer or predator of herbivorous vertebrates, (2) consumer of carrion, (3) creator of large burrows used by other wildlife, (4) controller of terrestrial vertebrate populations via predation or displacement, (5) disperser of seeds/fruits via ingestion or caching, and (6) creator of feeding opportunities for other carnivores or scavengers. The bear has a strong and consistent relationship (direct consumer at specific stages in its life history or at specific seasons) with the spawning and carcass stages of salmonid life history (IBIS 2003).

The status of the grizzly bear population in the Intermountain Province at the time of construction of the FCRPS projects is not well known. Grizzlies may have been present in low numbers in portions of the Upper Columbia, Pend Oreille, and Coeur d' Alene Subbasins. Construction of the Grand Coulee Project blocked an estimated 1,140 miles of salmon spawning areas, reaching as far upstream as Metaline Falls (Scholz et al. 1995). The loss of salmon as a food source, as well as the secondary effects of the projects, including increased timber harvest, road development, hunting and recreation, may have affected grizzly bears and their habitats within the province.

Limiting Factors

The primary limiting factors for recovery are accidental or purposeful human-caused mortality, and loss of remaining habitat.

Woodland Caribou

Population Status and Trend

The woodland caribou is listed as endangered by the federal government and states of Idaho and Washington. Prior to 1900, this animal was distributed throughout much of Canada and the northern conterminous United States. The species occurred in Idaho as far south as the Salmon River (Evans 1960). Presently, the last remaining woodland caribou population in the U.S. is restricted to the Selkirk Mountains of northeastern Washington, northern Idaho, and southeastern British Columbia. In 1983, that population dwindled to 26 individuals centered in British Columbia's Stagleap Provincial Park. The Selkirk Mountains woodland caribou subpopulation was augmented in 1996-1998 with 43 caribou from British Columbia placed into Washington and in British Columbia, immediately north of the border (Almack 2001). Since 1996, caribou have occurred in Washington as far south as Molybdenite Mountain. In the Intermountain Province, woodland caribou are found only in the Pend Oreille Subbasin (IDFG 2001; WDFW 2003b). The caribou has a general association with wetland, riparian, and upland forest habitats, especially mature or old trees with abundant lichens.

The woodland caribou provides at least four key ecological functions: (1) consumer of grasses, forbs, and woody leaves, (2) transporter of viable seeds, spores, plants, or animals, (3) disperser of lichens, and (4) fragmenter of woody debris.

Recovery efforts are focused on maintaining two existing woodland caribou herds in the Selkirk Ecosystem, establishing a third herd in Washington, and managing at least 443,000 acres of suitable and potential habitat (USFWS 1993b). Managing human access, educating hunters, enforcing protective laws, and augmenting the population are also planned. Audet and Allen (1996) recommended the following augmentation sites, shown in priority order: Pass Creek, Mankato Mountain, and Upper Sullivan Creek.

Woodland caribou and their habitat were not directly affected by the FCRPS projects within the Intermountain Province. Indirect effects of project development, including increased timber harvest, road construction, hunting and recreation, may have affected caribou habitat.

Limiting Factors

Factors that limit recovery are (1) excessive mortality — particularly for calves during their first few months — due to weather, predation, abandonment, poaching via road access, or accidents, and (2) habitat fragmentation or loss, especially the continued availability of arboreal lichens.

Pygmy Rabbit

Population Status and Trend

This tiniest of North American rabbits is listed as endangered by the federal government and the State of Washington. Paleontological studies suggest the pygmy rabbit disappeared from portions of its former range in the Great Basin over the past 7,000 years due to climatic conditions that affected the sagebrush plant communities it is dependent on. Washington populations are disjunct from the core of the species' range. Modern

records show that the rabbit occurred in five Washington counties: Adams, Benton, Douglas, Grant, and Lincoln (WDFW 1995). Today, the Washington population is confined to one isolated pocket of suitable habitat at Sagebrush Flat in Douglas County, where active burrows have dropped precariously since 1995 (Hays 2001). In Idaho, the species is found in sagebrush areas of the central and southern part of the state (IDFG 2001). The pygmy rabbit is not known to occur at this time in any Subbasin of the Intermountain Province, although the existing population in Douglas County, Washington, is only about 15 miles distant from the Lake Rufus Wood Subbasin. This mammal is uniquely dependent upon dense sagebrush for food and relatively deep, loose soil in which to dig its underground burrow.

The pygmy rabbit furnishes at least four key ecological functions: consumer of fecal material, prey for primary or secondary predators, creator of large burrows used by other wildlife species, and enhancer of soil structure and aeration via digging. Washington management is directed at (1) population surveys and monitoring, (2) captive rearing since 2001, (3) release site evaluation, (4) land acquisition or protection incentives, (5) habitat connectivity, (6) predator control, (7) food supplementation, and (8) genetic enhancement (Hays 2001, WDFW 1995).

Pygmy rabbit was not selected for evaluation of the construction effects of FCRPS project in the Intermountain Province. However, both the Chief Joseph and Grand Coulee projects inundated substantial quantities of shrub-steppe habitat, some of which may have provided potentially suitable habitat for pygmy rabbit (Kuehn and Berger 1992, Creveling and Renfrow 1986). Indirectly, the projects contributed to development and agriculture in the province, resulting in additional conversion of shrub-steppe habitats.

Limiting Factors

The primary limiting factor is the availability of suitable habitat due to agricultural conversion, and to wildfire which has destroyed known rabbit sites. Low numbers, when combined with disconnected and down-sized habitat parcels, make the rabbit extremely vulnerable to environmental and genetic influences that would otherwise be insignificant for long-term survival.

4.5.2.2 Idaho and Washington Threatened and Endangered Species

Fifteen species are classified by the states of Idaho or Washington as endangered or threatened (Table 4.9), including the six federally-listed species.

Table 4.9. State classified threatened and endangered wildlife species of the Intermountain Province

Common Name	Scientific Name	Idaho Status	Washington Status
American white pelican	*Pelecanus erythrorhynchos*	-	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Endangered	Threatened
Canada lynx	*Lynx canadensis*	-	Threatened
Ferruginous hawk	*Buteo regalis*	-	Threatened
Fisher	*Martes pennanti*	-	Endangered
Gray wolf	*Canis lupus*	Endangered	Endangered
Grizzly bear	*Ursus arctos*	Threatened	Endangered

Common Name	Scientific Name	Idaho Status	Washington Status
Northern leopard frog	*Rana pipiens*	-	Endangered
Peregrine falcon	*Falco peregrinus*	Endangered	-
Pygmy rabbit	*Brachylagus idahoensis*	-	Endangered
Sage grouse	*Centrocercus urophasianus*	-	Threatened
Sandhill crane	*Grus canadensis*	-	Endangered
Sharp-tailed grouse	*Tympanuchus phasianellus*	-	Threatened
Upland sandpiper	*Bartramia longicauda*	-	Endangered
Woodland caribou	*Rangifer tarandus*	Endangered	Endangered

(*Source*: IBIS 2003; IDFG 2003; WDFW 2003b)

American White Pelican

Population Status and Trend

The American white pelican is classified as endangered in Washington. Historically, the species occurred and presumably bred at water bodies in eastern Washington such as Sprague Lake and Moses Lake (Dawson and Bowles 1909). In addition, a significant number of non-breeding birds stayed throughout the year. Presently, a single breeding colony exists in the state at the McNary National Wildlife Refuge, downstream of Pasco, Washington (Ackerman 1994, 1997). As many as 2,000 non-breeding pelicans have come to the potholes region of the Columbia Basin (Ackerman 1994, 1997, Doran et al. 1999, Smith et al. 1997). Wintering concentrations of 40 to 300 individuals use the Columbia River from the Walla Walla River confluence to Priest Rapids. Areas within Washington may play an important role in sustaining non-breeding summer residents and birds dispersing from breeding areas in adjacent states and Canada. The species has a close association with lake, river, pond, or reservoir wetlands for breeding or loafing. Pelicans are known to travel 31 to 50 miles between nesting and feeding sites.

For approximately ten years, pelicans have been observed spring through fall at the mouth of the Okanogan River, west of the Lake Rufus Woods Subbasin. Occasional use of Lake Rufus Woods by white pelicans has been observed during this time period (personal communication, R. Fischer, USACE, December 3, 2003).

Doran et al. (1999) include the southern portion of the Spokane and Upper Columbia Subbasins within the species range. However, the only documented record in the Washington Priority Habitats and Species database occurred in June 2000 when 10 foraging individuals were sighted on the Pend Oreille River north of Newport in the Pend Oreille Subbasin (WDFW 2003b). The Washington State GAP Analysis found no evidence of current breeding within the province (Smith et al. 1997). WDFW notes that non-breeding pelicans may be under-represented in the WDFW database; they are fairly common in the Intermountain Province with wide dispersal immediately after breeding season (personal communication, Howard Ferguson, WDFW, April 2, 2004).

The American white pelican has a recurrent relationship (i.e. routine but occasional direct consumer, often in local areas and providing 5 to 50 percent of diet) with the fry/fingerling/parr stages of salmonid life history. The bird performs at least three key ecological functions: (1) consumer or predator of herbivorous fish, (2) creator of

structures possibly used by other organisms, and (3) carrier, transmitter, or reservoir of diseases that affect other wildlife species.

The State of Washington focuses on protecting from disturbance or contaminants all breeding colonies and feeding or loafing areas used by breeding or non-breeding birds.

Limiting Factors.

The main factors limiting breeding and non-breeding success of American white pelican are: (1) habitat destruction, (2) conversion of wetlands and lakes to other purposes (for example, irrigation, hydro-generated electricity, or waterfowl production), and (3) human disturbance at nesting sites (USFWS 1984). Other potential factors are decreased or fluctuating food availability, shooting, mammalian (especially coyote) predation at breeding sites, pesticide contamination via the food chain, and powerline collisions.

Bald eagle

Refer to preceding section on federally-listed species.

Canada lynx

Refer to preceding section on federally-listed species.

Ferruginous hawk

Population Status and Trend

The ferruginous hawk is classified as threatened in Washington. Historically, it is presumed the species was a regular breeder in suitable habitat. Currently, the species is an uncommon breeder and rare winter visitor east of the Cascade Mountains in Washington. No recent sightings of this raptor are known within the Intermountain Province (WDFW 2003b, Smith et al. 1997). The ferruginous hawk is closely associated with steppe/shrub-steppe habitats of uncultivated lands. The bird contributes at least two key ecological functions: primary predator or carnivore of terrestrial invertebrates and herbivorous vertebrates, and creator of aerial structures possibly used by other wildlife species.

The State of Washington's management recommendations include: (1) protection of at least half of all native shrub-steppe habitats within a pair's home range, (2) avoidance of human intrusion during nesting, (3) maintenance of potential nest sites via excluding tree-damaging agents, culturing new trees as recruits, or erecting artificial platforms, and (4) restricted or alternative rodent control in hawk foraging areas (Richardson et al. 1999).

Ferruginous hawk was not used as a HEP evaluation species for loss assessments of the FCRPS projects in the province. However, the Chief Joseph loss assessment (Kuehn and Berger 1992) named sage grouse as an indicator species for sagebrush and rockland dependent wildlife, and the ferruginous hawk was described as a beneficiary of sage grouse Habitat Units to be provided as mitigation for inundating shrub-steppe habitat. The Grand Coulee loss assessment (Creveling and Renfrow 1986) also named sage grouse as a surrogate for sagebrush dependent wildlife. Approximately 554 and 7,432 sage grouse HUs have been replaced to date for Chief Joseph and Grand Coulee, respectively. Indirectly, land converted to agriculture as a result of these two dams presumably affected both prey and habitat for ferruginous hawk.

Limiting Factors

Two primary factors limit the ferruginous hawk. One is loss of uncultivated lands used for nesting and hunting prey — populations are known to decline consistently once cultivated land exceeds 30 percent of the area (Schmutz 1987, 1989). The other factor is human disturbance, even if mild, during nest building and incubation, which causes egg mortality, fewer fledglings, increased sensitivity to disturbance (for example, birds flushing at further distances), and nest site abandonment for years afterward (White and Thurow 1985).

Fisher

Population Status and Trend

The fisher is classified as endangered in Washington and will become a candidate for federal listing in the near future (USFWS 2004). The species historically occurred throughout much of the forested areas in Washington, Idaho, and British Columbia, though it was probably not abundant. In Washington, it is currently very rare and possibly extirpated in the Columbia River and Okanogan eco-regions. One confirmed occurrence at Calispel Peak (Stevens County) in 1994 was from an animal reintroduced in Montana. In Idaho, reintroductions at three north-central sites in the 1960's were successful, and there is now a breeding population in the Clearwater River drainage.

The fisher is known from all Intermountain Province Subbasins except Lake Rufus Woods and San Poil (WDFW 2003b, IDFG 2001). The animal is closely associated with upland forest habitats — especially those with large-diameter conifer or mixed conifer-deciduous trees and snags, high canopy closure, multiple canopies, shrubs, and down logs. It also has a general association with wetland habitats.

The fisher provides several key ecological functions, including: (1) consumer or predator of herbivorous vertebrates and eggs, (2) consumer of carrion, (3) controller of terrestrial vertebrates via predation or displacement, and (4) disperser of viable seeds/fruits through ingestion or caching (Johnson and O'Neil 2001). The fisher has a rare relationship (*i.e.* often less than one percent of diet and during shortage of usual foods) with the carcass stage of salmonid life history (IBIS 2003).

Management for the species has included (1) reintroductions in Idaho and British Columbia, (2) trapping cessation/restriction in Washington and Idaho, and (3) habitat assessment in the Olympic and Cascade mountains of Washington.

Fisher was not evaluated in the HEP loss assessments for FCRPS projects in the province. Upland forest and riparian habitats used by the fisher may have been directly and indirectly affected by development of the federal projects.

Limiting Factors

Limiting factors include incidental trapping, vehicle collisions, shooting, predation, intraspecific fighting, disease, infections, starvation, poisoning, accidents, debilitation from porcupine quills, genetic drift/inbreeding, plus habitat loss/fragmentation caused by

forest management, human development, wildfires, windstorms, and volcanic eruption (Lewis and Stinson 1998).

Gray Wolf
Refer to preceding section on federally-listed species.

Grizzly Bear
Refer to preceding section on federally-listed species.

Northern Leopard Frog
Population Status and Trend

This amphibian is classified as endangered in Washington. It is one of the most widely distributed frogs in North America, and most certainly occurred in Washington, Idaho, and British Columbia. Museum records for Washington since the 1880s show its presence in 18 general areas covering eight counties, of which Pend Oreille County and Spokane County were two (McAllister et al. 1999). Currently, two areas in the Crab Creek drainage of Grant County, (McAllister et al. 1999), and one area of the Pend Oreille River on the Kalispel Indian Reservation in Pend Oreille County (personal communication, R. Entz, Wildlife Biologist, Kalispel Tribe, April 10, 2004), are known to be occupied in the state, but the population size is not known. Populations also exist in the northern portion of Idaho's panhandle. For the Intermountain Province, only the Pend Oreille Subbasin contains the northern leopard frog (IDFG 2001, McAllister et al. 1999). Wetland and riparian habitats are favored, especially where there is an abundance of vegetation to provide cover.

The northern leopard frog performs at least four key ecological functions: (1) consumer of live or decomposing aquatic vegetation, (2) consumer of terrestrial invertebrates or aquatic macroinvertebrates, (3) prey for primary or secondary predators, and (4) transferer of substances for nutrient cycling. Management focus in Washington is to: (1) survey for occupied habitat; (2) research on habitat relationships, pesticide/herbicide/foreign-species effects, decline factors, and genetic variability; (3) control competing bullfrogs and non-native fish, and (4) inform people about management needs.

Leopard frog was not selected for evaluation in the HEP loss assessments of FCRPS projects in the province. Wetland habitats that may have supported the species have been indirectly affected as a result of project development, through increased rates of residential and urban development, agriculture, and timber harvest.

Limiting Factors

Although little is known about limiting factors within Washington, several influences are suspected. They include (1) changed hydrology due to land alteration, irrigation, human occupancy, or drought, (2) introduction of competing or predatory bullfrogs and non-native fish, (3) chemical contaminants such as pesticides (even rotenone), herbicides, and fertilizers, and (4) ultraviolet-B radiation. It is suspected that several factors in combination create weakened vigor for surviving the normal stresses of frog life.

Peregrine Falcon

Population Status and Trend

The peregrine falcon is classified as endangered in Idaho. Historically, this falcon was uncommon in Washington and no nest sites were known east of the Cascade Mountains (Dawson and Bowles 1909). In modern times, populations at the national and state levels increased after the late 1970s because chlorinated hydrocarbon pesticides were banned and other protections were initiated. Their population numbers and distribution are still limited in Washington due to the lingering effects of pesticides and the lack of suitable nesting sites (Hays and Milner 1999). The peregrine is known to occur in Idaho's Kootenai County (IDFG 2001). Within the Intermountain Province, the peregrine has been reported in the Coeur d' Alene, Spokane, and Upper Columbia Subbasins (WDFW 2003b). The falcon is closely associated with cliffs or rock outcrops for nesting, and generally associated with riparian, shrub-steppe, or upland forest habitats for hunting prey.

The peregrine falcon provides at least two key ecological functions: primary consumer/predator of herbivorous vertebrates, and secondary predator. The bird has an indirect relationship (*i.e.* secondary consumer) with the carcass and fry/fingerling/parr stages of salmonid life history (IBIS 2003).

Management in Washington is focused on (1) developing a statewide management plan and individual site management plans for eyries in non-forested settings, (2) avoiding breeding season disturbance at eyries, and (3) supporting alternatives to pesticide use where peregrines are known to breed or hunt (Hayes and Buchanan 2002, Hays and Milner 1999).

Peregrine falcon was not selected as an evaluation species for the FCRPS projects in the Intermountain Province. However, cliff and rock outcrop habitats along the Columbia River and tributaries were inundated by both the Chief Joseph and Grand Coulee projects.

Limiting Factors

Three factors are thought to limit recovery of the peregrine: (1) chemical contamination from banned chlorinated hydrocarbon pesticides that are ingested by migratory prey while those species are in foreign countries, (2) disturbance from humans during peregrine nesting, and (3) availability of suitable nesting sites.

Pygmy Rabbit

Refer to preceding section on federally-listed species.

Sage Grouse

Population Status and Trend

The sage grouse is classified as threatened in the State of Washington. The species historically inhabited the shrub-steppe and meadow steppe of the Columbia Basin in eastern Washington. In modern times, populations of sage grouse declined to only eight percent of the species' former range. At present, there are two isolated sage grouse populations located in Douglas and Yakima counties, and the statewide breeding population is estimated to be 1,017 birds. Within the Intermountain Province, the sage

grouse has been reported from the Upper Columbia Subbasin only. All of the 14 sage grouse WDFW management units for recovery are located outside and south of the province (WDFW 2003b, Stinson et al. 2003). The bird is closely associated with steppe/shrub-steppe habitats.

The sage grouse provides several key ecological functions, including: (1) consumer of plant leaves, flowers, or fruits; (2) predator of terrestrial invertebrates; (3) prey for primary or secondary predators; and (4) carrier, transmitter, or reservoir of diseases that affect other wildlife species.

The State of Washington draft recovery plan focuses on (1) population monitoring and protection, (2) habitat acquisition, protection, and restoration, (3) research, and (4) interagency coordination and partnerships (Stinson et al. 2003).

Construction of the Grand Coulee hydropower project resulted in a loss of 14,000 acres of shrub-steppe vegetation and 2,746 sage grouse Habitat Units (Creveling and Renfrow 986). The Chief Joseph project caused a loss of 1,681 acres of shrub-steppe and 1,179 sage grouse HUs (Kuehn and Berger 1992). To date, replacement of 7,432 HUs and 554 HUs, respectively, has been achieved for sage grouse.

Limiting Factors

Several factors limit sage grouse populations or prevent habitat from being re-occupied. These include the quality of habitat present, the quantity of breeding and wintering habitat, isolation from occupied habitat, and the general health of existing sage grouse populations (Stinson et al. 2003). Predation from birds of prey and carnivorous mammals causes a significant proportion of loss to adult and young birds. An emerging threat may be West Nile virus, which caused a significant number of sage grouse deaths in other western states. Wildfire, conversion of shrub-steppe to cropland or other human development, military training disturbance, livestock grazing, and invasion by exotic plant are specific harmful impacts upon habitat.

Sandhill Crane

Population Status and Trend

This wading bird is state-listed as endangered in Washington. Historical data suggests the sandhill crane formerly bred in wetlands on both sides of the Cascade Mountains (Smith et al. 1997). East of the Cascades, nesting occurred at Columbia National Wildlife Refuge plus Coulee City (Grant County), Fort Colville (Stevens County), Calispell Lake (Pend Oreille County), and Spokane Bridge (Spokane County). Currently, only two nesting areas are known in Washington, and both are far outside of the Intermountain Province. A third breeding area — or a non-nesting summer site — may exist at Adkins Lake in Douglas County. Most sandhill cranes overfly the state on their way from wintering sites in central California to breeding areas in British Columbia. During migration, sandhill cranes have been reported in Lincoln, Okanogan, Pend Oreille, Spokane, and Stevens counties (Littlefield and Ivey 2001). The species is not known to nest in any Subbasin of the province. The sandhill crane is closely associated with wetland habitats.

This bird provides several key ecological functions, including: (1) consumer of aquatic vegetation, seeds, or fruits, (2) predator on terrestrial invertebrates or aquatic macro-invertebrates, (3) disperser of insects, other invertebrates, or vascular plants, and (4) carrier, transmitter, or reservoir of diseases that affect other wildlife and humans.

The State of Washington's recovery plan calls for (1) monitoring populations, (2) inventorying, assessing, and protecting habitat, (3) reducing mortality, (4) reducing disturbance factors, (5) managing breeding territories, staging areas, and wintering areas, (6) maintaining information, (7) informing the public, (8) research to aid recovery, and (9) cooperation with government, private landowners, NGOs, and funding sources.

Sandhill crane was not selected as a HEP evaluation species for FCRPS projects in the Intermountain Province. Indirect effects of project development on wetland habitats used by the species may have occurred through residential and urban development and agriculture.

Limiting Factors

Predation from common raven, mink, raccoon and coyote is the primary cause of egg and chick mortality (Littlefield and Ivey 2001). Collision with utility wires is a major mortality factor, especially for young fledglings and at staging and wintering areas. Loss of habitat from dewatering of wetlands, sprinkler or pivot irrigation instead of meadow flooding, construction of buildings, and conversion to row crops has displaced breeding pairs.

Sharp-tailed Grouse

Population Status and Trend

The sharp-tailed grouse, Columbian subspecies, is state-listed as threatened in Washington. A petition for federal listing was rejected based on the persistence of relatively stable populations in southeastern Idaho, northcentral Utah, and northwestern Colorado. Historically, Columbian sharp-tailed grouse ranged from the Canada border at Oroville south to the Oregon border, west to the eastern Cascades foothills, and east to the Idaho border in Whitman County. They were plentiful in eastern Washington, inhabiting most of the prairies in the Columbia plateau and the stream valleys emptying into the Columbia River. The species uses shrub-steppe, steppe, and meadow steppe habitats for breeding and deciduous shrub communities across eastern Washington (Schroeder and Tirhi 2003).

Populations of sharp-tailed grouse in Washington have declined dramatically over time. Schroeder (2002) reports that the 1970s population was estimated at 5,366 individuals; presently, there are an estimated 618 individuals in Washington. This is a decline of 88.5 percent in little more than twenty years. The range of the species has declined to less than three percent of the historic range, apparently due to loss of quantity and quality of native shrub-steppe habitats (Schroeder 2002).

The remaining Washington population of sharp-tailed grouse is divided between eight small, severely fragmented subpopulations in Douglas, Lincoln, and Okanogan counties (Schroeder 2002). The IMP contains two of the eight Washington subpopulations. The

largest Washington subpopulation is on the Colville Indian Reservation, contains approximately 200 birds, and is not considered to be self-sustaining at this time (personal communication, M. Berger, Wildlife Biologist, Colville Confederated Tribes, October 21, 2003).

Approximately half of the Upper Columbia Subbasin was historic range for the sharp-tailed grouse, but only two subpopulations now exist. A portion of the San Poil Subbasin was historic range, but part of only one subpopulation remains. A small portion of the Lake Rufus Woods Subbasin was historic range, but part of only one subpopulation has survived. All of the Spokane Subbasin, and the southern part of Pend Oreille Subbasin, were historic ranges, but no sharp-tailed grouse remain.

The sharp-tailed grouse contributes many key ecological functions, including: (1) consumer of plant leaves, flowers, seeds, or fruits; (2) predator of terrestrial invertebrates; (3) prey for primary or secondary predators; (4) disperser of plant seeds/fruits through ingestion or caching; and (5) carrier, transmitter, or reservoir of diseases that affect other wildlife species (IBIS 2003).

Washington Department of Fish and Wildlife management emphasizes protection of remaining native shrub-steppe habitats in Douglas, Lincoln, and Okanogan counties. Specific vegetation protection measures are prescribed for lek sites and two km buffers surrounding them, and for deciduous shrub habitats used for wintering. These recommendations also include a number of techniques to protect the quality of native habitats, including controls on grazing, burning, herbicide and insecticide use, noxious weeds, and human disturbance (Schroeder and Tirhi 2003). Sharp-tailed grouse management areas are designated by WDFW in portions of Douglas, Okanogan, Lincoln, Chelan, and Grant counties (Schroeder and Tirhi 2003).

Construction and reservoir inundation for the Grand Coulee Project caused a loss of 32,723 sharp-tailed grouse Habitat Units (HUs), and the Chief Joseph project lost 2,290 HUs (Creveling and Renfrow 1986, Kuehn and Berger 1992). The species was chosen for evaluation in the HEP study due to its use of native shrub-steppe and to represent species including mule deer, yellow warbler, downy woodpecker, northern oriole, burrowing owl, short-eared owl, Washington ground squirrel, upland sandpiper, golden eagle, badger, coyote, and cougar. To date, mitigation for the two projects has resulted in acquisition of lands providing 16,854 sharp-tailed grouse HUs (45 percent) and 14 HUs (less than one percent), respectively.

Limiting Factors

The primary factors affecting sharp-tailed grouse survival are: habitat loss or alteration (conversion to agriculture, conversion to livestock pasture, and overgrazing by livestock), and geographic isolation of small subpopulations (genetic quality and recruitment) (Hays et al. 1998). It is not clear if remaining Washington populations are declining due to isolation or a combination of other factors. Predation from diurnal raptors and nocturnal mammals can cause substantial nesting failures (for example, 37 percent of nests in one study by Bergerud 1988), which is especially significant in small populations. In large

contiguous populations, habitat with good cover for nesting and wintering would allow grouse to increase despite predation.

Upland Sandpiper

Population Status and Trend

The upland sandpiper was classified as an endangered species in Washington in 1982 (WAC 232-12-014). Relatively little is known about its historic status in the state. The species was first reported in 1905, but no further presence was found until 1928. The bird was very local and a rare breeder in eastern Spokane County (Smith et al. 1997). It is not known to have reproduced there since 1993 (Iten et al. 2001). Individual sightings have since been made in the months of August or September, but the dates may indicate migrating birds rather than breeders (WDFW 2003b). However, during 2002 and 2003 birds were observed west of Spokane from the end of May up to the middle of June (personal communication, H. Ferguson, WDFW, April 13, 2004). No breeding was documented. The upland sandpiper may be extirpated in Washington.

Populations of upland sandpiper in Washington and Idaho are considered disjunct and peripheral to the species main range, which covers a broad area but may be restricted to small local areas of suitable habitat. The species is closely associated with steppe/shrub-steppe habitats, especially wet meadows or grasslands (Buchanan 2002). Within the Intermountain Province, this shorebird is documented from only the Spokane Subbasin, as noted above, and the Coeur d' Alene Subbasin in 1993 (IDFG 2003).

The upland sandpiper provides at least four key ecological functions: (1) primary predator of terrestrial invertebrates, (2) prey for wildlife predators, (3) disperser of insects or other invertebrates, and (4) disperser of plant seeds or fruits through ingestion or caching.

Dechant et al. (2001) report that the key to upland sandpiper management is providing grasslands of various heights with few shrubs. The bird requires short vegetation (less than 12 inches tall) for foraging, taller vegetation (4-25 inches) for nesting, and short-to-medium vegetation (less than 6 inches tall) for brood cover. These authors also recommend (1) maintaining contiguous suitable habitat in blocks larger than 245 acres, (2) avoiding burning, mowing, or plowing during the nesting season, (3) providing display perches such as fence posts or rock piles, and (4) preventing encroaching woody vegetation.

Native grassland or meadow habitats that may have provided suitable breeding habitat for upland sandpiper were converted to agricultural crops as an indirect effect of the FCRPS projects.

Limiting Factors

While market hunting likely caused earlier population decline, the biggest current threat to upland sandpiper is habitat loss and alteration. Urban development, conversion of native grasslands to agriculture, uncontrolled livestock grazing, invasion by exotic plants, and pesticide use are modern factors.

Woodland Caribou
Refer to preceding Section on federally-listed species.

4.5.2.3 Habitat Evaluation Procedures (HEP) Wildlife Species for Federal Hydropower Loss Assessments

Eighteen wildlife species were selected to represent wildlife that lost habitat as a result of construction of the Chief Joseph, Grand Coulee, and Albeni Falls federal hydropower projects in the Intermountain Province (Table 4.10). The Habitat Evaluation Procedures (HEP) methodology was used to evaluate the loss of habitat in terms of habitat units (HUs), which incorporate both area and quality of habitat. Losses of two habitat types – riparian forest and riparian shrub – were also evaluated by the HEP for the Grand Coulee Project.

Table 4.10. HEP evaluation species and habitats for federal hydrosystem projects in the Intermountain Province **(Number specifies Habitat Units lost)**

Common Name	Scientific Name	Chief Joseph	Grand Coulee	Albeni Falls
Bald eagle	*Haliaeetus leucocephalus*			4,508 (breeding) 4,365 (wintering)
Black-capped chickadee	*Parus atricapillus*			2,286
Bobcat	*Lynx rufus*	401		
Canada goose	*Branta canadensis*	213	74 (nesting)	4,699
Lewis' woodpecker	*Melanerpes lewis*	286		
Mallard	*Anas platyrhynchos*			5,985
Mink	*Mustela vison*	920		
Mourning dove	*Zenaida macroura*		9,316	
Mule deer	*Odocoileus hemionus*	1,992	27,133	
Muskrat	*Ondatra zibethicus*			1,756
Redhead	*Aythya americana*			3,379
Ring-necked pheasant	*Phasianus colchicus*	239		
Ruffed grouse	*Bonasa umbellus*		16,502	
Sage grouse	*Centrocercus urophasianus*	1,179	2,746	
Sharp-tailed grouse	*Tympanuchus phasianellus Columbianus*	2,290	32,723	
Spotted sandpiper	*Actitis macularia*	1,255		
White-tailed deer	*Odocoileus virginianus ochrourus*		21,632	1,680
Yellow warbler	*Dendroica petechia*	58		
Riparian forest habitat	-		1,632	
Riparian shrub habitat	-		27	
Total		**8,833**	**111,785**	**28,658**

(*Sources*: Kuehn and Berger 1992; Creveling and Renfrow 1986; Martin et al. 1988.)

Bald eagle. Bald eagle was selected for evaluation in the Albeni Falls HEP study (Martin et al. 1988) because of its status as a federally-listed and state threatened species and its association with forested wetlands. Both wintering and breeding season models were evaluated. Bald eagle was selected as an important indicator species for river-edge riparian habitat in the Grand Coulee HEP (Creveling and Renfrow 1986); the HEP analyzed riparian forest habitat rather than a bald eagle habitat suitability model. Refer also to preceding discussion of federally-listed species.

Black-capped chickadee. The black-capped chickadee was selected as an indicator of deciduous forested wetlands with snags and was evaluated in the Albeni Falls HEP study (Martin et al. 1988). The species is common at lower elevation wetlands where hardwood trees occur. Breeding is confirmed within the Pend Oreille, San Poil, Spokane, and Upper Columbia Subbasins, and probably occurs in the other two Subbasins as well (Smith et al. 1997).

Bobcat. Bobcat was selected to represent wildlife species, both predator and prey, that use rock and rockland habitats. Species benefiting from mitigation for bobcat include yellow-bellied marmot, pika, bushy-tailed woodrat, cottontail rabbit, quail, golden eagle, and rattlesnake. An unpublished HEP model was evaluated for the Chief Joseph HEP study (Kuehn and Berger 1992).

Canada goose. Canada goose was selected for the HEP loss assessments for all three of the FCRPS projects in the province. A breeding season model was used to display the effects of loss of emergent wetland habitats for the Albeni Falls Project (Martin et al. 1988). In both the Grand Coulee and Chief Joseph studies, Canada goose was used to represent small riverine islands and/or sandbar habitats that provided secure breeding sites (Creveling and Renfrow 1986, Kuehn and Berger 1992). Other wildlife that use the island habitat were represented by the Canada goose in the Grand Coulee evaluation, including aquatic mammals, mourning doves, gulls and terns, shorebirds, and waterfowl. Canada goose is an important game species that is present in all Subbasins of the Intermountain Province.

Lewis' woodpecker. Lewis' woodpecker was evaluated in the Chief Joseph HEP study as an indicator of wildlife requiring trees of suitable diameter and decay class to provide cavities for nesting (Kuehn and Berger 1992). Species benefiting from mitigation for Lewis' woodpecker include ruffed grouse, white-tailed deer, sharp-shinned hawk, Cooper's hawk, northern goshawk, pileated woodpecker, black-backed woodpecker, sapsucker, white-headed woodpecker, western bluebird, boreal and flammulated owl, and small mammals (CCT 2004a). Ponderosa pine habitats were evaluated for their value to Lewis' woodpecker. The Washington GAP Analysis Project (Smith et al. 1997) confirms breeding in the San Poil Subbasin, with possible breeding in the Pend Oreille, Spokane, and Upper Columbia Subbasins.

Mallard. The effects of the Albeni Falls Project on mallard duck breeding habitat was evaluated by Martin et al. 1988. A breeding model was developed specifically for the Pend Oreille Lake emergent wetland habitats. This species also represents other waterfowl species that occur in the area. Mallard is an important game species and is present in all Subbasins of the province.

Mink. Mink was evaluated in the Chief Joseph HEP study as a representative carnivorous furbearer that uses shoreline and adjacent shallow water habitats (Kuehn and Berger 1992). Other species that may benefit from habitat improvements for mink include beaver, long-eared owl, northern flicker, pallid bat, western pipistrelle bat, long-eared bat, lesser goldfinch, ash-throated flycatcher, yellow-billed cuckoo, great egret, black-

crowned night heron, Sylvan hairstreak and Viceroy butterflies, river otter, water shrew, and black bear (CCT 2004a). Mink has cultural significance and is a game species.

The species was also selected as a Subbasin priority species for its close association with herbaceous wetland and riparian habitats, and for its economic value as a furbearer. The mink has a recurrent relationship (*i.e.* routine but occasional direct consumer, often in local areas and providing 5 – 50 percent of diet) with the carcass and fry/fingerling/parr stages of salmonid life history (IBIS 2003). It also is a critical functional link species using aquatic structures created by other organisms.

Mourning dove. Mourning dove was used in the Grand Coulee HEP study to represent wildlife using riparian and agricultural lands, particularly orchards and open ground (Creveling and Renfrow 1986). Other species that may benefit from activities that enhance mourning dove habitat include pheasant, quail, cottontail rabbit, western kingbird, meadowlark, northern harrier, Swainson's hawk, and meadow vole (CCT 2004a). Mourning dove is a culturally significant species and a game species. Breeding bird surveys from 1966 to 1998 show a statistically significant population decline of two to three percent per year in the Northern Rocky Mountains and Columbia Plateau planning regions (Altman 2000a, 2000b). Statewide in Washington, hunting harvest of mourning dove since the 1970s has declined by two-thirds (WDFW 2001). The species is present in all Subbasins of the province.

Mule deer and white-tailed deer. Mule deer was used in both the Grand Coulee and Chief Joseph HEP assessments to represent wildlife dependent upon shrub-steppe and river breaks (Creveling and Renfrow 1986, Kuehn and Berger 1992). Mixed forest, ponderosa pine savannah, and rockland habitats were also evaluated for mule deer in the Chief Joseph study. Mule deer are a culturally significant species. Species benefiting from mitigation for mule deer may include sharp-tailed grouse, downy woodpecker, northern oriole, burrowing owl, short-eared owl, Washington ground squirrel, upland sandpiper, golden eagle, badger, coyote, and cougar (CCT 2004a).

White-tailed deer were selected for the Grand Coulee HEP to represent wildlife dependent upon seral forest habitat with abundant shrubs and openings. Both mule and white-tailed deer are important game species.

Muskrat. Muskrat was selected to represent wildlife using slough/riverine and deep-water emergent wetland types within the Lake Pend Oreille study area of the Albeni Falls HEP (Martin et al. 1988). Muskrat is a game species.

Redhead. Redhead winter habitat consisting of shallow open water areas with abundant macrophytes was evaluated in the Albeni Falls loss assessment (Martin et al. 1988). Redhead also represented other waterfowl species with similar winter foraging habits. Redhead is a game species in both Washington and Idaho. Redhead provides a critical functional link through parasitizing the nests of other species during breeding (IBIS 2003). The species probably breeds along major river valleys in northeastern Washington as high up as the interior Douglas-fir zone, but is peripheral at best above the ponderosa

pine zone. Breeding is probable or at least possible in all Washington Subbasins of the province, although Smith et al. (1997) reports no confirmed breeding in these Subbasins.

Ring-necked pheasant. Ring-necked pheasant is an upland game species that uses agricultural lands in forage or grain production. The effects to this species were evaluated in the Chief Joseph HEP study (Kuehn and Berger 1992).

Ruffed grouse. Ruffed grouse was evaluated in the Grand Coulee Dam HEP assessment as a representative species of forested habitat with a hardwood tree component (Creveling and Renfrow 1986). Ruffed grouse is an important upland game species and is closely associated with riparian habitats, and generally associated with upland aspend (Johnson and O'Neil 2001). Breeding bird surveys during 1966-1998 show a statistically significant population decline of about seven percent per year for the Northern Rocky Mountain planning region (Altman 2000a). The Washington GAP Analysis Project confirms breeding in the Pend Oreille, San Poil, and Spokane Subbasins (Smith et al. 1997). Breeding occurs in the other Washington Subbasins, as well as in Idaho.

Sage grouse. Refer to preceding discussion under Idaho and Washington Threatened and Endangered Species.

Sharp-tailed grouse. Refer to preceding discussion under Idaho and Washington Threatened and Endangered Species.

Spotted Sandpiper. Spotted sandpiper is representative of shorebirds that use sparsely vegetated islands, sand/gravel bars, mudflats, and shorelines. The species was evaluated in the Chief Joseph HEP study (Kuehn and Berger 1992). Other species that may benefit from spotted sandpiper mitigation include osprey, snipe, bats, western toad, rubber boa, rattlesnake, raccoon, coyote, river otter, killdeer, bank swallow, merganser, coot, water shrew, common garter snake, northern leopard frog, and striped skunk (CCT 2004a). Populations of spotted sandpiper in the Columbia Plateau physiographic region show statistically significant declines (Sauer et al. 1999).

Yellow warbler. Yellow warbler was selected for evaluation in the Chief Joseph HEP study for its strong association with riparian shrub habitat and adjacent wetlands with open water (Kuehn and Berger 1992). Other species that may benefit from yellow warbler mitigation include hairy woodpecker, great blue heron, white-tailed deer, elk, turkey, red-tailed hawk, spotted frog, beaver, muskrat, raccoon, red-winged blackbird, long-toed salamander, meadow vole, tree frog, bats, and winter wren (CCT 2004a).

The species was also selected as Subbasin priority species for its close association with riparian habitat, especially the sub-canopy foliage in riparian woodlands. Breeding bird surveys in the Northern Rocky Mountains planning region show a statistically significant long-term (1966-98) population decline of about one percent per year (Altman 2000a). Over the same time period, the Columbia Plateau planning region showed a population increase of about two percent per year that was not, however, statistically significant (Altman 2000b). Other species indicated by the yellow warbler include warbling vireo, black-headed grosbeak, Swainson's thrush, and Wilson's warbler. Limiting factors are

(1) habitat loss or alteration from agriculture, (2) poorly-managed livestock grazing, (3) channelization for flood control or irrigation, and (4) parasitism by the brown-headed cowbird.

4.5.2.4 Other Priority Species

American beaver. Beaver was selected as a priority species for the San Poil, Upper Columbia, and Spokane Subbasins due to its close association with forested wetland and riparian habitats. Beaver provide critical functional links through impounding water by creating diversions or dams, by creating primary aquatic structures, and as primary consumers of bark, cambium, or tree boles (IBIS 2003). Harvest data is recorded by WDFW in the Trappers Report of Catch in the annual Game Harvest Reports (refer to Appendix G). Since 2000, when State Initiative 713 was passed, banning the use of leg or body gripping traps, little trapping of beaver has occurred in Washington.

American marten. American marten was selected as a priority wildlife species for the Pend Oreille Subbasin. Marten is closely associated with upland forests including montane mixed conifer, eastside mixed conifer, and lodgepole pine. It also uses montane coniferous wetlands. Marten is a game species in Washington and Idaho.

Bat guild. The bat guild was selected as a priority guild for the Coeur d' Alene and Pend Oreille Subbasins. Little detailed information exists regarding the distribution and occurrence of bats in the province, but up to 15 species may be present and their habitat associations and life histories are diverse.

Bighorn sheep. Bighorn sheep was selected as a priority species in the Upper Columbia Subbasin for their relationship with cliff and rock outcrop habitats. Extirpated from the province prior to construction of the FCRPS, bighorn sheep were reintroduced into the Kettle River drainage near Curlew in 1971 and the population has persisted to date. Additional translocations to Lincoln County occurred in the 1990s (personal communication with S. Zender, WDFW, December 22, 2003).

Black bear. Black bear was selected as a priority species for the Coeur d' Alene Subbasin. The species is associated with a variety of forested, riparian, and wetland habitats. Black bear is a culturally significant species and an important game species. Critical functional links are provided by black bear through primary cavity excavation in live trees or snags and through primary consumption of bark, cambium, or boles (IBIS 2003).

Cavity nester guild. The cavity nester guild was selected as a priority guild for the Coeur d' Alene and Pend Oreille Subbasins. Many of these species depend on primary excavators, such as the pileated woodpecker, to create suitable cavities in decaying trees. These species are indicative of forested habitats providing a range of sizes of cavities for reproduction and roosting. Nearly all cavity-nesting birds contribute a valuable ecological function by consuming forest insects, thereby contributing to the control of insect populations.

Columbia spotted frog. The Columbia spotted frog was selected as a priority species for the Spokane and Upper Columbia Subbasins because of its close association with wetland and riparian habitats. It is a candidate for state listing as threatened/endangered in Washington. Management in Washington is directed at protecting native wetland vegetation, avoiding the introduction of non-native species, controlling runoff, and using alternatives to pesticides.

Limiting factors are: (1) habitat alteration/fragmentation, (2) predation by introduced species such as game fish and bullfrogs, and (3) toxic chemicals such as pesticides, fire retardant, and petroleum products that enter the aquatic system. Habitat changes such as land conversion, water channeling, and livestock grazing can cause harm to the spotted frog's life stage requirements for stable water temperature and elevation, or for overhead cover. Water level fluctuation is particularly detrimental because egg-laying often occurs in shallow water where even short-term exposure to air can cause freezing or desiccation.

Golden eagle. This raptor was selected as a priority species for the Lake Rufus Woods, Upper Columbia, San Poil, and Spokane Subbasins due to its close association with cliffs and rock outcrops for nesting. It is a candidate for state listing as threatened/endangered in Washington. Washington's management emphasis is on (1) maintaining prey species habitats, (2) controlling rodenticide, insecticide, and herbicide use in foraging areas, (3) controlling recreational or other disturbances during nesting (Watson and Whalen 2003), and (4) managing other limiting factors such as lead shoot, electrocution hazards, and shooting.

The golden eagle has a recurrent relationship (routine but occasional direct consumer, often in local areas and providing 5-50 percent of diet) with the carcass and fry/fingerling/parr stages of salmonid life history (IBIS 2003). Limiting factors are: (1) habitat loss or alteration, (2) fluctuating populations of prey, (3) disturbance at nest sites, (4) lead poisoning and other prey contaminants, (5) powerline electrocution, (6) collision with wind turbines, and (7) shooting.

Great blue heron. The great blue heron was selected as a priority species in the Pend Oreille Subbasin for its close association with riparian forests for breeding and emergent wetlands for foraging. Great blue heron is a critical functional link species creating feeding, roosting, denning, or nesting opportunities for other organisms in open water, herbaceous, riparian, and westside lowland coniferous forests (IBIS 2003). The species occurs in all Subbasins of the province.

Harlequin duck. Harlequin duck is an indicator of mature riparian forests adjacent to fast-moving streams. The species was selected by both the Coeur d' Alene and Pend Oreille Subbasins as an indicator of mid- to late-successional forest riparian zones. Harlequin duck is listed as a game species in both Washington and Idaho. The Washington GAP Analysis Project (Smith et al. 1997) reports possible evidence of breeding only in the Pend Oreille Subbasin.

Long-eared owl. The long-eared owl was noted in the Grand Coulee HEP study as an indicator of wildlife species requiring grasslands and open agricultural lands adjacent to

woody riparian habitat. They are also a good indicator of the small mammal prey base. This species is a priority wildlife for the San Poil, Upper Columbia, and Spokane Subbasins. Smith et al. (1997) confirm breeding in the Washington portion of the Spokane Subbasin.

Long-toed salamander. The Pend Oreille Subbasin selected this species as an indicator of wetland and riparian habitats. Long-toed salamander provides a critical functional link as a secondary consumer of freshwater or marine zooplankton (IBIS 2003).

Migratory bird guild. The migratory bird guild was selected as a priority guild in the Coeur d' Alene and Pend Oreille Subbasins. Species in this guild breed within the province, but migrate south to winter at warmer latitudes in the United States, Mexico, or Central America. Migratory birds are of concern due to recent declines in breeding populations of many species. Currently, 75 species are defined as priority or focal species by Washington Partners in Flight and 58 species are defined similarly by Idaho Partners in Flight (IBIS 2003). Many of these species perform an important ecological function by feeding primarily on insects, thereby contributing to control of insect populations.

Moose. Moose was selected as a priority species in the Pend Oreille Subbasin. Moose is an important game species that primarily utilizes montane coniferous forests and montane wetlands.

Northern flicker. Northern flicker was selected by the San Poil Subbasin as a priority species. Flicker was noted in the Grand Coulee HEP study as a habitat indicator species of wildlife requiring riparian woodlands with trees of large diameter suitable for cavity nests. The species is presumed to breed in all Subbasins of the province.

Northern goshawk. The northern goshawk was selected as a priority species by the Pend Oreille and Coeur d' Alene Subbasins. Goshawks are closely associated with ponderosa pine, lodgepole, and eastside mixed conifer forests. The species is presumed to breed in all Subbasins of the province.

Osprey. Osprey was selected as a priority species for the Pend Oreille Subbasin. Ospreys are dependent upon riverine and lake/reservoir systems providing suitable fish species as prey, and require large trees or snags for nesting. The species is a confirmed breeder in all Subbasins of the province.

Pileated woodpecker. The pileated woodpecker was selected as a priority species by the Pend Oreille, Upper Columbia, and San Poil Subbasins. Pileated woodpecker represents species that use mature and old-growth upland forest, montane coniferous wetland, and wooded riparian habitats of the province. It is a candidate for state listing as threatened/endangered in Washington. Breeding bird surveys show a statistically significant long-term (1966-98) population increase of about four percent per year across the Northern Rocky Mountains planning region (Altman 2000a). The Washington GAP Analysis Project has confirmed breeding in Pend Oreille, Spokane, and Upper Columbia Subbasins; breeding is possible in the other Washington Subbasins. In the Idaho Subbasins, it is presumed that breeding occurs.

The pileated woodpecker wasn't specifically included as a Grand Coulee HEP assessment species, but that project's loss of 1,632 riparian forest HUs and loss of forested habitats on the other FCRPS projects may have affected the species. The pileated woodpecker provides a key ecological function by creating tree cavities large enough to be used by other focal wildlife in the province (for example, black-capped chickadee, northern flicker, common merganser, American marten, long-legged myotis, and northern flying squirrel), and game animals with no special status (for example, wood duck, Barrow's goldeneye, and bufflehead). It is relatively easier to inventory/monitor pileated woodpecker than most other species that benefit from its presence.

Rocky Mountain elk. Rocky Mountain elk were identified as a priority species for the Pend Oreille and Coeur d' Alene Subbasins. Elk is an important game species and is a culturally significant wildlife species. Critical functional links are provided by elk as creators of ponds or wetlands through wallowing activity and as grazers of grasses and forbs, with potential to alter vegetative structure and composition (IBIS 2003).

Sage sparrow. This bird is a Spokane Subbasin priority species whose distribution is closely tied to shrub-steppe habitats, especially large patches of contiguous sagebrush. It is a candidate for state listing as threatened/endangered in Washington. Breeding bird surveys from 1966 to 1998 show a statistically non-significant population decline of about one percent per year in the Columbia Plateau planning region (Altman 2000b). From 1980-98, the population increased about three percent per year that also is not statistically significant. Other species indicated by the sage sparrow include Brewer's sparrow, sage thrasher, sage grouse, loggerhead shrike, lark sparrow, vesper sparrow, and western meadowlark. Limiting factors are habitat loss and fragmentation from land conversion or wildfire, and parasitism by the brown-headed cowbird. Smith et al. (1997) found no confirmed evidence of breeding by sage sparrow in the Washington portion of the Subbasin.

Snowshoe hare. The snowshoe hare was selected as a Spokane Subbasin priority species for its key ecological function as primary prey to the Canada lynx, and for its close association with upland forest habitats — especially those with a densely-treed understory. Snowshoe hare provide a critical functional link as a consumer of fecal material (IBIS 2003). The species is listed as a game species in both Washington and Idaho.

Waterfowl guild. The Coeur d' Alene and Pend Oreille Subbasins selected the waterfowl guild as a priority guild. Waterfowl are important game and cultural species, and are closely tied to emergent wetlands and open water habitats in the province. There are approximately 39 species in this guild, including loons, grebes, cormorants, mergansers, ducks, geese, and swans.

White-headed woodpecker. This woodpecker was selected as a priority species by the Pend Oreille, Spokane, and Upper Columbia Subbasins. The species is closely associated with upland forest habitats in the Subbasin, especially large patches of old-growth ponderosa pine or mixed conifer. It is a candidate for state-listing as

threatened/endangered in Washington. Altman (2000a) reports there is an insufficient number of breeding bird surveys to determine population trend in the Northern Rocky Mountains planning region, but anecdotes suggest local and regional extirpations of populations. The Washington GAP Analysis Project confirmed breeding only in the San Poil and Upper Columbia Subbasins (Smith et al. 1997).

The presence of white-headed woodpecker can indicate other species such as flammulated owl, Lewis' woodpecker, white-breasted nuthatch, Williamson's sapsucker, northern goshawk, Hammond's flycatcher, hairy woodpecker and brown creeper. Limiting factors for the species are (1) timber and fuelwood cutting of large-diameter live/dead trees suitable for nesting, seed (food) production, and ground foraging, (2) habitat fragmentation, and (3) fire suppression which allows encroachment by atypical tree species.

Wolverine. The Pend Oreille and Coeur d' Alene Subbasins selected the wolverine as a priority species. This species is associated with montane coniferous forest habitats. It is a candidate for listing in both Idaho and Washington states.

4.6 Ecological Relationships

4.6.1 Wildlife Structural Condition Assessment

Structural conditions are the vegetation structure and successional category of a wildlife habitat in a specific location. Forest structural conditions characterize tree size (dbh), aerial canopy cover, and number of canopy layers. Shrubland structural conditions describe shrub height, aerial cover, and age class. Grassland structural conditions denote only grass or forb aerial cover.

Johnson and O'Neil (2001) specify three degrees of association between wildlife and structural conditions: closely associated, generally associated, and present. A "closely associated" species is widely known to depend on a habitat or structural condition for part or all of its life history requirements. A "generally associated" species exhibits a high degree of adaptability and may be supported by a number of habitats or structural conditions. A "present" species demonstrates occasional use of a habitat or structural condition.

Table 4.11 presents the tally of focal species by structural condition class for forested stands. The forest structural conditions having the greatest number of closely associated focal wildlife during breeding — nine species — are "grass/forb with open or closed canopy cover", and "shrub-seedling with open canopy cover". When considering focal wildlife that are either closely associated or generally associated during breeding, the greatest number of focal species — 30 species — occurs in the "medium tree – single-story – open canopy cover" structural condition.

Table 4.11. Relationship between number of focal wildlife species and forest structural condition used during breeding

Forest Structural Condition*	Close Association	General Association	Present
Giant Tree – Multi-story	3	14	0
Large Tree – Multi-story – Closed canopy cover	2	17	0
Large Tree – Multi-story – Moderate canopy cover	3	18	0
Large Tree – Multi-story – Open canopy cover	5	21	0
Large Tree – Single-story – Closed canopy cover	0	19	0
Large Tree – Single-story – Moderate canopy cover	0	21	0
Large Tree – Single-story – Open canopy cover	0	27	2
Medium Tree − Multi-story – Closed canopy cover	1	18	0
Medium Tree − Multi-story – Moderate canopy cover	2	18	0
Medium Tree − Multi-story – Open canopy cover	2	22	1
Medium Tree − Single-story – Closed canopy cover	0	17	2
Medium Tree − Single-story – Moderate canopy cover	0	21	0
Medium Tree − Single-story – Open canopy cover	4	26	2
Small Tree – Multi-story – Closed canopy cover	1	14	1
Small Tree – Multi-story – Moderate canopy cover	2	16	1
Small Tree – Multi-story – Open canopy cover	4	20	1
Small Tree – Single-story – Closed canopy cover	0	15	2
Small Tree – Single-story – Moderate canopy cover	1	20	3
Small Tree – Single-story – Open canopy cover	4	22	2
Sapling/Pole – Closed canopy cover	2	14	0
Sapling/Pole – Moderate canopy cover	4	17	1
Sapling/Pole – Open canopy cover	6	21	3
Shrub/seedling – Closed canopy cover	3	20	2
Shrub/Seedling – Open canopy cover	9	14	3
Grass/Forb – Closed canopy cover	9	14	1
Grass/Forb – Open canopy cover	9	17	0

(*Source*: IBIS 2003)

* Attribute values for Forest Structural Conditions

Size (inches dbh)		**Canopy layers (strata)**		**Canopy cover (percent)**	
Giant tree	= ≥30	Multi-story	= >2 strata	Closed	= 70-100
Large tree	= 20-29	Single story	= 1 stratum	Moderate	= 40-69
Medium tree	= 15-19			Open	= 10-39
Small tree	= 10-14				
Sapling/pole	= 1-9				
Shrub/seedling	= <1				
Grass/Forb	= no trees				

Grasslands are essential habitat to at least nine focal wildlife species, and supportive habitat for another 15 focal wildlife (Table 4.12). Four of the nine species – woodland caribou, sage grouse, sharp-tailed grouse, and upland sandpiper – are state classified as endangered or threatened. Seven of the nine species – sage grouse, sharp-tailed grouse, mourning dove, ring-necked pheasant, spotted sandpiper, mule deer, and white-tailed deer – are Habitat Evaluation Procedure (HEP) species for federal hydro-system projects in the Intermountain Province.

Shrublands with shrubbery 1.6-6.5 feet tall, 10-69 percent aerial canopy cover, and 0-25 percent crown decadence are essential habitat to 10 focal wildlife species, and supportive habitat for another 20 focal wildlife (Table 4.12). Of the 10 species, one (pygmy rabbit) is federally-listed as endangered, and three species (pygmy rabbit, sage

grouse, and sharp-tailed grouse) are state classified as endangered or threatened. Eight of the 10 species – sage grouse, sharp-tailed grouse, mourning dove, ring-necked pheasant, spotted sandpiper, mule deer, white-tailed deer, and bobcat – are Habitat Evaluation Procedures (HEP) species for FCRPS projects in the Intermountain Province.

Table 4.12. Relationship between number of focal wildlife species and grassland or shrubland structural condition used during breeding

Grassland/Shrubland Structural Condition*	Close Association	General Association	Present
Grass/Forb – Closed	9	15	2
Grass/Forb – Open	10	15	1
Low Shrub – Closed Shrub Overstory – Old	1	11	1
Low Shrub – Closed Shrub Overstory – Mature	1	12	0
Low Shrub – Closed Shrub Overstory – Seedling/Young	0	12	0
Low Shrub – Open Shrub Overstory – Old	2	17	1
Low Shrub – Open Shrub Overstory – Mature	4	15	1
Low Shrub – Open Shrub Overstory – Seedling/Young	4	14	1
Medium Shrub – Closed Shrub Overstory – Old	4	10	2
Medium Shrub – Closed Shrub Overstory – Mature	4	12	1
Medium Shrub – Closed Shrub Overstory – Seedling/Young	1	16	0
Medium Shrub – Open Shrub Overstory – Old	5	22	1
Medium Shrub – Open Shrub Overstory – Mature	10	20	0
Medium Shrub – Open Shrub Overstory – Seedling/Young	10	20	0
Tall Shrub – Closed Shrub Overstory – Old	3	13	1
Tall Shrub – Closed Shrub Overstory – Mature	3	14	0
Tall Shrub – Closed Shrub Overstory – Seedling/Young	1	16	0
Tall Shrub – Open Shrub Overstory – Old	4	18	1
Tall Shrub – Open Shrub Overstory – Mature	7	15	1
Tall Shrub – Open Shrub Overstory – Seedling/Young	5	19	0

(*Source*: IBIS 2003; Johnson and O'Neil 2001)

* Attribute values for Grassland/Shrubland Structural Conditions

Shrub height (feet)
Tall = >6.5-16.5
Medium = 1.6-6.5
Low = <1.6

Canopy cover (percent)
Closed = 70-100
Open = 10-69

Age class (percent decadence)
Old = 26-100
Mature = ≤25
Seedling/Young= minor

4.6.2 Key Environmental Correlate Assessment

Key environmental correlates (KECs) are specific substrates, habitat elements, and attributes of species' environments that are not represented by overall (macro) habitats and vegetation structural conditions. KECs can include vegetation habitat elements, non-vegetation terrestrial elements, aquatic bodies, substrates, and human elements. Specific examples of KECs include snags, down wood, vegetation strata, rock and soil types, hedgerows and roads. Although KECs are key to species occurrence and population

success, there is little data available within the IBIS system to allow specific evaluation of historic versus current KEC levels, and corresponding population densities or trends.

Human land uses have affected many of the biotic habitat elements, such as the composition of herb, shrub, and tree strata in forested stands. Presumably, in the historical condition, anthropogenic habitat elements, such as roads and structures were few in number. Information on KECs can be compiled at the local level from sources such as vegetation surveys, stand exam data, riparian transects, aerial photography, and stream surveys. This type of information is essential for the evaluation of habitat quality for individual wildlife species. The HEP models used to evaluate the construction and inundation effects of the federal hydropower projects (Creveling and Renfrow 1986, Kuehn and Berger 1992, Martin et al. 1988) rely in part on habitat variables that represent KEC categories. KEC information has been collected at many sites as part of watershed assessment and natural resource planning (for example, refer to USFS 2003). However, this type of information is not available at the scale of the Intermountain Province, or individual subbasins. Therefore, a comparison of historic and current condition KECs is not provided.

4.6.3 Key Ecological Function Assessment

Key ecological functions (KEFs) describe the major ecological roles played by a species. Specific examples include primary excavation of tree cavities or ground burrows, herbivore dispersal of seeds/spores, and nutrient cycling. KEFs are noted for each species based on a classification system of 85 KEF categories (Johnson and O'Neil 2001). Little data exists to quantify the rates or amounts of KEFs. Eight selected KEF categories represent, collectively, the greatest diversity of species across a province or Subbasin; browser; grazer; fungivore; facilitator in nutrient cycling; creator of feeding, roosting, denning, or nesting opportunities; primary creator of structures; primary cavity excavator; and improver or degrader of soil structure/aeration. In the descriptions immediately following, focal wildlife species having close association to wetland or riparian habitats are identified in bold type.

Browsers (woody leaf or stem consumer) and grazers (grass or forb consumer) can change plant community composition or structure. Wild turkey, **snowshoe hare**, white-tailed jackrabbit, **American beaver**, Rocky Mountain elk, mule deer, **white-tailed deer**, and **moose** are focal wildlife browsers that perform this function (Table 4.13). The **Canada goose**, **American wigeon**, **sandhill crane**, white-tailed jackrabbit, **northern bog lemming**, black bear, woodland caribou, mountain goat, and California bighorn sheep are grazers that can also change plant communities.

Fungivores (fungus eater) disseminate beneficial fungi to other parts of the ecosystem. Focal wildlife that produce this function are northern flying squirrel, Rocky Mountain elk, and mule deer.

Facilitators in nutrient cycling help transfer substances that contain carbon, nitrogen, and many other elements. Fifteen focal wildlife accomplish this: **long-toed salamander**, **Coeur d' Alene salamander**, **western toad**, **northern leopard frog**, **wood frog**,

double-crested cormorant, **great blue heron**, **ring-billed gull**, **American beaver**, **long-legged myotis**, **western small-footed myotis**, and five other bat species.

Creators of feeding, roosting, denning, or nesting opportunities, creators of structures, and primary cavity excavators provide life needs to secondary animal users that may number from one to many. **Great blue heron**, gray wolf, grizzly bear, and cougar are focal wildlife species that create feeding, roosting, denning, or nesting opportunities. **Western grebe**, **American white pelican**, **osprey**, bald eagle, northern goshawk, Swainson's hawk, ferruginous hawk, golden eagle, American crow, northern flying squirrel, **American beaver**, and **muskrat** are other focal species that specifically create structures. Focal wildlife that are primary cavity excavators in snags or live trees include six woodpeckers (Lewis', downy, white-headed, three-toed, black-backed, and pileated), black-capped chickadee, pygmy nuthatch, and black bear.

Soil improving animals help structure or aeration typically by digging, while degraders harm soils typically by trampling. Ten species of focal wildlife contribute this service: **long-toed salamander**, **Coeur d' Alene salamander**, **western toad**, **wood frog**, pygmy rabbit, **snowshoe hare**, white-tailed jackrabbit, Washington ground squirrel, **American beaver**, and American badger.

Table 4.13. Number of focal wildlife species that provide selected Key Ecological Functions (kefs) in the Intermountain Province

Key Ecological Function	Amphib.	Bird	Mamm.	Reptile	Total
Browser	0	1	7	0	8
Grazer	0	3	11	0	14
Fungivore	0	0	3	0	3
Facilitator in nutrient cycling	5	3	8	0	16
Creator of feeding, roosting, denning, or nesting opportunities	0	1	3	0	4
Primary creator of structures	0	10	3	0	13
Primary cavity excavator	0	8	1	0	9
Improver of soil structure/aeration	4	0	6	0	10

(*Source*: Johnson and O'Neil 2001)

Functional keystone species are those whose removal would most alter the structure, composition, or function of a community. Critical functional link species are the sole species in a community that perform a specific ecological function to the community. Removal of these species would indicate loss of that function in the community. Reduction or extirpation of populations of functional keystone species and critical functional link species may have unexpected or unknown effects in the community, changing biotic processes and community functioning.

Functional keystone species with little functional redundancy among the118 focal wildlife include: (1) northern flying squirrel, Rocky Mountain elk, and mule deer for their role as fungivores, and (2) great blue heron, gray wolf, grizzly bear, and cougar as creators of feeding, roosting, denning, or nesting opportunities.

Of 118 focal wildlife, 11 are critical functional link species, defined as the sole species to perform a specific key ecological function. The critical functional link species in the Intermountain Province are: long-toed salamander, redhead, great blue heron, black tern, American beaver, snowshoe hare, mink, black bear, grizzly bear, Rocky Mountain elk, and woodland caribou. Appendix E lists the species, the habitats they are associated with, and the key ecological function provided by each species. The pileated woodpecker could also be considered a critical functional link species because it creates large-diameter tree cavities for secondary users such as the wood duck or American marten.

4.6.4 Focal Species Associated with Salmonids

More than 95 percent of the body mass in Pacific salmon is accumulated from the marine environment (Groot and Margolis 1991). This material is transported to and deposited in freshwater habitats where salmon spawn and die. The deposition of nutrients by spawning salmon is estimated to now be only about seven percent of historic levels in watersheds of Washington, Idaho, and Oregon (Gresh et al. 2000). These nutrients are incorporated into the food web via direct consumption of salmon eggs and flesh by fish and invertebrates, and chemical or biological uptake of dissolved materials released from fish metabolism and carcass decomposition (Naiman et al. 2002).

There are 33 focal wildlife species that feed upon salmonids in the Intermountain Province (Table 4.14).

Table 4.14. Number of wildlife species that feed upon salmonids in the Intermountain Province

	Focal Species	All Occurring Species
Amphibians	0	1 (6 % of 17 total)
Birds	19	65 (23 % of 277 total)
Mammals	14	25 (25 % of 101 total)
Reptiles	0	3 (17 % of 18 total)
Total	33	94 (23 % of 413 total)

(*Source*: IBIS 2003)

Seven focal wildlife species have a strong and consistent link to salmonids: bald eagle, American black bear, common merganser, grizzly bear, harlequin duck, osprey, and northern river otter. The link occurs at one or more of the following salmonid life stages:

- Egg or alevin (common merganser and harlequin duck)
- Fry, fingerling, or parr (common merganser, osprey, and northern river otter)
- Smolt, immature adult, or adult (bald eagle, common merganser, harlequin duck, and osprey)
- Spawning adult (bald eagle, black bear, grizzly bear, osprey, and northern river otter)
- Carcass (bald eagle, black bear, grizzly bear, and northern river otter)

Bald eagles take in salmon nutrients immediately before making long migrations. The northern river otter, mink, many species of gull, and other animals utilize these nutrients just before the winter season with its limited food availability. The timing of lactation in mink is known to vary regionally along the Pacific coast, coinciding with the arrival of

salmon (Ben-David et al. 1997). The indirect effects of declining salmon populations on these and other animals are suspected to be profound in terms of survivorship, fecundity, ability to compete, and other life history requirements (Naiman et al. 2002).

4.6.5 Focal Wildlife Species Associated with Aquatic KECs

Association with aquatic habitat correlates indicates an ecological tie between terrestrial wildlife and aquatic habitat. Table 4.15 presents the aquatic KECs that are associated with ten or more focal species of the IMP. Fifty-eight wildlife species are associated with river and stream KECs. Open water, oxbows, and lower perennial aquatic habitats are associated with the greatest numbers of species. Fifty-seven species are associated with vegetated wetlands and forty-four with lakes, ponds, and reservoirs. Changes to aquatic habitats and their habitat correlates can lead to effects on a multitude of wildlife species, in addition to aquatic species such as fish and macroinvertebrates.

Table 4.15. Number of focal wildlife species associated with Key Environmental Correlates in aquatic habitats*

Key Environmental Correlate	Number of Focal Wildlife Species
Water depth	16
Free water derived from any source	18
Rivers and Streams	58
Oxbows	29
Upper perennial	11
Lower perennial	26
Open water	34
Shoreline	20
Emergent vegetation	10
Pools	16
Runs and glides	11
Seeps and springs	24
Ephemeral Pools	24
Sand Bars	14
Gravel Bars	14
Lakes/Ponds/Reservoirs	44
Open water	35
Shoreline	20
Submergent vegetation	13
Emergent vegetation	18
Wetlands/Marshes/Wet Meadows/Bogs/Swamps	57
Riverine	41
Forest	23
Nonforest	13
Islands	13
Seasonal Flooding	21

(*Source*: IBIS 2003) * Only KECs having ≥ 10 associated focal species are listed.

4.7 Terrestrial Resource Mitigation and Enhancement Priorities

4.7.1 Status of Wildlife Mitigation for Federal Hydrosystem Projects

4.7.1.1 Construction Loss Mitigation

The Northwest Power Act of 1980 required that measures be implemented to protect, mitigate, and enhance wildlife affected by the development and operation of FCRPS. Habitat loss assessments for project construction and reservoir inundation were

conducted (Kuehn and Berger 1992, Creveling and Renfrow 1986, Martin et al. 1988). Each assessment reported the number of acres of habitat types that were affected (Table 4.16). Habitat Evaluation Procedures (HEP) studies were performed to determine the value of the lost habitats to various indicator species of wildlife. As described in Section 4.5.2 above, 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. HEP studies provide results in terms of Habitat Units, which are units of value based on both quality and quantity of habitat. Progress made to date toward implementing the recommended mitigation strategies is summarized below in terms of Habitat Units by species (Table 4.17).

Completion of the FCRPS construction loss mitigation is the highest priority for terrestrial resources in the Intermountain Province (IMP Terrestrial Resources Ad-Hoc Technical Team meeting, May 5, 2003). The riverine, riparian, and wetland areas affected were habitat types with unusually high value to wildlife. Other habitats, such as shrub-steppe, are in relatively low quantity and/or quality in the province.

The projects were constructed in the 1940s and 1950s. Initial mitigation acquisitions occurred after implementation of the Northwest Power Act and completion of the loss assessment studies in the late 1980s and early 1990s. The construction losses continue to affect wildlife each year that they remain unmitigated. The loss estimates presented in the HEP studies do not take into consideration the value of the lost habitats that would have accrued over time from the date of the initial impacts, referred to as "annualization." At this time, the loss estimates are recognized as un-annualized construction losses, and alternative crediting methods continue to be investigated by the Columbia Fish and Wildlife Authority Wildlife Crediting Subcommittee.

From the latest data available, construction loss mitigation for the Albeni Falls Project is estimated at 15.1 percent complete, Grand Coulee is 50.7 percent complete, and Chief Joseph is 16 percent complete. These numbers are updated periodically as new parcels are acquired and as initial HEP evaluations are performed to define the quality of acquired lands. Habitat Units by species were not available at the time of publication for recently acquired parcels for the Albeni Falls Mitigation Project.

Table 4.16. Acres of habitat types affected by federal hydrosystem project construction and inundation

Project	Habitat Type	Acres of Habitat Inundated
Albeni Falls		
	Herbaceous wetland	4,376
	Deciduous forested wetland	2,314
	Shallow open water	**655**
Total		**7,345**
Grand Coulee		
	Islands	1
	Riparian lands	2,000

Project	Habitat Type	Acres of Habitat Inundated
	Shrub-steppe uplands	14,000
	Forested uplands	25,000
	Agricultural lands	15,000
	Barren lands	13,000
Total		**70,000**[1]
Chief Joseph		
	Riverine	2,910
	Shrub-steppe	1,681
	Sand/gravel/cobble	1,184
	Riparian/Macrophyllus draws	658
	Agriculture	366
	Rockland	330
	Ponderosa pine savannah	346
	Island/sandbar	238
	Rock	256
	Mixed forest	106
	Palustrine (ponds/slackwater)	9
Total		**8,084**

(*Sources*: Creveling and Renfrow 1986; Kuehn and Berger 1992; Martin et al. 1988)

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

Table 4.17. Status of mitigation for construction and inundation wildlife habitat losses

Project	Species	Habitat Units lost	Habitat Units acquired	Percent complete
Albeni Falls[1]				
	Bald eagle (breeding)	4,508		
	Bald eagle (wintering)	4,365		
	Black-capped chickadee	2,286		
	Canada goose	4,699		
	Mallard	5,985		
	Muskrat	1,756		
	Redhead duck	3,379		
	White-tailed deer	1,680		
Total all loss species		**28,658**	**4,329**	**15.1%**
Grand Coulee[2]	**Species**	**Habitat Units lost**	**Habitat Units acquired**	**Percent complete**
	Canada goose (nesting)	74	-	0.0%
	Mourning dove	9,316	1,001	10.7%
	Mule deer	27,133	19,056	70.2%
	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%

Project	Species	Habitat Units lost	Habitat Units acquired	Percent complete
	White-tailed deer	21,632	9,064	41.9%
	Riparian forest	1,632	234	14.3%
	Riparian shrub	27	131	100.0%
Total all loss species/habitats		**111,785**	**56,680**	**50.7%**
	Species	**Habitat Units lost**	**Habitat Units acquired**	**Percent complete**
Chief Joseph[2]				
	Bobcat	401	132	32.9%
	Canada goose	213	10	4.7%
	Lewis' woodpecker	286	141	49.3%
	Mink	920	137	14.9%
	Mule deer	1,992	409	20.5%
	Ring-necked pheasant	239	-	0.0%
	Sage grouse	1,179	554	47.0%
	Sharp-tailed grouse	2,290	14	0.6%
	Spotted sandpiper	1,255	10	0.8%
	Yellow warbler	58	26	44.8%
Total all loss species		**8,833**	**1,433**	**16.2%**

([1] *Sources*: BPA 2002 and KT 2003; HUs by species not available for all parcels)
([2] *Sources*: BPA 2002 and WDFW 2004b)

Table 4.18 presents the mitigation priorities for habitats and target species in the Upper Columbia River basin, as established in the Council's 1995 Plan and adopted into the 2000 Fish and Wildlife Program. The Upper Columbia River Basin, as defined in the Council's 1995 Wildlife Plan, incorporates both the Intermountain Province and the Mountain Columbia Province. While the Intermountain Province did not establish priorities within the species and habitat types affected by the construction losses, these 2000 Fish and Wildlife Program mitigation priorities could be used in combination with the priorities established in the HEP loss assessments to prioritize projects.

Table 4.18. 2000 Columbia River Basin Fish and Wildlife Program Upper Columbia River Wildlife Mitigation Priorities

Habitat Types - Target Species	Priority
Riparian / River	High
Bald eagle (breeding)	
Black-capped chickadee	
Peregrine falcon	
Shrub-Steppe	High
Sharp-tailed grouse	
Pygmy rabbit	
Sage grouse	
Mule deer	
Wetlands	High
Mallard	
Redhead	

Habitat Types - Target Species	Priority
Islands	Medium
White pelican	
Agricultural Lands	Low
Swainson's hawk	
Ring-necked pheasant	

(*Source*: Council 2000)

4.6.2 Operational Impacts

Operational impact assessments have not yet been conducted for terrestrial resources at any of the three federal dams in the IMP. Assessment and mitigation of operational impacts is the second highest terrestrial resources mitigation priority for the province.

Important factors in the operational loss assessments for federal hydropower system developments in the province include the following:

1) The effects of project operation and reservoir fluctuation on reservoir and river/stream shoreline habitats (Lake Pend Oreille, 226 miles of shoreline; Lake Roosevelt, 530 miles of shoreline; Lake Rufus Woods, 106 miles of shoreline):
    - Direct effects of water fluctuation on wildlife populations, including inundation/desiccation of breeding sites,
    - Effects of water fluctuation on wildlife habitats, particularly wetland extent, type, and species composition,
    - Effects of water fluctuation on shoreline erosion and associated effects to fish and wildlife habitats,
    - Effects to ecosystem of loss of littoral zone vegetation and changes to aquatic bed vegetation, and
    - Effects of change from riverine to reservoir system on ecosystem productivity.
2) Wildlife mortality due to electrical towers and lines.
3) Potential effects to terrestrial resources resulting from transmission line right-of-way maintenance.
4) Ongoing effects of loss of salmonid nutrient base supporting a wide variety of wildlife species and key ecological functions that connect terrestrial with aquatic systems.
5) Ongoing human disturbance of wildlife and wildlife habitat due to project related recreation.

4.7.3 Secondary Effects of Hydroelectric Project Development

Secondary effects of development and operation of the hydroelectric projects include:

1) Overall increase in development and urbanization, due to industry and inexpensive power, and resulting conversion and modification of native wildlife habitats.
2) Increase of irrigated agriculture, particularly in the Lake Rufus Woods Subbasin, due to relatively inexpensive power and water supply.

3) Increased reliance on agriculture and timber industry for employment opportunities, in absence of salmon resource, with associated decrease in habitat quality due to habitat conversion, timber management, and road construction and use.
4) Increased hunting pressure on big game by subsistence and sport hunters in the absence of salmon resource.
5) Increased recreation pressure, both at reservoirs and in surrounding lands as population base increases, hunting pressures increase.
6) Increased number of roads and associated disturbances, barriers to movement, increased mortality, and fragmentation.

These secondary effects of hydropower development, while difficult to quantify, can be far-reaching. Mitigation for these effects in the Intermountain Province is sought as the third tier of priority for terrestrial resources mitigation. Due to the magnitude of the construction mitigation remaining outstanding, it is anticipated that completion of the construction mitigation and assessment and mitigation of operational effects will be the primary terrestrial mitigation activities during the first 10-year plan period. In some cases, the objectives and strategies for the secondary effects mitigation were developed to a less detailed level by the work teams, with the understanding that these would be revised and refined during subsequent planning periods. The secondary effects mitigation will address a broader array of habitats and species than the construction loss assessments. Protection of existing high value habitats and restoration of habitats is viewed as a primary goal.

4.8 Subbasin Assessments

The individual terrestrial resource assessments for the six IMP subbasins are provided in sections 8 (Coeur d'Alene), 16 (Pend Oreille), 24 (Spokane), 32 (Upper Columbia), 40 (San Poil), and 48 (Lake Rufus Woods). The subbasin assessments rely on the IBIS and GAP data to provide estimates of current habitat conditions; however, the historic habitat condition is provided only at the Province level (Section 4), due to the high degree of inaccuracy of these data sets for the historic time period. Information on the management and status of wildlife analysis species, particularly federal and state threatened and endangered species is provided for the Province in Section 4. The subbasin wildlife assessments do not repeat the general status and management information, but provide subbasin-specific information on species occurrence, management programs, and limiting factors.