

SECTION 24 – Table of Contents

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24 Spokane Subbasin Assessment – Terrestrial Resources

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

Vegetation in the Spokane Subbasin ranges from open grass prairies of the rolling Palouse Hills in the southeast to pine savannas at mid-elevations to higher elevation mixed conifer forests in the north and far southeast. Timber management is a major land use in the Little Spokane River drainage. Agriculture is widespread throughout the Subbasin and is the dominant land use in the Hangman/Latah creek drainage. Urban development dominates the east-central portion of the Subbasin, with the cities of Spokane and Spokane Valley comprising the largest urban center in the IMP. The Idaho communities of Post Falls, Hayden and portions of the city of Coeur d' Alene also occur within the Subbasin.

Figure 21.13 (Section 21) shows the current distribution of wildlife-habitat types in the Spokane Subbasin based on IBIS (2003). Table 24.1 presents the corresponding acreages by habitat type and by Subbasin focal habitat. Five focal habitats were selected for the IMP: wetlands, riparian, steppe and shrub-steppe, upland forest, and cliff/rock outcrops. Four of these habitats are represented by the IBIS data displayed in Figure 21.13 and Table 24.1. Cliff/rock outcrop habitats are not mapped by IBIS. Undeveloped, native habitats in the Spokane Subbasin occupy about 55 percent of the area and are dominated by ponderosa pine forest and woodlands (23 percent), eastside interior mixed conifer forest (18 percent), and shrub-steppe (6 percent). Wetlands comprise about 1.6 percent of the area (excluding open water habitats). Developed habitats, including agricultural and urban lands, currently occupy 45 percent of the Subbasin.

The IBIS data is based on satellite imagery at a scale that tends to under-represent habitats that are small in size or narrow in shape. Additional information on habitats within the Spokane Subbasin is available for selected ownerships and/or jurisdictions within the Subbasin; these sources include the WDFW priority habitats and species database, WDOE wetlands mapping, and studies performed by the Coeur d' Alene and Spokane tribes. Data from these sources has been used where available to provide more specific information on habitat distribution within the Subbasin.

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

Table 24.1. Current wildlife-habitat types in the Spokane Subbasin

Wildlife-Habitat Type	Spokane Current Acres	Percent of Total
Wetlands (Focal Habitat)		
Lakes, Rivers, Ponds, and Reservoirs	30,021	1.6%
Herbaceous Wetlands	1,823	0.1%
Montane Coniferous Wetlands	25,244	1.4%
Riparian and Riparian Wetlands (Focal Habitat)		
Eastside (Interior) Riparian Wetlands	1,430	0.1%
Steppe and Shrub-Steppe (Focal Habitat)		
Westside Grasslands	51	0.0%
Eastside (Interior) Grasslands	84,059	4.5%
Shrub-Steppe	107,867	5.8%
Upland Forest (Focal Habitat)		
Westside Lowland Conifer-Hardwood Forest	4,997	0.3%
Montane Mixed Conifer Forest	584	0.0%
Eastside (Interior) Mixed Conifer Forest	334,048	18.0%
Lodgepole Pine Forest and Woodlands	2,857	0.2%
Ponderosa Pine Forest and Woodland	426,089	22.9%
Upland Aspen Forest	1,108	0.1%
Alpine and Subalpine		
Alpine Grasslands and Shrublands	1,142	0.1%
Developed		
Agriculture, Pasture, and Mixed Environs	763,035	41.1%
Urban and Mixed Environs	73,440	4.0%
Total	1,857,795	100.0%

(Source: IBIS 2003)

24.1.1 Open Water, Wetlands, and Riparian Areas

Figure 24.1 shows the distribution of wetlands in the Washington portion of the Spokane Subbasin based on the WDOE mapping (WDOE 1999), using aggregated National Wetlands Inventory wetland types. The IBIS wildlife-habitat map (Figure 21.13) is based in part on National Wetland Inventory mapping, but does not utilize all of the wetland categories or show the full extent of very small mapped areas. Table 24.2 summarizes the acreages of wetlands in the Washington portion of the Subbasin by wetland category. Riparian zones have been described for portions of the Subbasin, including the Spokane River and Hangman Creek (Avista 2003, Spokane County Conservation District 2003, and Spokane River Subbasin Summary, Whalen 2000).

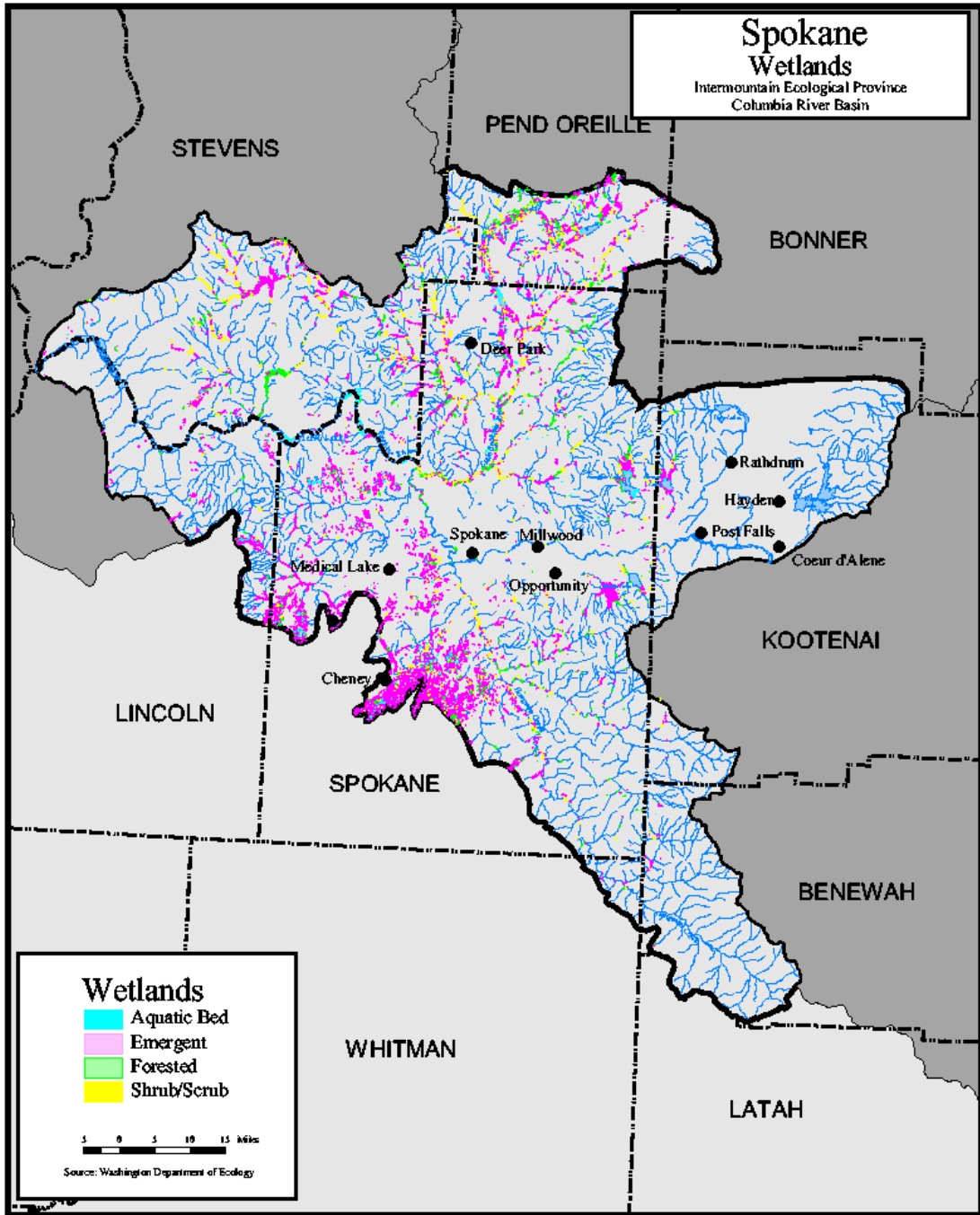


Figure 24.1 Wetland areas within the Spokane Subbasin

Table 24.2. Acres of wetlands in the Washington portion of the Spokane Subbasin by wetland type

Wetland Type	Acres
Emergent	23,370
Scrub/shrub	4,161
Forested	2,957
Aquatic bed	1,674
Total all wetland types	32,162

(Source: WDOE 1999)

24.1.1.1 Open Water

The Spokane River, Little Spokane River, and Hangman Creek (also known as Latah Creek) are the largest riverine systems in the Subbasin. Large reservoirs include the Spokane Arm of Lake Roosevelt and Long Lake (also referred to as Lake Spokane) above the Long Lake Dam. Major lakes in the Subbasin include Liberty Lake east of Spokane; Hauser, Newman and Spirit lakes in Idaho; and Eloika and Diamond lakes in the Little Spokane River watershed.

The Spokane River has been significantly influenced by water resource projects, with the majority of the river being managed to provide reservoir storage during some portion of each year. The Lake Roosevelt reservoir created by Grand Coulee Dam on the Columbia River inundated approximately 28 miles of the Spokane River (Whalen 2000). Seven other water resource developments are located along the Spokane River's current 111-mile length: the Little Falls Project, the Upriver Project, and the Spokane River Hydroelectric Project consisting of five developments: Post Falls at RM 102, Upper Falls at RM 74.2, Monroe Street at RM 74, Nine Mile at RM 58, and Long Lake at RM 34 (Avista 2003). The remaining free-flowing reaches of the Spokane River are limited to a 15-mile reach downstream of Post Falls Dam, a 2-mile-reach downstream of Upriver Dam, a 10-mile reach below Monroe Street Dam, and a 0.5-mile reach below Nine Mile Dam (Avista 2003).

The Little Spokane River has been influenced by residential, agricultural, industrial, and timber management land uses. Surface water rights within the basin are dominated by irrigation uses (75 percent), with additional withdrawals for domestic use and stock watering (WDOE 1995).

Hangman Creek has been affected by industrial and residential growth near its confluence with the Spokane River. The upper and middle reaches of the watershed support extensive agricultural developments, often up to the edge of the stream (Whalen 2000). Hangman Creek is extremely variable in flow volumes, ranging from near 10 cfs during summer months to over 20,000 cfs during winter storm events (SCCD 2003).

24.1.1.2 Wetlands and Riparian Areas

Riparian vegetation along the Spokane River corridor is limited primarily to narrow, intermittent bands immediately adjacent to the river. Occasional patches of more

extensive wetlands occur in areas where the river supports a broader floodplain and at the confluences of major tributary streams (Figure 24.1).

Riparian zones along the 28-mile long Spokane Arm of Lake Roosevelt were inundated by Lake Roosevelt. Approximately 195 acres of river-edge riparian and riparian forest habitats were inundated on the Spokane Reservation (Creveling and Renfrow 1986). The inundated areas included riparian cottonwood forests and other riparian habitats along the lower Spokane River (K. Singer, Spokane Tribe of Indians, personal communication, October 16, 2003). The loss of cottonwood galleries, island habitats, and riverine function due to hydropower development, coupled with the degradation of remaining riparian habitats from agriculture practices, livestock grazing, and development, has contributed significantly towards the decline of shoreline associated populations, e.g., herons and shorebirds (H. Ferguson, WDFW, personal communication, April 2, 2004).

The current shoreline of the Spokane Arm continues to be influenced by the reservoir fluctuations on daily and seasonal bases. During the approximately three-month winter drawdown period, the water surface elevation of Lake Roosevelt is as much as 80 feet below the full pool level. The fluctuation zone is largely unvegetated, and provides little wildlife value.

Riparian habitats along the Spokane River upstream of Long Lake Dam were described by Avista (2003). Long Lake Reservoir supports a narrow band of riparian habitat along much of the shoreline, with more extensive wetlands at canyon mouths, at Woody Slough on the east end of the lake, and at the Little Spokane River delta. The delta area includes deciduous forest, scrub-shrub, and emergent wetlands. Vegetation of the Lake Spokane riparian zones includes a variety of native species as well as introduced weeds such as the aquatic species Eurasian milfoil. Nine Mile reservoir is bounded by varied terrain that includes basalt cliffs, steep unstable slopes, benches, islands, and mud flats. Weedy vegetation dominates the riparian wetlands, including purple loosestrife, reed canarygrass, and Japanese knotweed. Upstream of Nine Mile, riparian vegetation includes emergent, scrub-shrub, and deciduous forest wetlands at intermittent locations along the riverbanks. Cottonwood trees were noted in the reach upstream of Upriver Dam (RM 80).

Woody riparian zones are present along some reaches of the Little Spokane River, including the Little Spokane Natural Area which is located along seven miles of the lower river.

The majority of the Hangman Creek watershed is currently in agricultural land uses, resulting in conversion of native shrub-steppe, tilling of the soil up to the creek's edge, channelization of the stream, and removal of large woody material (Whalen 2000). These activities, in combination with the steep slopes, fine silt and soils, and seasonal high flows, contribute to active erosion along much of the stream. Very little woody riparian vegetation remains along the creeks in this watershed.

Extensive emergent wetlands are associated with several of the major lakes in the Subbasin, including Diamond and Eloika lakes in the Little Spokane drainage, Newman Lake in the eastern Spokane River drainage, the Medical Lake complex, and various lakes and sloughs of the northern Turnbull National Wildlife Refuge near Cheney.

24.1.2 Steppe and Shrub-steppe

Steppe and shrub-steppe habitats currently occupy about 10 percent of the Spokane Subbasin (Table 24.1). Grassland habitats remain primarily in the east-central and northwestern portions of the Subbasin, and in the upper Hangman Creek drainage in the southeastern portion of the Subbasin (Figure 21.9). Shrub-steppe habitats are present mainly in the southwestern portion of the Subbasin. The majority of these habitats have been modified from historic conditions through grazing, agriculture, and rural residential development. Extensive areas have been converted to non-vegetated habitats through industrial and urban development.

Development of the federal hydropower system contributed to the conversion of shrub-steppe habitats to open water reservoirs. Approximately 28 miles of the lower Spokane River was inundated by creation of Lake Roosevelt on the Columbia River (Whalen 2000), including shrub-steppe habitats. A total of 636 acres of shrub-steppe was lost on the Spokane Reservation; a portion of this was located within the Spokane River Subbasin. Construction of other hydropower projects along the Spokane River may have affected steppe and shrub-steppe habitats; however, no estimates of habitat areas inundated are available. Loess soils of the Palouse Hills have been extensively developed for dryland agriculture of wheat, cereal grains, alfalfa, and legumes. One estimate indicates that 56 percent of the Hangman Creek watershed is managed for dryland agriculture (Whalen 2000). The portion of the Hangman Creek drainage within the Coeur d' Alene Reservation was analyzed by the Tribe's Natural Resources Department (G. Green, CDAT, personal communication, September 5, 2003). Based on this analysis, approximately 60 percent of the habitat has been converted to agriculture, with a small amount converted into developed cover types (less than one percent). Throughout the Subbasin, fire suppression and grazing have also modified the plant species composition of remaining grassland and shrub-steppe habitats.

24.1.3 Upland Forests

Upland forests in the Spokane Subbasin are dominated by ponderosa pine (23 percent) and mixed conifer forests (18 percent, Table 24.1). Ponderosa pine forests and woodlands are distributed throughout the Subbasin; mixed conifer forests are found at higher elevations primarily in the northern portion of the Subbasin.

Construction of the Grand Coulee Project resulted in inundation of approximately 1,018 acres of ponderosa pine savannah and 66 acres of ponderosa pine forest on the Spokane Reservation; a portion of these lands are located within the Spokane River Subbasin. The Long Lake and Post Falls project reservoirs also likely inundated limited quantities of ponderosa pine habitats at the time of construction. Agricultural, industrial, and residential development in the Subbasin have converted many acres of ponderosa pine forests and woodlands to non-vegetated cover types. Timber harvest continues to be an

important land use on private lands in the upper Little Spokane River drainage; timber management occurs on a smaller scale in other forested portions of the Subbasin. Forest stands in general show a reduction in the proportion of mature and old growth stands with respect to historic conditions, many sites show a general decreasing trend in ponderosa pine with replacement by other coniferous species. Fire suppression also has influenced the stand structure, species composition, and understory structure of forested habitats in the Subbasin.

24.1.4 Other Terrestrial Resource Limiting Factors

As noted in the Section 4, numerous specific habitat elements (called key environmental correlates, or KECs in IBIS terminology) influence the value of wildlife-habitat types to individual wildlife species. Habitat elements may include natural attributes, such as snags, downed wood, soil types, and also include anthropogenic features such as buildings, chemical contaminants, and roads. Information on site-specific habitat elements is critical to determination of habitat suitability for wildlife; however, data is not available at a subbasin-wide level for most habitat elements. Information on selected habitat elements having important influences on habitat quality and wildlife use has been compiled for this assessment, including road density and salmonid nutrients lost to the Intermountain Province.

24.1.4.1 Road Density

Figure 21.14 (Section 21) displays road density by density class in sixth order watersheds of the Subbasin. The area including the cities of Spokane and Spokane Valley is rated as very high road density (4.7 to 16.4 miles of road per square mile); most of the surrounding areas are rated as high (1.7 to 4.7 miles of road per square mile). Other areas ranked as high road density include the Hayden Lake area, the Mt. Spokane State Park vicinity, National Forest System lands north of Eloika Lake, and an area along the western edge of the Subbasin. Moderate road densities (0.7 to 1.7 miles per square mile) were determined for areas in the upper Hangman drainage, portions of the Spokane River drainage, and the majority of the Little Spokane River drainage. No areas within the Subbasin were ranked as very low road density.

High road densities are indicative of human land uses and activities. In the Spokane River Subbasin, high and very high road densities are associated primarily with urban centers. High densities are also present on managed timberlands. Road density values in excess of 1.5 miles per square mile are considered suboptimal for mule deer summer range; values greater than 0.5 miles per square mile are suboptimal for the species on their winter range (WDFW 1991). The majority of the Subbasin exceeds the road density levels considered optimal for mule deer winter range; a substantial portion of the Subbasin is at or near (moderate ranking) the value considered suboptimal for summer ranges.

24.1.4.2 Loss of Salmonid Nutrient Base

Construction of the Chief Joseph and Grand Coulee dams on the Columbia River eliminated the potential for salmon to return to areas traditionally and culturally used by the Spokane, Coeur d' Alene, and other native American Tribes, including portions of the Spokane River Subbasin. The loss of anadromous fish affected not only tribal and

recreational use of the fisheries resource, but also affected salmon-dependent wildlife and modified the nutrient input to the overall ecosystem.

Appendix E of the 1987 Columbia Basin Fish and Wildlife Program (Council 1987) presents the results of several alternative calculations to determine the loss of salmon within the Columbia River system due to hydropower development. Based on the pre-1850 run size, with no dams in place, the number of adults at spawning grounds in reaches above Chief Joseph Dam would total 3,175,000 fish, with sockeye comprising greater than 55 percent, summer Chinook 19 percent, and fall Chinook, spring Chinook, coho, and steelhead the remaining 26 percent. Although the analysis does not break out the returns by major river and stream systems, it can be assumed that a significant number of fish would have returned to accessible portions of the Spokane River.

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

24.1.4.3 Lake Roosevelt Shoreline Erosion

Wave action, combined with fluctuating water surface levels and unstable soils, has contributed to erosion of steep banks along portions of the Spokane Arm of Lake Roosevelt. USBR (1984) reported that 11.5 miles of Lake Roosevelt shoreline were lost to slides on Spokane Reservation lands; several of the sites are located on the Spokane Arm.

Erosion of the Lake Roosevelt shoreline has the potential to affect terrestrial resources through direct loss of habitats, including shrub-steppe, grasslands, wetlands, and riparian shrubs and trees. Direct loss of wildlife could occur through effects to active nesting sites of species such as Canada goose or mallard, and burrow or denning sites. Figure 21.12 (Section 21) shows the portion of Lake Roosevelt located within the Spokane Subbasin and highlights the areas of high erosion potential along the shoreline. Analysis of a 300-foot wide band, extending upslope from the average reservoir elevation of 1,290 feet, shows that 23 percent of the area within the band is classified as high erosion potential, while 7 percent of the area is bedrock. To date, site-specific assessment of the effects of shoreline erosion on terrestrial resources has not been conducted.

24.1.5 Land Ownership and Gap Status

Land ownership in the Spokane River Subbasin is summarized in Table 24.3, based on Gap Analysis Program data (IBIS 2003). A map of ownership categories in the province is presented in Section 4, Figure 4.3. The Spokane River Subbasin is dominated by

private ownership (84 percent), with small percentages in federal (3 percent), Tribal (8 percent), and state (4 percent). Relative protection levels of native habitats are shown in Table 24.4, GAP Status. No lands within the Subbasin are categorized as Status 1, High Protection, due to the absence of highly protected habitats such as designated wilderness areas. Habitats protected under Status 2, Medium Protection (1 percent of total), include the Coulee Dam National Recreation Area along the Spokane Arm of Lake Roosevelt, Riverside State Park near Spokane, and portions of Mt. Spokane State Park and the Turnbull National Wildlife Refuge. Of the total acreage under Status 2 protection, focal habitats comprise about 89 percent: 2 percent wetlands, 13 percent steppe and shrub-steppe, and 74 percent upland forests. Lands under Low Protection (Status 3) levels total about 8 percent of the Subbasin. Lands with No or Unknown Protection total over 90 percent of the Subbasin. Due to the scale of mapping, small parcels may be incorrectly categorized in this analysis.

Table 24.3. Land ownership in the Spokane Subbasin by wildlife-habitat type

Wildlife-Habitat Types (acres)	Federal Lands	Native American Lands	State Lands	Local Gov't. Lands	Non-Gov't. Org. Lands	Private Lands	Water	Total
Wetlands (Focal Habitat)								
Lakes, Rivers, Ponds, and Reservoirs	1,198	3,148	691	172	0	20,570	6,386	32,164
Herbaceous Wetlands	19	0	29	0	0	2,314	13	2,375
Montane Coniferous Wetlands	258	1,099	620	327	0	25,547	0	27,852
Riparian and Riparian Wetlands (Focal Habitat)								
Interior Riparian Wetlands	4	0	53	0	0	1,445	23	1,526
Steppe and Shrub-Steppe (Focal Habitat)								
Interior Grasslands	802	12,955	3,598	136	0	81,687	0	99,179
Shrub-steppe	2,186	13,929	4,366	116	0	89,659	0	110,256
Upland Forest (Focal Habitat)								
Mesic Lowland Conifer-Hardwood Forest	3,885	0	67	0	0	1,028	0	4,979
Montane Mixed Conifer Forest	414	0	19	0	0	153	0	586
Interior Mixed Conifer Forest	37,685	21,316	35,138	857	0	236,690	0	331,686
Lodgepole Pine Forest & Woodlands	1,136	0	204	1	0	2,675	0	4,016
Ponderosa Pine Forest & Woodlands	4,702	74,498	23,700	2,555	0	310,110	0	415,565
Upland Aspen Forest	16	0	292	1	0	2,300	0	2,609
Alpine and Subalpine								
Subalpine Parkland	0	0	0	0	0	0	0	0
Alpine Grasslands and Shrublands	39	0	61	0	0	1,086	0	1,187
Developed								
Agriculture, Pasture, and Mixed Environs	4,371	14,960	7,839	860	0	721,947	0	749,977
Urban and Mixed Environs	163	0	995	1,167	0	71,554	0	73,878
Total Acres	56,877	141,905	77,672	6,193	0	1,568,764	6,422	1,857,833

(Source: IBIS 2003)

Table 24.4 GAP status of lands in the Spokane Subbasin by wildlife-habitat type

Wildlife-Habitat Type (acres)	1 - High Protection	2 - Medium Protection	3 - Low Protection	4 - No Protection	Water	Total
Wetlands (Focal Habitat)						
Lakes, Rivers, Ponds, and Reservoirs	0	1,261	664	23,702	6,696	32,323
Herbaceous Wetlands	0	19	63	2,276	13	2,371
Montane Coniferous Wetlands	0	398	1,313	26,107	0	27,818
Riparian and Riparian Wetlands (Focal Habitat)						
Interior Riparian Wetlands	0	0	85	1,420	20	1,526
Steppe and Shrub-Steppe (Focal Habitat)						
Westside Grasslands	0	44	0	0	0	44
Interior Grasslands	0	673	5,075	93,469	0	99,218
Shrub-steppe	0	2,499	4,779	102,944	0	110,223
Upland Forest (Focal Habitat)						
Mesic Lowland Conifer-Hardwood Forest	0	0	3,953	1,024	0	4,977
Montane Mixed Conifer Forest	0	0	448	139	0	587
Interior Mixed Conifer Forest	0	9,497	69,805	252,681	0	331,983
Lodgepole Pine Forest & Woodlands	0	13	1,399	2,615	0	4,027
Ponderosa Pine Forest & Woodlands	0	8,759	28,740	378,226	0	415,724
Upland Aspen Forest	0	2	406	2,203	0	2,611
Alpine and Subalpine						
Subalpine Parkland	0	0	0	0	0	0
Alpine Grasslands and Shrublands	0	0	98	1,094	0	1,192
Developed						
Agriculture, Pasture, and Mixed Environs	0	1,299	24,474	723,580	0	749,353
Urban and Mixed Environs	0	378	1,427	72,051	0	73,856
Total Acres	0	24,843	142,730	1,683,531	6,729	1,857,833

(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.

24.2 Wildlife of the Spokane Subbasin

24.2.1 Wildlife Occurring in the Spokane Subbasin

The Spokane River Subbasin provides a wide range of wildlife-habitat types including grasslands, shrub-steppe, ponderosa pine woodlands, wetlands, and interior mixed coniferous forests. There are approximately 353 terrestrial vertebrate wildlife species using these habitats, many of which are important for ecological, cultural, and/or economic reasons. Table 24.5 presents the terrestrial vertebrate wildlife species occurring within the Spokane Subbasin (IBIS 2003). Due to the large number of wildlife species in the Subbasin, the following discussion focuses on wildlife species that are important indicators of habitat quality, those representing other wildlife species, and those with special management status. WDFW harvest information for key game species is summarized; more detailed harvest information based on WDFW (2004a) is provided in Appendix G. For further information on the broader spectrum of wildlife species in the Subbasin, refer to the Spokane River Subbasin Summary (Whalen 2000).

Table 24.5. Number of wildlife species (and percent of Province total) in the Spokane Subbasin

	Occurring Species	HEP/Priority Species	HEP/Priority Species Closely Associated With Herbaceous Wetlands	HEP/Priority Species Closely Associated With Riparian Wetlands	HEP/Priority Species That Feed Upon Salmon	Occurring Species That Feed Upon Salmon
Amphibians	14 (82%)	1	1	1	0	1
Birds	237 (86%)	10	1	3	2	56
Mammals	86 (85%)	5	1	3	1	22
Reptiles	16 (89%)	0	0	0	0	2
Total	353 (86%)	16	3	7	3	81

(Source: IBIS 2003)

24.2.2 HEP and Priority Species of the Spokane Subbasin

Subbasin planners selected a group of wildlife species to represent the focal habitats and wildlife of the Spokane River Subbasin. Wildlife species used in the Grand Coulee Habitat Evaluation Procedures (HEP) study (Creveling and Renfrow 1986) were selected because they were used in the construction and inundation loss assessment for the federal hydrosystem project and because they will be used in the future to evaluate mitigation for the project. Additional wildlife species were selected due to their management, cultural, and/or economic values in the Subbasin; these species also represent specific focal habitats. The list of HEP and priority species for the Subbasin, as well as federal and state-listed threatened and endangered species, is presented in Table 24.6.

Table 24.6. Federal and state endangered/gthreatened, HEP, and priority wildlife species of the Spokane Subbasin and degree of association¹ with focal habitats during breeding

Common & Scientific Names	Federal/ ID / WA Listing Status ²	HEP/ Priority Status ³	Focal Habitats				
			Cliff/ Rock Outcrop	Wetland	Riparian	Steppe/ Shrub-Steppe	Upland Forest
American beaver <i>Castor canadensis</i>	-	P(1,2,3)	-	<u>Close</u>	<u>Close</u>	-	-
Bald eagle <i>Haliaeetus leucocephalus</i>	T / e / t	P(1,3,4)	-	-	<u>General</u>	-	General
Canada goose <i>Branta canadensis</i>	-	HEP	General	Close	-	General	-
Canada lynx <i>Lynx canadensis</i>	T / - / t	P(4)	-	-	-	-	Close
Columbia spotted frog <i>Rana luteiventris</i>	-	P(1)	-	<u>Close</u>	<u>Close</u>	-	-
Fisher <i>Martes pennanti</i>	- / - / e	P(4)	-	General	-	-	Close
Golden eagle <i>Aquila chrysaetos</i>	-	P(1,3)	<u>Close</u>	-	General	General	General
Gray wolf <i>Canis lupus</i>	T / e / e	P(4)	-	-	General	General	General
Grizzly bear <i>Ursus arctos</i>	T / t / e	P(4)	-	-	-	-	General
Mink <i>Mustela vison</i>	-	P(1,2)	-	<u>Close</u>	<u>Close</u>	-	-
Mourning dove <i>Zenaidura macroura</i>	-	HEP	-	-	<u>Close</u>	General	General
Mule deer <i>Odocoileus hemionus hemionus</i>	-	HEP	-	General	General	<u>General</u>	General
Peregrine falcon <i>Falco peregrinus</i>	- / e / -	P(4)	Close	-	General	General	General
Pileated woodpecker <i>Dryocopus pileatus</i>	-	P(1)	-	General	General	-	<u>General</u>
Ruffed grouse <i>Bonasa umbellatus</i>	-	HEP	-	<u>General</u>	<u>Close</u>	-	<u>Close</u>
Sage grouse <i>Centrocercus urophasianus</i>	- / - / t	HEP	-	-	-	<u>Close</u>	-
Sage sparrow <i>Amphispiza belli</i>	-	P(1)	-	-	-	<u>Close</u>	General
Sharp-tailed grouse <i>Tympanuchus phasianellus columbianus</i>	- / - / t	HEP	-	-	-	<u>Close</u>	General
Snowshoe hare <i>Lepus americanus</i>	-	P(1)	-	Close	Close	-	<u>Close</u>
Upland sandpiper <i>Bartramia longicauda</i>	- / - / e	P(4)	-	General	-	Close	-
White-headed woodpecker	-	P(1)	-	-	General	-	<u>Close</u>

Common & Scientific Names	Federal/ ID / WA Listing Status ²	HEP/ Priority Status ³	Focal Habitats				
			Cliff/ Rock Outcrop	Wetland	Riparian	Steppe/ Shrub-Steppe	Upland Forest
<i>Picoides albolarvatus</i>							
White-tailed deer <i>Odocoileus virginianus</i>	-	HEP	-	-	<u>Close</u>	General	<u>General</u>
Yellow warbler <i>Dendroica petechia</i>	-	P(1)	-	-	<u>Close</u>	-	-

(Source: Spokane Subbasin Work Team and IBIS 2003)

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

General = Animal adaptive and supported by numerous habitats.

² **E** = Federal Endangered. **T** = Federal Threatened. **e** = State Endangered. **t** = State Threatened. State listings for Idaho and Washington shown in that order.

³ **HEP** = Species evaluated via Habitat Evaluation Procedures loss assessment for Grand Coulee Dam (Creveling and Renfrow 1986)

P = Priority species designated as important because it is **(1)** ecological indicator for habitat or other animals, **(2)** game animal, **(3)** highly culturally prized, or **(4)** special status for management. Many priority species were selected to represent one or more focal habitat types; the habitat(s) a species represents is(are) indicated by underlined degree of association (e.g., close).

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

24.2.2.1 Federal and State Threatened and Endangered Species

Bald eagle. The Spokane Subbasin currently supports 11 bald eagle nesting territories and one communal winter roost (WDFW 2003b). Six nesting territories and the communal roost are located along the Spokane River between Long Lake Dam and Nine Mile Dam. The other five territories occur at Diamond Lake, Eloika Lake, Liberty Lake, Newman Lake, and Philleo Lake (H. Ferguson, WDFW, personal communication, April 2, 2004).

Canada lynx. The Spokane Subbasin is outside of the six Lynx Management Zones (LMZs) or subsequent Lynx Analysis Units (LAUs) established by the WDFW (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 closest historic Washington location for lynx in this Subbasin was reportedly near Chewelah, where a skull was collected in 1917 (Stinson 2001). The only recent occurrence of Canada lynx in Washington's part of the Spokane Subbasin is a

1992 sighting at Liberty Lake Regional Park (WDFW 2003b). In the Idaho portion of the Spokane Subbasin, no lynx sightings are documented (IDFG 2003).

Fisher. Records for the Washington portion of the Subbasin show one sighting of a fisher in 1998 within a tributary drainage east of the Little Spokane River (WDFW 2003b).

Gray wolf. The wolf's occurrence within the Washington side of the Spokane Subbasin is very rare, as reflected by only one recorded sighting of an adult in 1991 near Long Lake Dam (WDFW 2003b). No current records of gray wolf are recorded for the Idaho portion of the Spokane Subbasin (IDFG 2003), although wolf have been observed in Idaho's Kootenai County, based on either museum records, incidental sightings, or field surveys (IDFG 2001). The closest wolf pack, named the Marble Mountain pack, is in the Coeur d'Alene Subbasin east of the Spokane Subbasin on the central border between Benewah and Shoshone counties (Mack and Holyan 2003).

Grizzly bear. The Spokane Subbasin is outside of the seven federal grizzly bear Recovery Plan zones, although the Selkirk Zone is located in the Pend Oreille Subbasin to the north. The Washington portion of the Subbasin has a single confirmed grizzly sighting in 1996 from the Dragoon Creek drainage (WDFW 2003b). The Idaho Conservation Data Center does not monitor this species, so occurrence of grizzly in the Idaho portion of the Subbasin is unknown.

Peregrine falcon. Within the Spokane subbasin in Washington, one eyrie is present in the Hangman Creek drainage and another unoccupied hack site is a few miles away on the Spokane River (WDFW 2003b). Another new eyrie may have been found in 2003 at Hawk Creek and will be verified in 2004 (H. Ferguson, WDFW, personal communication, April 2, 2004). The Idaho portion of the Subbasin has no record of peregrine sightings (IDFG 2003).

Sage grouse. In 1998, the Washington Fish and Wildlife Commission listed the sage grouse as threatened. Populations of sage grouse have been dramatically reduced in Washington state due to conversion of suitable shrub-steppe habitats to agricultural uses and degradation of remaining shrub-steppe (Schroeder et al. 2003). Direct effects to sage grouse breeding and wintering habitats are believed to have occurred as a result of inundation of lands under Lake Roosevelt; a total of 76 birds were estimated to have been lost on the Spokane Reservation (Creveling and Renfrow 1986). However, no specific Habitat Unit mitigation requirement was established for the Spokane Tribe, as little sagebrush-steppe habitat was thought to have been affected on the Spokane Reservation (Creveling and Renfrow 1986). Currently, there are two known breeding populations in the state, both are located in counties west of the Spokane Subbasin (Schroeder et al. 2003).

Sharp-tailed grouse. In 1998, the Washington Fish and Wildlife Commission listed the sharp-tailed grouse, Columbian subspecies, as threatened. Although historically present within the Spokane River Subbasin, no populations of sharp-tailed grouse are currently

known to exist in the Subbasin (Schroeder and Tirhi 2003; WDFW 2003b). Habitat for the species has been reduced 76 percent since the late 1800s due to conversion of native habitats to agricultural uses (Schroeder and Tirhi 2003). The overall population declined almost continually between 1960 and 2001, but particularly during the 1960s and 1970s when populations are estimated to have fallen from about 10,000 birds to less than 1,000. The overall estimated decline was 95.7 percent between 1960 and 2001; the current distribution of sharp-tailed grouse covers approximately 2.8 percent of their historic range. The primary factor resulting in loss of native habitat was conversion of native habitat to dryland farming (Yocom 1952; Buss and Dziedzic 1955). Dams along the Columbia River resulted in additional loss of habitat due to flooding and indirect loss of habitat due to expansion of irrigated farming (Schroeder 2001).

Potential habitat for sharp-tailed grouse was inundated by construction of the Grand Coulee Dam. Creveling and Renfrow (1986) note 2,609 HUs for sharp-tailed grouse were lost on the Spokane Reservation; this was the greatest single species loss incurred on the Reservation. Sharp-tailed grouse habitat inundation would have occurred within and/or adjacent to the Spokane River Subbasin as defined for this analysis.

State of Washington management is directed at 1) species monitoring via winter and lek surveys, 2) habitat protection and enhancement via acquisition, incentives, seedings, and plantings, 3) population reintroduction and augmentation, 4) protection enforcement, and 5) public awareness (Schroeder and Tirhi 2003). Currently, the Spokane Tribe is conducting a feasibility assessment for the reintroduction of sharp-tailed grouse on the Spokane Reservation; the study is scheduled for completion in summer 2004 (K. Singer, Spokane Tribe, personal communication, October 16, 2003). The Coeur d' Alene Tribe management goal is to reintroduce sharp-tailed grouse to the Coeur d' Alene Reservation by 2010 (B. Kinkead, Coeur d' Alene Tribe, personal communication, October 16, 2003).

Upland Sandpiper. The upland sandpiper was classified as an endangered species by the Washington Wildlife Commission in 1981. Upland sandpiper is not known to have reproduced in Spokane County since 1993 (Iten et al. 2001). In the Washington portion of the Subbasin, upland sandpipers were seen during the nesting season of 1984, 1986, 1987, and 1992 on private land south of Newman Lake (WDFW 2003b). During 2002 and 2003 birds were observed west of Spokane from the end of May up to the middle of June; an intensive survey will be conducted during the 2004 breeding season to determine status of these birds (H. Ferguson, WDFW, personal communication, April 2, 2004).

24.2.2.2 Grand Coulee HEP Species

Canada goose. Canada goose was selected for the HEP loss assessment of Grand Coulee Dam to show the effects of reservoir impoundment on small islands in the Columbia River that provided secure breeding habitat for geese. A loss of 20 secure island nest sites was estimated for the Spokane Reservation portion of Lake Roosevelt (Creveling and Renfrow 1986); some portion of these would likely have been within the Spokane Subbasin as delineated for this analysis. Data from the WDFW shows that the Spokane Subbasin accounts for about five percent of the state's goose hunting harvest and four

percent of its goose hunting recreation (Appendix G). That statistic combines all goose species (Canada goose, snow goose, Brandt, etc.).

Mourning dove. The mourning dove is a Grand Coulee Dam HEP assessment species, widespread in the Subbasin but closely associated with riparian habitat. Mourning dove was used in the HEP study to represent wildlife using riparian and agricultural lands, particularly orchards and open ground (Creveling and Renfrow 1986). The Subbasin accounts for approximately three percent of the Washington total for dove hunting harvest and recreation. The Grand Coulee Project caused the loss of 9,316 mourning dove Habitat Units. A total of 653 mourning dove Habitat Units were lost on the Spokane Reservation, which is located partially within the Spokane River Subbasin.

Mule deer and white-tailed deer. In the Spokane Subbasin, white-tailed deer are more closely associated with agriculture, pasture, and woodland habitats than upland forests (WDFW 2003a). In Washington, the most recent data (1996-99) shows that post-hunting herd composition for both white-tailed deer (16-29 bucks:100 does) and mule deer (15-37 bucks:100 does) in GMUs 127 and 130 consistently exceeded the management guideline of 15:100 (WDFW 2001). The post hunting ratio between females and young remained high, indicating good or very good habitat and weather conditions for white-tails especially. Current habitat conditions are expected to support increased population growth until a severe winter or significant drought. White-tailed deer experienced significant losses in GMU 121 from epizootic hemorrhagic disease (EHD). Collisions between vehicles and deer in GMU 127 are a public concern.

The WDFW's harvest management objective is to maintain both white-tailed deer and mule deer numbers that (1) are compatible with landowners and urban expansion, (2) provide as much hunting and viewing recreation as possible, (3) meet a post-hunting-season buck:doe ratio of at least 15:100, and (4) maintain healthy buck:doe:fawn ratios in areas with deer damage to agriculture.

In the Idaho portion of the Spokane Subbasin, white-tailed deer management objectives are to maintain a harvest of at least 30 percent bucks with 4 or more antler points per side, and at least 7 percent bucks with 5 or more antler points per side. The most recent data (years 2000-2002) varied from 58 to 61 percent bucks with 4 or more antler points per side, and from 20 to 27 percent bucks with 5 or more antler points per side. The Idaho mule deer management objective is to maintain a harvest of at least 30 percent bucks with 4 antler points or better for a three-year running average. The most recent data (years 2000-2002) averaged 43 percent (range 42 to 45) with 4 points or better, significantly exceeding the minimum.

An estimate of deer hunting harvest and recreation in the Subbasin is presented in Table 24.7 for mule and white-tailed deer combined. These statistics show that the Washington side of the Subbasin produces approximately 9 percent of the state's deer hunting harvest and 7 percent of its deer hunting recreation. The small portion in Idaho contributes a relatively insignificant amount to that state's deer harvest and hunting recreation.

Table 24.7. Mule deer and white-tailed deer hunting harvest and recreation within the Spokane Subbasin¹

Year	Harvest						Hunter-Days					
	Quantity			% of State Total			Quantity			% of State Total		
	ID	WA	Total	ID	WA	Total	ID	WA	Total	ID	WA	Total
1999	119	2,980	3,098	0.3	9.3	4.6	2,198	101,166	103,364	0.3	7.0	4.5
2000	129	4,196	4,325	0.4	11.2	5.9	n.d.	75,416	-	-	7.9	-
2001	134	3,010	3,144	0.3	8.3	4.0	1,664	54,276	55,940	0.3	6.5	4.0
2002	110	2,976	3,086	0.3	8.8	4.3	2,113	56,582	58,694	0.3	6.8	3.7
Average	123	3,290	3,413	0.3	9.4	4.7	1,992 ²	71,860	72,666 ²	0.3	7.0	4.1 ²

(Source: Appendix G)

¹ Includes portions of Idaho Big Game Unit 5, plus Washington Game Management Units 121, 124, 127, and 130.

² 3-year average instead of 4-years due to no data (n.d.).

Ruffed grouse. Hunting for forest grouse (ruffed grouse, blue grouse, and spruce grouse) occurs in all Washington counties of this Subbasin, but most birds are harvested in Stevens and Pend Oreille counties. Spokane County harvests fewer than 20 percent of the number for Stevens County. The agency estimates that ruffed grouse comprise 75 to 80 percent of the total grouse harvest. The Spokane Subbasin accounts for about seven percent of Washington’s grouse hunting harvest and five percent of its grouse hunting recreation (Table 24.8). Idaho grouse hunting data is not reported at a hunting unit or county level for Subbasin proportioning, so that state’s statistics are not included here.

Table 24.8. Forest grouse (guffed grouse, blue grouse, and spruce grouse) hunting harvest and recreation within the Washington portion of the Spokane Subbasin¹

Year	Harvest		Hunter-Days	
	Quantity	% of State Total	Quantity	% of State Total
1999	6,249	8.5	12,528	6.6
2000	10,004	6.8	20,854	5.2
2001	6,191	5.6	12,495	4.2
2002	7,124	5.1	13,800	4.2
Average	7,392	6.5	14,919	5.0

(Source: Appendix G)

¹ Subbasin includes portions of Lincoln, Pend Oreille, Spokane, and Stevens counties in Washington, plus Kootenai County in Idaho.

Sage grouse. Refer to preceding discussion under Federal and State Threatened and Endangered Species.

Sharp-tailed grouse. Refer to preceding discussion under Federal and State Threatened and Endangered Species.

24.2.2.3 Other Priority Species

American beaver. Beaver was selected as a priority species for the Spokane Subbasin due to its close association with forested wetland and riparian habitats. The beaver is present in all Washington counties of this Subbasin. Trapping harvest is several times higher in the counties of Pend Oreille or Stevens than in Lincoln or Spokane. The Subbasin harvest during 1999-2002 averaged about nine beaver per year and is less than one percent of the state total. Harvest declined during those years, but it is not clear whether this was due to a population reduction, the passing of State Initiative 713 in 2000 (which banned the use of leg or body gripping traps), or other reasons such as a weak fur market, or drop in nuisance complaints.

Columbia spotted frog. The Columbia spotted frog is a federal species of concern and a Washington State candidate species under evaluation for possible listing as endangered, threatened, or sensitive. It was selected as a priority species for the Subbasin because of its close association with wetland and riparian habitats. In the Washington portion of the Spokane Subbasin, this amphibian has a close association with wetland and riparian habitats and adjacent uplands, and is known to occur (1) patchily along the Spokane River, (2) consistently along the Little Spokane River, (3) in the tributaries of Mud Creek and Thompson Creek, and (4) in the small ponds and lakes just southwest of Spokane (WDFW 2003b; H. Ferguson, WDFW, personal communication, April 2, 2004). In Idaho, the species occurs in appropriate habitat throughout the Subbasin (IDFG 2001). Management in Washington is directed at protecting native wetland vegetation, avoiding the introduction of nonnative species, controlling run-off, and using alternatives to pesticides.

Golden eagle. This raptor was selected as a Spokane Subbasin priority species due to its close association with cliffs and rock outcrops for nesting. It is a candidate for state listing as threatened/endangered in Washington. Within the Washington portion of the Subbasin, no sightings are reported in the Priority Habitats and Species database (WDFW 2003b).

Mink. This carnivore was selected as a Subbasin priority species for its close association with herbaceous wetland and riparian habitats, and for its economic value as a furbearer. Within the Washington portion of the Subbasin, no sightings are reported in the Priority Habitats and Species database (WDFW 2003b). Trapping records during 1999-2002 show an estimated average of one mink taken per year in the Subbasin (Appendix G).

Pileated woodpecker. The pileated woodpecker was selected as a priority species to represent species using mature and old-growth upland forest, montane coniferous wetland, and wooded riparian habitats of the Subbasin. For the Washington portion of the Subbasin, one sighting occurred in the Rattlesnake Hills area of the Little Spokane River (WDFW 2003b). No detailed information on the species occurrence is available, but it likely occurs in many forested locations within the Subbasin.

Sage sparrow. The Washington Gap Analysis Project (Smith et al. 1997) reports no evidence of breeding in the Spokane Subbasin, and the WDFW (2003b) has no records of occurrence here. General references such as Sibley (2003) indicate the species is absent, but occurs west of the Subbasin during breeding.

Snowshoe hare. The snowshoe hare was selected as a 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. These habitats occur on the Subbasin's north, east, and southeast peripheries. No detailed information on snowshoe hare occurrence is available. Within the Washington portion of the Subbasin, no sightings are reported in the Priority Habitats and Species database (WDFW 2003b).

White-headed woodpecker. This woodpecker was selected as a Spokane Subbasin priority species closely associated with upland forest habitats in the Subbasin, especially large patches of old-growth ponderosa pine or mixed conifer. The Washington Gap Analysis Project (Smith et al. 1997) reports no evidence of breeding in the Spokane Subbasin, and the WDFW (2003b) has no records here at all. General references such as Sibley (2003) indicate the species is rare.

Yellow warbler. The yellow warbler was selected as a Subbasin priority species for its close association with riparian habitat, especially the sub-canopy foliage in riparian woodlands.

Habitat loss due to hydrological diversions and control of natural flood regimes (for example, dams), inundation from impoundments, cutting and spraying riparian woody vegetation for water access, gravel mining, and urban development have negatively affected yellow warbler in the region. Similarly, yellow warblers have been impacted by habitat degradation including: (1) loss of vertical stratification of riparian vegetation; (2) lack of recruitment of young cottonwoods, ash, willows, and other subcanopy species; (3) stream bank stabilization which narrows stream channels, reduces the flood zone, and reduces extent of riparian vegetation; (4) invasion of exotic species such as reed canary grass and blackberry; (5) overgrazing, which can reduce overstory cover; and (6) reductions in riparian corridor widths which may decrease suitability of the habitat and increase encroachments of nest predators and nest parasites (Ashley and Stovall 2004). The Grand Coulee HEP study didn't specifically identify yellow warbler habitat losses, but did report a loss of 1,632 riparian forest Habitat Units and 27 riparian shrub Habitat Units. Since the yellow warbler is closely associated with these two habitat types, it would have been affected.

24.3 Summary of Terrestrial Resource Limiting Factors

24.3.1 Direct Effects of Federal Hydrosystem Projects

The direct effects of construction of the Grand Coulee Project on terrestrial resources included loss of animals living within the inundated area as well as long-term conversion

of vegetated habitats to reservoir. The construction losses were evaluated through a HEP completed in 1986 (Creveling and Renfrow 1986). The HEP evaluation species were selected based on their use of specific habitat types and structural elements, and to represent other wildlife species that use those habitats. The HEP study results are provided in terms of Habitat Units, which are units of value based on both quality and quantity of habitat.

The habitat losses were mapped by Creveling and Renfrow (1986) and are summarized in Table 24.9. The loss of wildlife habitat value for individual species, as determined through the HEP study and expressed in Habitat Units (HUs), is summarized in Table 24.10. The current status of completed mitigation for the Grand Coulee Project is also presented; approximately 49 percent of the mitigation remains to be implemented.

Table 24.9. Acres of habitat types affected by Grand Coulee Dam project construction and inundation

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

(Source: Creveling and Renfrow 1986)

¹ This figure includes the rivers' shorelines between the high and low water levels. USBR revised its figure for lands inundated by 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 24.10. Status of mitigation for construction and inundation wildlife habitat losses, Grand Coulee project.¹

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

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

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

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

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

24.3.2 Operational Effects of Federal Hydrosystem Projects

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

- 1) continued erosion of shoreline habitats along the Spokane Arm of Lake Roosevelt;
- 2) ongoing absence of riparian vegetation, particularly woody species, along portions of the reservoir subjected to sustained drawdowns;
- 3) ongoing disturbance of wildlife and habitats (for example, nest sites, amphibian breeding sites) in the fluctuation zone of the reservoir;
- 4) periodic disturbance of habitats and species within transmission line rights-of-way due to maintenance activities;
- 5) ongoing absence of anadromous fish in the Subbasin, resulting in loss of key food item for numerous wildlife species and important nutrient input for the riverine ecosystem; and
- 6) fragmentation of habitat, discontinuity of important wildlife corridors and linkages thereby preventing immigration and emigration, and elimination of sand bars and islands suitable for establishing cottonwood galleries.

Erosion sites along Lake Roosevelt have been inventoried and described by USBR (1984) and continue to be monitored (USBR 2000). The effects of erosion on wildlife and other

terrestrial resources have not been determined. Other ongoing effects of operation of the Grand Coulee Project have not been assessed. Assessment and mitigation of the operational effects of the project are required under the Northwest Power Act, and these activities are considered a high priority by the Spokane River Subbasin Planning Team.

24.3.3 Secondary Effects of Federal Hydrosystem Projects and Other Limiting Factors

The federal hydropower system contributed to development in the Spokane River Subbasin primarily by providing an inexpensive source of power. The Spokane River Subbasin supports the highest level of urbanization and agricultural development in the Intermountain Province, with over 45 percent of native habitats converted to agricultural and urban uses. Factors currently limiting terrestrial resources in the Subbasin are dominated by loss of habitat through conversion and modification, disturbance of wildlife species by humans and human activities, and interactions with nonnative plant and animal species.

24.4 Interpretation and Synthesis

Overall, the Spokane Subbasin has been highly modified from historic conditions due to development and agriculture, which have converted about 45 percent of native habitat. Road densities are high, protected lands are low in acreage, and large tracts of protected lands are virtually nonexistent. The direct impacts of the federal hydropower system are relatively localized to the Spokane Arm of Lake Roosevelt; however the effects of extirpation of salmonids influence habitats and wildlife throughout the historically accessible reaches of the basin, including the Little Spokane River and portions of the mainstem Spokane River. Operation of the project continues to affect wildlife and wildlife habitats through altered hydrology; detailed assessments of operational effects have not been performed. Secondary effects of the project continue to impact wildlife of the Subbasin through human land uses and disturbance. Secondary effects of the power projects on development of the Subbasin are wide-reaching, as the Spokane is the most populated Subbasin in the province.

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