SECTION 48 – Table of Contents

48 Lake Rufus Woods Subbasin Assessment – Terrestrial

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

The Lake Rufus Woods Subbasin is dominated by shrub-steppe habitats, which occur across the western and southern portions of the subbasin. Forested habitats of ponderosa pine and interior mixed conifer forest occur in the higher elevations of the northeastern portion of the subbasin. Agriculture and related land uses comprise over 16 percent of the Subbasin, primarily south of Lake Rufus Woods. The largest urban centers include Nespelem, Elmer City, and Coulee Dam.

The current distribution of wildlife-habitat types in the Subbasin (based on IBIS 2003) is shown in Section 45, Figure 45.2. Table 48.1 below presents the acreages by habitat type and by subbasin focal habitats. Five focal habitats were selected for the IMP: wetlands, riparian, steppe and shrub-steppe, upland forest, and cliff/rock outcrops. The same habitats were selected as focal habitats for the Lake Rufus Woods Subbasin (Ad Hoc Terrestrial Resources Tech Team, May 5, 2003). Focal habitats comprise about 84 percent of the basin, including steppe and shrub-steppe (58 percent), upland forests (22 percent), and wetlands and riparian habitats (5 percent, including open water habitats). Developed habitats, including agricultural and urban lands, currently comprise approximately 16 percent of the Subbasin and are located primarily south of Lake Rufus Woods. Cliff/rock outcrop habitats are not mapped in the IBIS system.

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

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

Table 48.1. Current wildlife-habitat types in the Lake Rufus Woods Subbasin

Wildlife-Habitat Type	Lake Rufus oods Current Acres	Percent of Total
Wetlands (Focal Habitat)		
Lakes, Rivers, Ponds, and Reservoirs	12,128	2.8%
Herbaceous Wetlands	1,280	0.3%
Montane Coniferous Wetlands	4,305	1.0%
Riparian and Riparian Wetlands (Focal Habitat)		0.0%
Eastside (Interior) Riparian Wetlands	2,834	0.7%
Steppe and Shrub-Steppe (Focal Habitat)		0.0%
Eastside (Interior) Grasslands	19,694	4.6%
Shrub-Steppe	229,340	53.0%
Upland Forest (Focal Habitat)		0.0%
Montane Mixed Conifer Forest	969	0.2%
Eastside (Interior) Mixed Conifer Forest	58,072	13.4%
Lodgepole Pine Forest and Woodlands	828	0.2%
Ponderosa Pine Forest and Woodland	32,976	7.6%
Upland Aspen Forest	1,222	0.3%
Alpine and Subalpine		0.0%
Subalpine Parklands	15	0.0%
Alpine Grasslands and Shrublands	220	0.1%
Developed		0.0%
Agriculture, Pasture, and Mixed Environs	67,930	15.7%
Urban and Mixed Environs	662	0.2%
Total	**432,475**	**100.0%**

(*Source*: adapted from IBIS 2003)

48.1.1 Open Water, Wetlands, and Riparian Areas

The IBIS wildlife-habitat map (Figure 45.2) is based in part on National Wetlands Inventory (NWI) mapping, but does not utilize all of the wetland categories or show the full extent of very small mapped areas. The following discussion of open water habitats is based on Figure 45.2 and the corresponding Table 48.1. Figure 48.1 provides a more detailed mapping of wetlands, excluding open water habitats, based on WDOE mapping (WDOE 1999) using aggregated NWI wetland types. Table 48.2 summarizes the acreages of wetlands in the Subbasin by wetland category.

48.1.1.1 Open Water

Open water habitats of natural and human origin comprise approximately three percent of total area of the Lake Rufus Woods Subbasin (IBIS 2003). Lake Rufus Woods, the reservoir behind Chief Joseph Dam, is the largest waterbody in the Subbasin with a surface area of over 8,000 acres. Other large lakes in the Subbasin include Owhi, Little Owhi, Johnson, Buffalo, and McGinnis lakes. Numerous small lakes are scattered throughout the Subbasin. The Nespelem River is the primary tributary river system in the Subbasin.

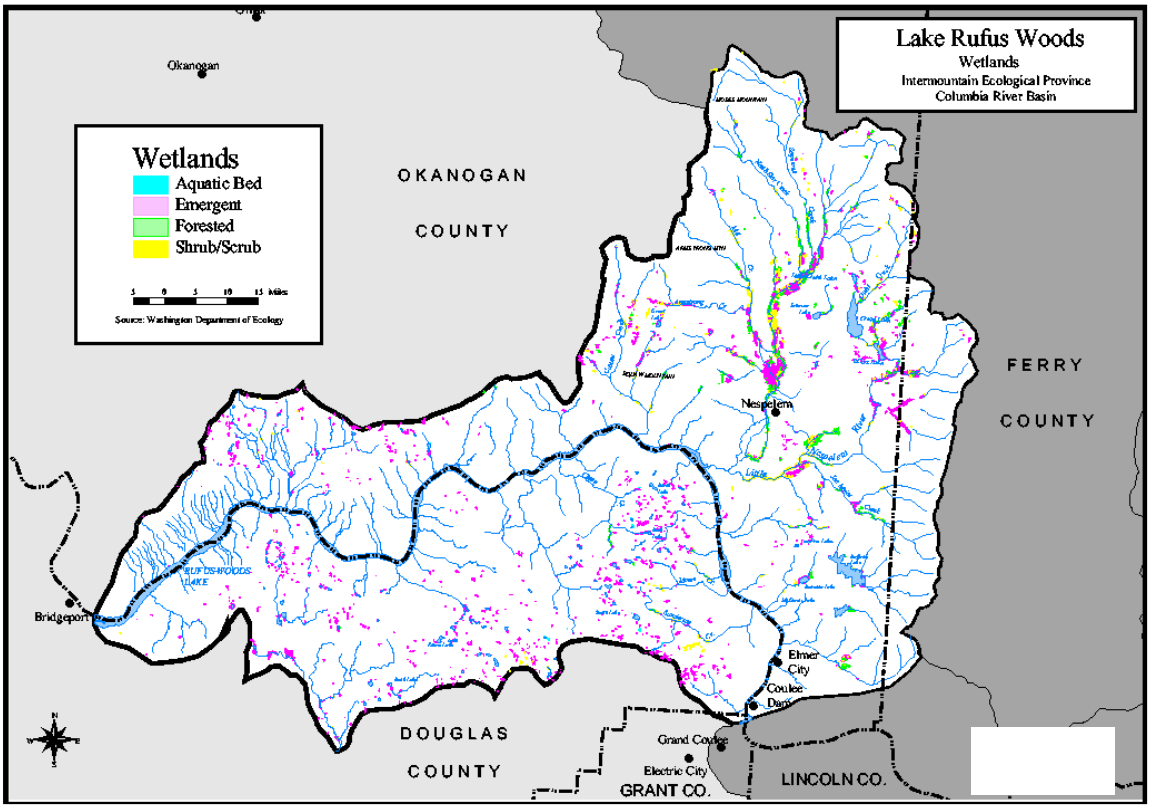

Figure 48.2

Figure 48.1 Wetland areas within the Lake Rufus Woods Subbasin

The Chief Joseph Project caused the impoundment of approximately 51 miles of the Columbia River (Kuehn and Berger 1992). The project is operated as a run-of-river facility, providing little storage capacity within the reservoir confines. Other factors that have influenced the Subbasin's waterbodies include various water resources projects, agriculture, grazing, timber harvest, and residential development.

48.1.1.2 Wetlands and Riparian Areas

Wetlands (excluding open water habitats) comprise approximately one percent of land cover in the Lake Rufus Woods Subbasin (Table 48.2). Wetlands are dominated by emergent herbaceous habitats (54 percent of total wetland habitat); these wetlands are scattered throughout the Subbasin, with the largest complexes associated with the Nespelem and Little Nespelem river riparian areas. Scrub-shrub wetlands comprise about 25 percent and forested wetlands about 18 percent of total wetland habitat; these wetlands are also located in greatest concentration along the Nespelem and Little Nespelem rivers.

Table 48.2. Acres of Wetlands in the Lake Rufus Woods Subbasin by Wetland Type

Wetland Type	Acres
Emergent	3,526
Scrub/shrub	1,550
Forested	1,126
Aquatic bed	54
Total all wetland types	**6,256**

(*Source*: WDOE 1999)

Riparian vegetation along Lake Rufus Woods currently is limited due to the fluctuation of the reservoir. Construction of the Chief Joseph Project resulted in loss of 658 acres of riparian habitats dominated by woody, broad-leaved species (Kuehn and Berger 1992) located along the Columbia River and tributary streams.

In the northeastern portion of the Subbasin, forested habitats of the upper Nespelem and Little Nespelem drainages support woody riparian vegetation. Timber management in these drainages has been intensive, and many of the riparian areas have been modified as a result. In the remainder of the Lower Subbasin, non-forested habitats prevail. Riparian zones within these areas have been greatly modified through grazing and agricultural practices. Effects have included removal of streamside vegetation, compaction of soil, and increased cover of nonnative plant species (CCT 2000).

48.1.2 Steppe and Shrub-Steppe

Shrub-steppe habitat is the dominant land cover in the Lake Rufus Woods Subbasin, occupying 53 percent of the total area; an additional 5 percent of the Subbasin is classified as interior grasslands. The extent of shrub-steppe has declined from historic conditions due to the large-scale conversion of shrub-steppe to agricultural and developed lands. Approximately 16 percent of the Subbasin is currently in agricultural uses; the majority of this land was converted from shrub-steppe. A secondary effect of agriculture and grazing is the introduction of nonnative noxious weeds through seed sources and via roads and equipment. Remaining shrub-steppe habitats in the Subbasin are greatly modified from historic conditions by reduction of native plant species and increases the cover of noxious weeds.

Construction of the Chief Joseph Project resulted in loss of 1,681 acres of shrub-steppe habitat for placement of project facilities and creation of the reservoir (Kuehn and Berger 1992). Additional habitat was lost due to the 10-foot pool raise that occurred in 1981 (USACE 1980).

48.1.3 Upland Forests

Upland forests in the Lake Rufus Woods Subbasin are dominated by interior mixed conifer stands (13 percent of land cover) at higher elevations and ponderosa pine (8 percent) at lower elevations. Timber harvest is a primary land use on the Colville Indian Reservation across the northern portion of the Subbasin.

Forested stands in the Subbasin have been modified through timber management and associated human land uses. Late and old-successional stage stands have has been reduced from the historic condition, and have been largely replaced by younger seral

stands with dominance of less fire-resistant species such as Douglas fir. Timber management has caused increased road densities throughout the subbasin. Fire control, grazing, and residential development have also influenced the distribution and structure of upland forests in the Subbasin.

Construction of the Chief Joseph Project and reservoir inundation caused the direct loss of an estimated 346 acres of ponderosa pine savannah and 106 acres of mixed forest (Kuehn and Berger 1992). Additional forest habitat was affected by the 10-foot pool raise that occurred in 1981.

48.1.4 Other Terrestrial Resource Limiting Factors

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

48.1.4.1 Road Density

Road density, by density class, for each sixth order watershed in the Lake Rufus Woods Subbasin is shown in Section 45, Figure 45.3. The northeastern portion of the Subbasin is ranked as high road density (1.7 to 4.7 miles of road per square mile), due in large part to timber management activities in the Nespelem River watershed. The majority of the Subbasin is ranked as moderate density (0.7 to 1.7 miles of road per square mile). Several watersheds in Douglas County in the south-central portion of the Subbasin are ranked as low density (0.1 to 0.7 miles of road per square mile).

High road densities are indicative of human land uses and activities. Road density values in excess of 1.5 miles per square mile are considered suboptimal for mule deer and white-tailed deer summer range; values greater than 0.5 miles per square mile are suboptimal for the same species on their winter ranges (WDFW 1991). Most of the Lake Rufus Woods Subbasin currently supports road density levels considered suboptimal for these game species. However, the Subbasin has the lowest road densities, on average, in the IMP. Road access to the Lake Rufus Woods reservoir is very limited, restricted mainly to the upper and lower ends.

48.1.4.2 Loss of Salmonid Nutrient Base

Construction and operation of the Chief Joseph Dam on the Columbia River prevented salmon and other anadromous fishes from returning to the Lake Rufus Woods Subbasin. The loss of anadromous fish affected not only subsistence and recreational use of the 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.

Scholz, et al. (1985) compiled information on salmon and steelhead run size and harvest above Grand Coulee Dam, which is located about 51 miles above Chief Joseph 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.

48.1.5 Land Ownership and Gap Status

Land ownership in the Lake Rufus Woods Subbasin is summarized in Table 48.3, based on data from the Gap Analysis Program (GAP). A map of ownership categories across the IMP is presented in Section 4, Figure 4.3. The Lake Rufus Woods Subbasin is dominated by Tribal lands of the Colville Indian Reservation, which occupy the northern and eastern portions of the Subbasin (64 percent of total). (Note: private lands located within the reservation boundaries are not displayed in Figure 4.3 and Table 48.3.) Private ownership comprises about 28 percent of the total; these lands are located south of the reservoir. State lands south of Lake Rufus Woods make up about seven percent of the Subbasin. Federal lands comprise about one percent of the total ownership, and are associated primarily with Grand Coulee Dam.

Relative protection levels of native habitats in the Lake Rufus Woods Subbasin are shown in Table 48.4. No lands within the Subbasin are categorized as Status 1, High Protection. Habitats protected under Status 2, Medium Protection, comprise less than one percent of the total and are confined to a limited number of parcels near the Chief Joseph and Grand Coulee dam sites. About nine percent of the Subbasin lands are in Low Protection; these lands correspond in part to the state-owned properties in the southern portion of the Subbasin. The majority of lands (90 percent) within the Subbasin have no formal protections for terrestrial resources.

Due to the scale of the IBIS and GAP mapping, small parcels may be incorrectly categorized in this analysis. For example, the 3,417-acre Moses Mountain Natural Area located on the Colville Indian Reservation (CCT 2000; CCT 2004b) is located within the Lake Rufus Woods Subbasin. This highly protected area is not shown in the GAP analysis. No commercial timber harvest is allowed within the natural area.

Table 48.3. Land ownership in the Lake Rufus Woods Subbasin by wildlife-habitat types

Wildlife-Habitat Type (acres)	Federal Lands	Native American Lands	State Lands	Local Gov't. Lands	Non-Gov't. Org.Lands	Private Lands	Water	Total
Wetlands								
Lakes, Rivers, Ponds, and Reservoirs	246	6,310	231	0	0	5,338	0	12,125
Herbaceous Wetlands	0	614	208	0	0	556	0	1,378
Montane Coniferous Wetlands	0	4,305	0	0	0	0	0	4,305
Riparian and Riparian Wetlands								0
Interior Riparian Wetlands	48	2,311	81	0	0	395	0	2,834
Steppe and Shrub-Steppe								
Interior Grasslands	0	19,675	0	0	0	0	0	19,675
Shrub-steppe	4,318	134,262	18,045	0	0	72,624	0	229,248
Upland Forest								
Montane Mixed Conifer Forest	0	962	0	0	0	0	0	962
Interior Mixed Conifer Forest	0	57,946	1	0	0	13	0	57,959
Lodgepole Pine Forest & Woodlands	0	825	0	0	0	0	0	825
Ponderosa Pine Forest & Woodlands	28	32,322	94	0	0	515	0	32,959
Upland Aspen Forest	0	1,215	0	0	0	0	0	1,215
Alpine and Subalpine								
Subalpine Parkland	0	15	0	0	0	0	0	15
Alpine Grasslands and Shrublands	0	219	0	0	0	0	0	219
Developed								
Agriculture, Pasture, and Mixed Environs	484	15,982	9,222	0	0	42,189	0	67,876
Urban and Mixed Environs	415	247	0	0	0	0	0	662
Total Acres	**5,538**	**277,211**	**27,881**	**0**	**0**	**121,629**	**0**	**432,259**

(*Source*: adapted from IBIS 2003)

Table 48.4. GAP status of lands in the Lake Rufus Woods Subbasin by wildlife-habitat type

Wildlife-Habitat Type (acres)	1 - High Protection	2 - Medium Protection	3 - Low Protection	4 - No Protection	Water	Total
Wetlands						
Lakes, Rivers, Ponds, and Reservoirs	0	83	491	11,550	0	12,125
Herbaceous Wetlands	0	0	258	1,121	0	1,378
Montane Coniferous Wetlands	0	0	0	4,305	0	4,305
Riparian and Riparian Wetlands						
Interior Riparian Wetlands	0	23	138	2,673	0	2,834
Steppe and Shrub-Steppe						
Interior Grasslands	0	0	0	19,675	0	19,675
Shrub-steppe	0	1,271	19,015	208,963	0	229,248
Upland Forest						
Montane Mixed Conifer Forest	0	0	0	962	0	962
Interior Mixed Conifer Forest	0	0	1	57,959	0	57,959
Lodgepole Pine Forest & Woodlands	0	0	0	825	0	825
Ponderosa Pine Forest & Woodlands	0	0	99	32,860	0	32,959
Upland Aspen Forest	0	0	0	1,215	0	1,215
Alpine and Subalpine						
Subalpine Parkland	0	0	0	15	0	15
Alpine Grasslands and Shrublands	0	0	0	219	0	219

Wildlife-Habitat Type (acres)	1 - High Protection	2 - Medium Protection	3 - Low Protection	4 - No Protection	Water	Total
Developed						
Agriculture, Pasture, and Mixed Environs	0	252	20,379	47,246	0	67,876
Urban and Mixed Environs	0	410	0	252	0	662
Total Acres	**0**	**2,039**	**40,380**	**389,840**	**0**	**432,259**

(*Source*: adapted from IBIS 2003)

GAP Status Definitions (Source: USGS 2000):

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

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

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

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

48.2 Wildlife of the Lake Rufus Woods Subbasin

48.2.1 Wildlife Occurring in the Lake Rufus Woods Subbasin

Wildlife-habitat types in the Lake Rufus Woods Subbasin are dominated by shrub-steppe habitats in the south and ponderosa pine and interior mixed conifer forests in the northeast. There are approximately 356 species of terrestrial vertebrate wildlife that occur within the Subbasin, many of which are important for ecological, cultural, and/or economic reasons. Table 48.5 presents the terrestrial vertebrate wildlife species occurring within the Subbasin. Due to the large number of wildlife species, the following discussion focuses on wildlife species that are important indicators of habitat quality, those that represent other wildlife species, and those with special management status. Refer to the Lake Rufus Woods Subbasin Summary (LeCaire 2000) for more detailed information on general wildlife of the Subbasin.

Table 48.5. Number of wildlife species (and percent of province total) in the Lake Rufus Woods Subbasin

	Occurring Species (Percent of Province Total)	HEP/Priority Species	HEP/Priority Species Closely Associated With Herbaceous Wetlands	HEP/Priority Species Closely Associated With Riparian Wetlands	HEP/Priority Species That Feed Upon Salmon	Occurring Species That Feed Upon Salmon
Amphibians	12 (71%)	0	0	0	0	0
Birds	231 (84%)	9	1	2	3	53
Mammals	96 (95%)	3	0	1	2	24
Reptiles	17 (94%)	0	0	0	0	2
Total	356 (86%)	12	1	3	5	79

(*Source*: IBIS 2003)

48.2.2 HEP and Priority Species of the Lake Rufus Woods Subbasin

Subbasin planners selected a group of wildlife species to represent the focal habitats and wildlife of the Lake Rufus Woods Subbasin. Species used in the Chief Joseph Project Habitat Evaluation Procedures (HEP) study (Kuehn and Berger 1992) were selected because they were used to assess the construction and inundation losses for the federal hydrosystem project, and because they will be used in the future to evaluate mitigation for the project. Additional wildlife species were selected due to their management, cultural, and or economic values in the Subbasin; these species also represent specific focal habitats. The list of HEP and priority species for the Subbasin, as well as federally-listed and state classified threatened and endangered species, is presented in Table 48.6.

Table 48.6. Federal and state endangered/threatened, HEP, and priority wildlife species of the Lake Rufus Woods Subbasin and degree of association1 with focal habitats during breeding

Common & Scientific Names	Federal/ State Listing Status [2]	HEP/ Priority Status [3]	Focal Habitats				
			Cliff/ Rock Outcrop	Wetland	Riparian	Steppe/ Shrub-Steppe	Upland Forest
Bald eagle *Haliaeetus leucocephalus*	T / t	P(1,3,4)	-	-	General	-	General
Bobcat *Lynx rufus*	-	HEP	General	-	General	General	General
Canada goose *Branta canadensis*	-	HEP	General	Close	-	General	-
Golden eagle *Aquila chrysaetos*	-	P(1,3)	Close	-	General	General	General
Lewis woodpecker *Melanerpes lewis*	-	HEP	-	-	General	General	General
Mink *Mustela vison*	-	HEP	-	Close	Close	-	-
Mule deer *Odocoileus hemionus hemionus*	-	HEP	-	General	General	General	General
Ring-necked pheasant *Phasianus colchicus*	-	HEP	-	-	Close	Close	-
Sage grouse *Centrocercus urophasianus*	- / t	HEP	-	-	-	Close	-
Sharp-tailed grouse *Tympanuchus phasianellus Columbianus*	- / t	HEP	-	-	-	Close	General
Spotted sandpiper *Actitis macularia*	-	HEP	-	General	Close	-	-
Yellow warbler *Dendroica petechia*	-	HEP	-	-	Close	-	-

(*Source*: Subbasin Work Team and IBIS 2003)

1 **Close** = Animal dependent on the habitat for part or all of its life history requirements.
General = Animal adaptive and supported by numerous habitats.

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

3 **HEP** = Species evaluated via Habitat Evaluation Procedures loss assessment for Chief Joseph Dam (Kuehn and Berger 1992)
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 threatened and endangered species are discussed in Section 4, Terrestrial Resources in the Intermountain Province. Subbasin-level information on occurrence of these species is provided in this section. The occurrence of HEP and priority species in the Subbasin is also discussed briefly below.

Some species were selected primarily as indicators of wildlife guilds or of a focal habitat; for many of these species detailed information on status in the Subbasin is not available.

48.2.2.1 Federal and State Threatened and Endangered Species

American white pelican. Approximately 80 non-breeding pelicans have been observed at the mouth of the Okanogan River from spring through fall during the past ten years (R. Fischer, USACE, personal communication, December 3, 2003). Although this location is outside of the Subbasin (to the west), occasional use of Lake Rufus Woods by the pelicans has been observed.

Bald eagle. A total of seven nesting territories have been documented on Lake Rufus Woods, beginning with a single nest in 1990 (R. Fischer, USACE, personal communication, December 3, 2003). During 2003, five territories had active nests. WDFW (2003b) report two winter roosts along the Columbia River, found in 1979 and 1984, and a nesting territory near Buffalo Lake.

Sage grouse. The only known sage grouse lek in the IMP is located south of the Columbia River in the southwestern portion of the Lake Rufus Woods Subbasin (WDFW 2003b). The lek was reported in 1996. The sage grouse lost 1,179 Habitat Units as a result of construction of the Chief Joseph hydropower project.

Sharp-tailed grouse. Records from the WDFW (2003b) show that 33 of 48 sharp-tailed grouse leks in the province occur within this Subbasin. The Chief Joseph hydropower project caused a loss of 2,290 Habitat Units for sharp-tailed grouse.

48.2.2.2 Chief Joseph HEP Species

Bobcat. The WDFW does not report trapping statistics for this species, nor do they systematically monitor its population. It is presumed that the bobcat occurs throughout the subbasin. The Chief Joseph hydropower project reported a loss of 401 Habitat Units for bobcat.

Canada goose. Canada goose is known to breed in the Lake Rufus Woods Subbasin. Data from the WDFW (2004a; Appendix G) estimates that the Lake Rufus Woods Subbasin provides less than one percent of the state's total goose hunting harvest and recreation. That statistic combines all goose species for the state. The Canada goose lost 213 Habitat Units from construction of the Chief Joseph Project.

Lewis' woodpecker. The Washington GAP Analysis Project (Smith et al. 1997) reports no evidence of Lewis' woodpecker breeding within this Subbasin, and the WDFW (2003b) does not have any records of occurrence. The Chief Joseph Project resulted in a loss of 286 Habitat Units for Lewis' woodpecker.

Mink. The WDFW reports almost no trapping harvest of mink within the counties of the Subbasin (Appendix G). The Chief Joseph Project caused the loss of 920 mink Habitat Units.

Mule deer. Mule deer population management objective of the WDFW is an increase in populations within the limitations of available mule deer habitat (WDFW 2003c). The recreation management objective is to maintain or increase hunting opportunity and improve hunting quality. The current general, post-hunting-season buck survival of 15 per 100 does. After a population decline due to the 1996-97 severe winter, numbers have fully recovered. During winter, the deer population benefits significantly from available agricultural crops, especially alfalfa and wheat. Deer have also benefited significantly from plantings accomplished through the Conservation Reserve Program (CRP). An estimate of deer hunting harvest and recreation in the Subbasin is presented in Table 48.7; note that the data include both mule deer and white-tailed deer. The Subbasin contributes a relatively small proportion of Washington State's total deer harvest and deer hunting recreation.

Table 48.7. Mule deer (and white-tailed deer) hunting harvest and recreation within the Lake Rufus Woods Subbasin[1]

	Harvest		Hunter-Days	
Year	Quantity	% of State Total	Quantity	% of State Total
1999	66	0.2	1,033	0.1
2000	52	0.1	708	0.1
2001	81	0.2	712	0.1
2002	88	0.3	864	0.1
Average	72	0.2	829	0.1

(*Source*: Appendix G)

[1] Includes a portion of Washington Game Management Unit 248.

Construction of the Chief Joseph Project resulted in a loss of 1,992 Habitat Units for mule deer.

Ring-necked pheasant. The WDFW objectives for pheasant in this Subbasin are to maintain a viable population for hunting recreation and harvest, and to increase population size above that of the past five years. Pheasant populations have declined dramatically over the last 30 years and are now at very low levels. Habitat loss or fragmentation from human development and agricultural practices is speculated as the primary reason. For instance, agricultural crops have changed from species that benefit the pheasant to undesirable ones, and recent culturing techniques have caused more pheasant loss than before. Research is needed to identify the exact causes. Pheasant hunting harvest and recreation in the Subbasin make up less than one percent of the state total for those measures (Appendix G). The Chief Joseph Project caused the loss of 239 pheasant Habitat Units in the Subbasin.

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

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

Spotted sandpiper. Smith et al. (1997) confirmed that breeding occurs in the Subbasin, but in winter this shorebird migrates to warmer latitudes. The Chief Joseph Project reported a loss of 1,255 Habitat Units for the spotted sandpiper.

Yellow warbler. The Washington GAP Analysis Project (Smith et al. 1997) reports probable, but not confirmed, evidence of breeding in the Subbasin. However, that finding might be from insufficient sampling since general references such as Sibley (2003) indicate that breeding does occur in the Subbasin. The Chief Joseph Project resulted in the loss of 1,255 Habitat Units for the yellow warbler.

48.2.2.3 Other Priority Species

Golden eagle. There are approximately 13 golden eagle nesting territories in the Subbasin: 12 along the Columbia River, and one in the Coyote Creek drainage (WDFW 2003b).

48.3 Summary of Terrestrial Resource Limiting Factors

48.3.1 Direct Effects of Federal Hydrosystem Projects

Development of the Chief Joseph Project resulted in direct loss of wildlife and wildlife habitats along a 51-mile reach of the Columbia River. Habitat losses associated with inundation of project reservoirs were assessed in the Wildlife Habitat Impact Assessment for the Chief Joseph Dam Project (Kuehn and Berger 1992) through a Habitat Evaluation Procedures (HEP) study. The HEP evaluation species were selected based on their use of specific habitat types and structural elements, and to represent other wildlife species that use those habitats. The HEP study results are provided in terms of Habitat Units (HUs), which are units of value based on both quality and quantity of habitat. The study provides the number of habitat units to be provided in compensation for the construction losses and identifies potential mitigation areas. The study also provides a list of prioritized mitigation objectives for the two wildlife management jurisdictions, the Colville Confederated Tribes and the WDFW.

Table 48.8 summarizes the loss of habitats as determined by Kuehn and Berger (1992). The loss of habitat value for individual wildlife species, as determined through the HEP study and expressed in HUs, is summarized in Table 48.9. The current status of completed mitigation for the Chief Joseph Project is also presented; approximately 84 percent of the mitigation remains to be implemented.

In 1981, the full pool level of the Lake Rufus Woods reservoir was raised 10 feet to 956 feet msl. Assessment of the effects of the pool raise on terrestrial resources was conducted through a modified HEP analysis (USACE 1980). A mitigation plan for the pool raise impacts was developed cooperatively with the Tribes, WDFW, and USFWS. Sixteen mitigation sites were established on a total of over 1,500 acres. A variety of enhancements were implemented, including irrigation, shrub and tree plantings, livestock exclusion fences, raptor poles, and goose nesting structures. Monitoring of these sites has occurred on a five-year interval since initial implementation in 1983. The impacts of the 10-foot pool raise and mitigation for that loss are evaluated separately of the original construction and inundation impacts, and are not displayed in the following tables.

Table 48.8. Acres of habitat types affected by Chief Joseph project construction and inundation

Chief Joseph Project	Habitat Type	Acres of Habitat Inundated/converted
	Riverine	2,910
	Shrub-steppe	1,681
	Sand/gravel/cobble	1,184
	Riparian/Macrophyllus draws	658
	Agriculture	343
	Rockland	380
	Ponderosa pine savannah	346
	Island/sandbar	238
	Rock	256
	Mixed forest	106
	Palustrine (ponds/slackwater)	90
Total		**8,192**

(*Source*: Kuehn and Berger 1992)

Table 48.9. Status of mitigation for construction and inundation wildlife-habitat losses, Chief Joseph project

Chief Joseph Project	Species	Habitat Units lost	Habitat Units acquired	Percent complete
	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%**

(*Source*: BPA 2002)

48.3.2 Operational Effects of Federal Hydrosystem Projects

Ongoing operation of the Chief Joseph Project affects terrestrial resources of the Lake Rufus Woods Subbasin through:

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

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

Ongoing effects of operation of the Chief Joseph 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 Lake Rufus Woods Subbasin Work Team.

48.3.3 Secondary Effects of Federal Hydrosystem Projects and Other Limiting Factors

The federal hydropower system contributed to development in the Lake Rufus Woods Subbasin by providing an inexpensive source of both power and irrigation water. The Subbasin supports high levels of agriculture and grazing, and active timber management in the northeastern portion. Residential land uses occur throughout the southern half of the subbasin. Factors that currently limit terrestrial resources in the Subbasin are dominated by loss of habitat through conversion and modification, disturbance of wildlife species by humans and human activities, and interactions with nonnative plant and animal species.

48.4 Interpretation and Synthesis

The Lake Rufus Woods Subbasin has been highly modified from historic conditions due primarily to agriculture, grazing, residential development, and, in the northeastern portion of the Subbasin, timber management. Approximately 16 percent of native habitats, primarily shrub-steppe, have been converted to agriculture and developed land uses. The majority of the remaining habitats have been modified through land use practices. Construction of the Chief Joseph Dam directly affected the Columbia River along a 51-mile reach. The dam blocks all anadromous fish access to the Lake Rufus Woods Subbasin and upstream Columbia, Spokane, and Pend Oreille river subbasins. Road densities are moderate throughout much of the Subbasin. Protected lands are very low in acreage. Secondary effects of the power projects on development of the Subbasin are wide-reaching, including agriculture, grazing, timber harvest, and residential development.

Terrestrial resources mitigation related to initial construction and inundation of the Chief Joseph Project is approximately 16 percent complete. Completion of the mitigation is the highest terrestrial resources priority for the Subbasin Work Team, followed by assessment and mitigation of operational impacts of the hydrosystem projects.