EXHIBIT E – ENVIRONMENTAL REPORT

SUBPART E.3
FISH, WILDLIFE, AND BOTANICAL RESOURCES

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E.3.1 INTRODUCTION

This section of the Exhibit E describes the fish, wildlife, and botanical resources in the vicinity of the Project and the potential impact of the Project on those resources. The section is divided into three parts: Fish and Aquatic Resources, Wildlife Resources and Botanical Resources. In each of these there is a description of existing conditions that identifies species present, including threatened and endangered species, and habitat needs; a discussion of potential impacts associated with the proposed Project; and proposed protection, mitigation and enhancement measures.

Exhibit E.3 of this application presents information on fish, wildlife and botanical resources associated with, or found in, the vicinity of the Project. Some of this information was synthesized from reports and information available for this area. Additional information was gathered from surveys and studies conducted in consultation with applicable state and federal agencies in accordance with Title 18, Part 4, Section 41 of the Code of Federal Regulations (18 CFR 4.41): Application for Major Modified Project-Existing Dam.

E.3.2 FISH & AQUATIC RESOURCES

E.3.2.1 EXISTING CONDITIONS

Exhibit E.3.2.1 provides a description of existing fisheries resources in the Project Vicinity, with emphasis on the Project Area. The information presented is a combination of recent and historical reports produced by state and federal resource agencies, investigations by universities and consulting groups and file materials from state and federal agencies. These materials were supplemented by information from studies conducted by the District from 2005 to 2008 in support of current efforts to license the Enloe Hydroelectric Project (Public Utility District No. 1 of Okanogan County 2005, Okanogan Basin Monitoring and Evaluation Project 2006). The District's studies were conducted in consultation with state and federal agencies and tribes responsible for the management of aquatic resources in the Upper Columbia River drainage including: NOAA Fisheries, USFWS, WDFW, and the Colville Tribes. The general study area for the license application extends from Shanker's bend (RM 10.1) to the confluence of the Similkameen River with the Okanogan River (RM 0) downstream of Oroville, Washington (Exhibit G, Map 1). The Enloe Hydroelectric Project is located immediately

upstream of Similkameen Falls, about 9 miles upstream from the confluence with the Okanogan River.

Description of Project Vicinity

The Similkameen River is approximately 72 miles long and originates in the Cascade Mountains near the border of British Columbia and Washington State (see Exhibit B, Figure B-1). It flows north out of Manning Provincial Park then turns south across the border and eventually joins the Okanogan River south of Oroville. The 27-mile reach that lies within Washington State flows through semi-arid mountainous terrain. The proposed Enloe Hydroelectric Project, at the site of Enloe Dam, lies near RM 9.

Fish Abundance and Distribution

Literature reviews and additional field surveys both upstream and downstream of Enloe Dam were conducted to develop distribution and abundance data (ENTRIX 2007a). There have been several studies related to fish use in the vicinity of Enloe Dam, as summarized below. A list of fish species documented from the three primary studies that have examined upstream and downstream of the Enloe Project are provided in Table E.3-1 (IEC Beak 1984, Public Utility District No. 1 of Okanogan County 1991, and ENTRIX 2007a).

Several anadromous fish species (those which spawn in freshwater and migrate to salt water as part of life cycle) and resident fish species (which complete their life cycle in fresh water) are found in the Similkameen River. Native anadromous fish species include Chinook salmon, sockeye salmon and summer steelhead trout, which are all found in the lower Similkameen River below the Project (Figure E.3-1). Similkameen Falls, which lies immediately downstream of the Project, is a natural barrier that prevents anadromous fish from entering the upper Similkameen River basin. This condition will remain unchanged by the Project. There is no historical documentation that anadromous fish (salmon/steelhead) naturally passed upstream of the falls (Mitchell 1980, WDFW 1990, Public Utility District No. 1 of Okanogan 1990).

Native resident species found in the Similkameen River in the vicinity of the Project include chiselmouth, peamouth, rainbow trout, suckers, sculpins, whitefish, longnose dace, burbot and northern pikeminnow. In addition to native fish species, a number of introduced (non-native) species occur in the Project Vicinity including large and small mouth bass, crappie, perch and carp (IEC Beak 1984, Public Utility District No. 1 of Okanogan County 1991, ENTRIX 2007a, WDFW 2005b).

The following discussion of fish distribution, abundance, and habitat conditions is divided into two main sections, the area upstream of Enloe Dam (focused primarily on the reservoir) and the river downstream of the falls.

Table E.3-1: Resident Fish Species Documented in the Vicinity of Enloe Dam in Three Separate Studies

Species		Source		
Scientific Name	**Common Name**	**IEC Beak (1984)**	**Okanogan PUD (1991)**	**ENTRIX (2006)**
Catostomidae				
Catostomus columbianus	Bridgelip Suckers	D [1]	U	U
Catostomus macrocheilus	Largescale Suckers		U/D	U/D
Centrarchidae				
Lepomis spp.	Unidentified Sunfish			U
Micropterus dolomieui	Smallmouth Bass			U
Micropterus salmoides	Largemouth Bass		U/D	U/D
Pomoxis nigromaculatus	Black Crappie	D	D	
Cottidae				
Cottus spp.	Sculpins	D	U/D	U/D
Cyprinidae				
Cyprinus carpio	Common Carp			U/D
Cyprinidae spp.	Unidentified minnows		U	U/D
Ptychocheilus oregonensis	Northern Pikeminnow	D	U	D
Rhinichtys cataractae	Longnose Dace	U/D		
Richardsonius balteatus	Redside Shiner		U	U/D
Gadidae				
Lota lota	Burbot		U	
Percidae				
Perca flavescens	Yellow Perch			U
Salmonidae				
Oncorhynchus sp.	Unidentified Trout		D	
Oncorhynchus mykiss	Rainbow Trout	U*	D	D
Oncorhynchus nerka	Kokanee	U		
Prosopium williamsoni	Mountain Whitefish	D	U/D	D

U = upstream of Enloe Dam, D = downstream of Similkameen Falls, U = upstream above Project Boundary, in Canada*

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[Figure E.3-1]

Legend

- River Mile Marker
- Oroville Substation
- Enloe Dam
- Road
- FERC Boundary

Spawning Habitat

- Known Salmonid Spawning Areas

Anadromous Fish Presence

Species

- Steelhead, Chinook and Sockeye

N W E S

0 0.25 0.5 1 Miles

Image source: 2005 USDA National Agriculture Imagery Program.

Enloe Dam Licensing Project

Figure E.3-1
Anadromous Fish Distribution in the Similkameen River

ENTRIX

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Upstream of Enloe Dam

Fish

The fishery resources in the reservoir have fewer fish species than the river downstream of the dam and most are introduced warm-water species that are better adapted to lentic (slow moving water) environments.

Resident fish species identified during previous studies upstream of Enloe Dam in the Similkameen River include rainbow trout, mountain whitefish, bridgelip and largescale suckers, longnose dace, sculpin, northern pikeminnow, chisel mouth, redside shiner, largemouth bass, kokanee, trout, and burbot (Table E.3-1) (IEC Beak 1984, Public Utility District No. 1 of Okanogan 1991).

Fish sampling in the reservoir during 2006 was accomplished using backpack electrofishing equipment, seines, and minnow traps. Gill net surveys in March and July of 2007 in conjunction with beach seine and minnow trap surveys were conducted. Eight species of fish were collected, four of which had not been documented in previous studies (chiselmouth, peamouth, common carp and yellow perch) (ENTRIX 2007a, Table E.3-1). The relative abundance among fish species in the reservoir is estimated in Table E.3-2, based on data collected (ENTRIX 2007a).

The dominant family of species found in the reservoir was Cyprinidae (minnows). These represented approximately 53 percent of the total catch in 2006 and 67 percent of the catch in 2007. The next most common family (30 percent of the total catch in 2006 and 21 percent of the catch in 2007) was Centrarchidae (bass and sunfish). The majority of Centrarchids collected were largemouth bass. Catostomidae (suckers) comprised approximately 10 percent of the total catch in 2006 and 7 percent of the catch in 2007. Though not all of the suckers were identified to species, they were all determined to be either largescale suckers or bridgelip suckers. The addition of gill nets to the sampling effort in 2007 allowed for the capture of larger fish that were using deeper and open water habitats, thus the mean sample length increased for the most abundant families of fish collected. Cyprinids collected in 2006 had an average length of just over 3 inches, while in 2007, the mean length of cyprinids in the samples was 5.7 inches. The larger fish using the reservoir included northern pikeminnow, chisel mouth, suckers and peamouth. The largest fish captured by gill net in the reservoir was a northern pikeminnow at nearly 15 inches, but the average length was 7.8 inches. The largest chiselmouth was just over 8 inches in length with all chiselmouth averaging about 7 inches. Other families collected included Cottidae (sculpins) and Percidae (perch) (Table E.3-2).

Table E.3-2: Fish Species Collected in the Enloe Reservoir During the Summers of 2006 and 2007 (ENTRIX 2007a)

	2006							2007						
	Beach Seines			Minnow Traps			% of Catch[a]	Beach Seine		Minnow Trap		Gill Net		% of Catch
Date	7/7	8/11	9/14	7/7	8/11	9/14		3/22	7/24	3/22	7/24	3/22	7/24	
Catostomidae (Suckers)														
Catostomid spp. –[b].– Suckers[b].	22	1	0	0	1	0	10.2%	0	2	1	0	0	2	6.7%
Cottidae (Sculpin)														
Cottus spp. – Unidentified Sculpin[b]	2	0	0	0	0	1	1.3%	0	0	1	0	0	0	1.3%
Centrarchidae (Bass)														
Micropterus salmoides – Largemouth Bass	53	16	0	0	0	0	29.4%	0	16	0	0	0	0	21.3%
Cyprinidae (Carp & Minnows)														
Acrocheilus alutaceus – Chiselmouth	0	0	0	0	0	0	0.0%	0	0	0	0	0	8	10.7%
Cyprinus carpio – Common Carp	14	0	0	0	0	0	6.0%	0	0	0	0	0	0	0.0%
Cyprinidae spp. – Unidentified Minnows[b]	68	28	1	4	4	3	46.0%	0	1	0	1	0	0	2.7%
Mylocheilus caurinus – Peamouth	0	0	0	0	0	0	0.0%	0	0	0	0	0	2	2.7%
Ptychocheilus oregonensis - Northern Pikeminnow	0	0	0	0	0	0	0.0%	0	0	0	3	0	16	25.3%
Richardsonius balteatus - Redside Shiner	2	0	0	1	0	0	1.3%	1	0	11	1	0	0	17.3%
Rhinichthys cataractae – Longnose Dace	0	0	0	0	0	0	0.0%	3	3	0	0	0	0	8.0%
Percidae (Perch)														
Perca flavescens – Yellow Perch	13	1	0	0	0	0	6.0%	0	1	0	0	0	0	1.3%
Salmonidae (Salmon, Trout & Whitefish)														
Prosopium williamsoni – Mountain Whitefish	0	0	0	0	0	0	0.0%	0	2	0	0	0	0	2.7%
Total	174	46	1	5	5	4	100%	4	25	13	5	0	28	100%

a. percent is based on total abundance across sampling period and gear types

b. fish captured were too small to identify species in the field

Sport fish that have been documented in the reservoir area include largemouth bass, yellow perch, black crappie, kokanee, and mountain whitefish (IEC Beak 1984, Public Utility District No. 1 of Okanogan 1991, ENTRIX 2007a). Of those, only mountain whitefish are native. The IEC Beak (1984) study documented rainbow trout upstream of Enloe Dam in Canada, but no trout were observed between U.S./Canadian border and Enloe Dam in any of the past surveys.

Aquatic Macroinvertebrates

Data on aquatic macroinvertebrates in the Similkameen River was collected by Vinson (1994). He conducted a macroinvertebrate survey that included three sites between the Canadian border and the project area at RM 17, 16 and 12. The survey included quantitative samples from three riffles at each site as well as qualitative grab samples from other habitat types that commonly support invertebrates, such as large woody debris (LWD), leaf packs and other coarse particulate organic matter. Of the 85 taxa collected, ten made up 80 percent of the sample (Table E.3-3). A majority of the individuals collected (50.3 percent relative abundance) was chironomid larvae, with the next most populous group being ephemeroptera from the family Ephemerellidae (19 percent relative abundance). Trichopterans were 9 percent of the total sample.

Table E.3-3. Relative abundance of dominant macroinvertebrate taxa collected from three sites in the Upper Similkameen River

Taxa				Portion of Sample (%)	Cumulative %
Order	**Family**	**Sub-family**	**Genus**		
Diptera	Chironomidae	Orthocladiinae	--	21.0	21.0
Diptera	Chironomidae	Chironominae	--	19.2	40.2
Ephemeroptera	Ephemerellidae	--	*Ephemerella*	11.0	51.2
Diptera	Chironomidae	Tanypodinae	--	8.0	59.2
Trichoptera	Hydropsychidae	--	*Hydropsyche*	7.1	66.3
Ephemeroptera	Baetidae	--	*Baetis*	5.4	71.7
Ephemeroptera	Ephemerellidae	--	--	2.6	74.3
Diptera	Chironomidae	--	--	2.1	76.4
Trichoptera	Brachycentridae	--	*Brachycentrus*	1.9	78.3
Oligochaeta	Tubificidae	Naidinae	--	1.8	80.1

Source: Vinson 1994.

Macroinvertebrate populations in the reservoir have not been sampled; however it is likely that they are less diverse than the community in upstream lentic sections of the Similkameen, with a significant increase in non-insect taxa that are tolerant of silt conditions, such as oligochaete worms and isopods (Isham 2005).

Downstream of Enloe Dam

Fish

In 2006 snorkel surveys were completed (ENTRIX 2007a) in representative habitats downstream of Enloe Dam during three different periods (spring, summer, and fall) in 2006. The surveys were conducted in sites from Similkameen Falls to the confluence with the Okanogan River. This river section was divided into three reaches (Figure E.3-2) determined by substantial differences in habitats (see habitat description below): (1) a canyon reach, from the dam, RM 8.8 to RM 7.1; (2) a transition reach, from RM 7.1 to RM 4.7; and (3) a braided reach, from RM 4.7 to RM 0. Data collected by ENTRIX are summarized in Table E.3-4, which provides an estimate of distribution and abundance among fish species.

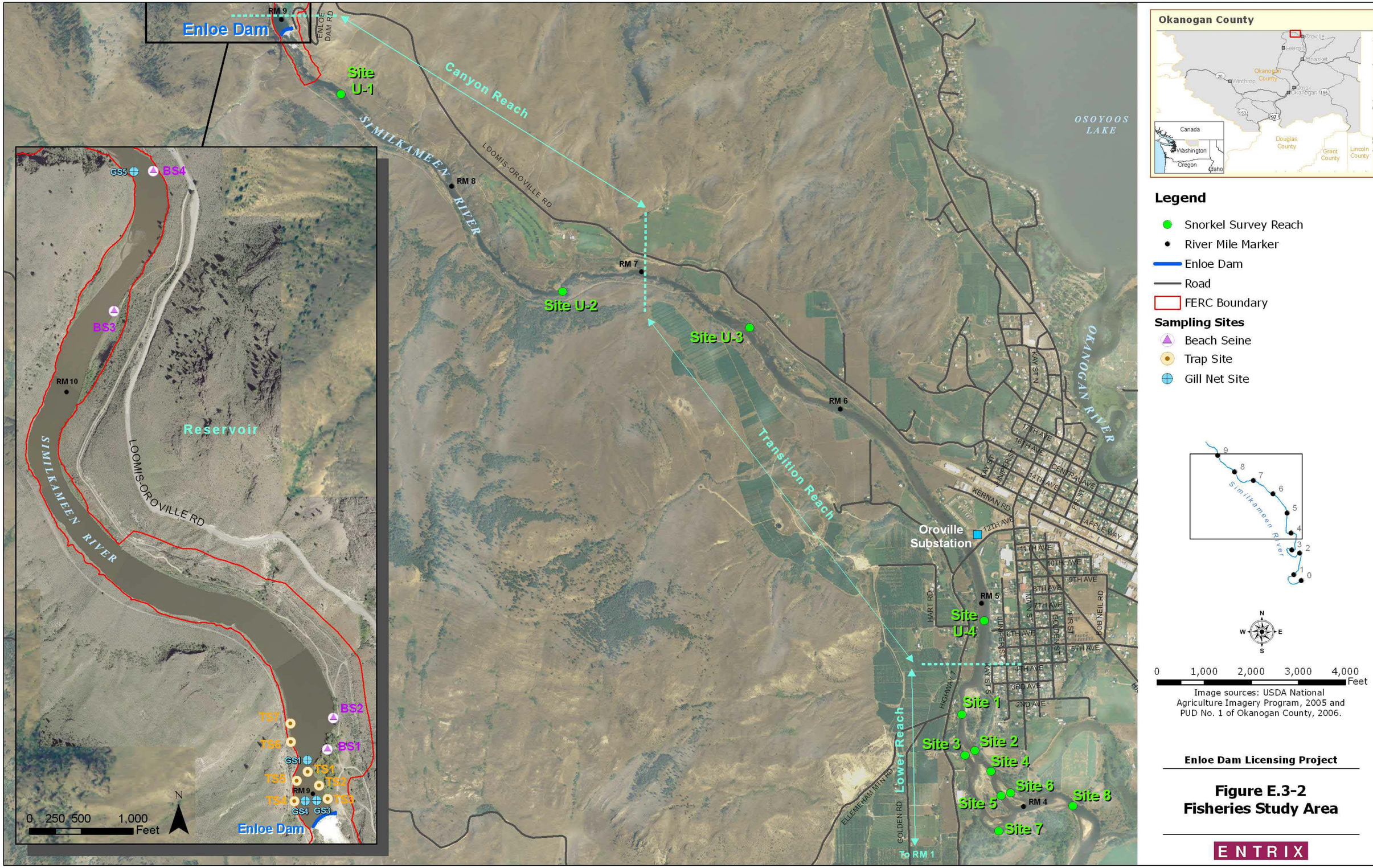
Smallmouth bass dominated the fish assemblage for Reach 1, in the canyon habitat below the dam (Table E.3-4 and ENTRIX 2007a). Adult Chinook salmon, rainbow trout, suckers, and northern pikeminnow were also observed in this area.

Suckers (Catostomidae) dominated Reach 2 (the transition area), with more fish observed in September than August (Table E.3-4). Bass (largemouth and smallmouth) were also relatively abundant in August, mountain whitefish in September, and northern pikeminnow with equal numbers in August and September. Rainbow trout or steelhead[1] was also more abundant in Reach 2 than in Reach 1.

Cyprinidae (minnows) were the most abundant fish in the low gradient habitats of Reach 3 with substantially more observations than any other species or family (Table E.3-4). The snorkeling survey team could not identify these fish to the species level because of their small size. Suckers and bass were also relatively abundant. Of the salmonids observed in the study area below the dam, rainbow trout/steelhead were the most abundant in Reach 3 with greater numbers found in the August sampling period. Most (73 percent) of the rainbow trout/steelhead in all reaches were between 4 and 12 inches long (total length).

[1] Young rainbow trout and steelhead are identical in appearance during the rearing phase.

[Figure E.3-2]



Enloe Dam Licensing Project

Figure E.3-2
Fisheries Study Area

ENTRIX

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Table E.3-4: Seasonal Activity (Phenology) of Anadromous Fish Species in the Vicinity of the Enloe Hydroelectric Project*

Date	Reach 1 (RMs 8.8-7.1)		Reach 2 (RMs 7.1-4.7)		Reach 3 (RMs 4.7-0)		% of Catch
	Aug	Sept	Aug	Sept	Aug	Sept	
Catostomidae (Suckers)							
Catostomid spp. – Suckers	0	1	53	176	29	314	22.0%
Centrarchidae (Bass)							
Micropterus salmoides – Largemouth	0	0	12	7	42	25	3.3%
Micropterus dolomieu – Smallmouth	13	20	32	8	101	92	10.2%
Cottidae							
Cottus spp. – Unidentified Sculpins	0	0	1	3	3	6	0.5%
Cyprinidae							
Cyprinus carpio – Common Carp	0	0	0	0	0	13	0.5%
Cyprinid spp. – Unidentified Minnows	0	0	5	0	472	737	46.6%
Ptychocheilus oregonensis – Northern Pikeminnow	0	1	21	21	15	0	2.2%
Salmonidae							
Oncorhynchus mykiss – Rainbow Trout/Steelhead[1] (juveniles)	3	1	16	8	115	77	8.4%
Oncorhynchus mykiss – Steelhead (adults)	0	0	0	0	0	3	0.1%
Oncorhynchus nerka – Sockeye	0	0	2	0	0	13	0.6%
Oncorhynchus tshawytscha – Chinook	0	0	0	0	0	33	1.3%
Prosopium williamsoni – Mountain Whitefish	0	0	1	24	41	47	4.3%
Total Observations	16	23	143	247	818	1,360	100%

The numbers of adult anadromous fish observed during the snorkel surveys were not considered representative of population strength. Adult anadromous fish are most abundant in the river during their respective spawning seasons, but may be present in other months holding in deep pools or other resting areas. Annual surveys performed by Okanogan Basin Monitoring and Evaluation Project (OBMEP) provide estimates of salmon and steelhead (and other fish species). WDFW has surveyed summer Chinook salmon spawning grounds in the Similkameen River since 1956. These sources provide the best information regarding salmon and steelhead distribution and abundance in the Similkameen River.

[1] Young rainbow trout and steelhead are identical in appearance during the rearing phase.

Annual surveys performed by OBMEP since 2005 provided specific data on anadromous fish populations and habitat conditions in the Okanogan River basin (Arterburn and Kistler 2006 and 2007). In 2005, OBMEP performed snorkel surveys in two locations along the stretch of the Similkameen to assess the fish populations. The total number of fish counted in the transition reach was 266, which included no salmonids. Suckers were the dominant group with a total of 159 individuals. The fish density was 226.1 fish per square mile. Surveys in the downstream reach had a total fish count of 102, which included one juvenile steelhead trout, three adult sockeye and two adult Chinook salmon. Suckers were the dominant group counted consisting of 38 fish. The total fish density was 194.2 fish per square mile. The density of salmonids was 11.4 fish per square mile. The low number of anadromous fish observed was believed to be partially due to the atypical river conditions during the time of the survey (Arterburn and Kistler 2006). The previous winter had been abnormally warm, which led to a low snow pack, early runoff. Streamflows were lower and water temperatures were warmer than usual at the time of the survey.

WDFW has surveyed summer Chinook salmon spawning grounds in the Similkameen River since 1956. During 2005, the number of redds enumerated in the Similkameen River was 1,423; in 2004 it was 1,660. Redd counts are estimated to represent an escapement (fish returning to spawn) of summer Chinook salmon of approximately 4,169 fish in 2004 and 3,770 fish in 2005. The majority of the summer Chinook salmon spawn in the lower five miles of the river (Arterburn and Kistler 2006) with no known spawning areas within the Project area (FERC Boundary). Summer Chinook are known to hold in the pool area below Similkameen Falls.

OBMEP surveys of the steelhead redd distribution in the lower section of the Similkameen River in 2005 and 2006 were performed during March to April. In 2005, a total of 106 redds were counted, for a density of 18.8 redds per square mile. In 2006, 98 redds were observed with a density of 17.4 redds per square mile. For both years, the majority of redds were found below the bridge crossing in Oroville (RM 5.0) and above the cross-channel with the Okanogan River (Arterburn and Kistler 2006 and 2007). Distribution and known spawning locations for these anadromous species are illustrated in Figure E.3-1. There are no known spawning areas within the Project area (FERC Boundary).

There is little data on the current distribution of Pacific lamprey in the Okanogan Basin (including the Similkameen River). The 2000 status report for Pacific lamprey in the mid-Columbia region indicates that though suitable spawning and rearing habitat were present, attempts to document Pacific lamprey in the Okanogan River Basin were unsuccessful. Lamprey were not observed during the Project-related snorkel surveys and there is no known documentation of adult lamprey occurrence in the Similkameen River including surveys conducted by agencies or tribes. However, WDFW has documented unidentified ammocoetes in holding ponds in the Hatchery Pond on the lower reaches of the Similkameen River close to the confluence with the Okanogan

River (Hallock, pers. comm. 2007b). In 2006, the CCT Fish & Wildlife Division collected both adults and ammocoetes (juvenile lampreys) from screw traps in the Okanogan River downstream of the confluence with Salmon Creek (Rayton, pers. comm. 2007). Potential lamprey redds (not confirmed) were observed in the middle reach of the Okanogan River in 2008 (J. Arterburn, pers. comm. 2008).

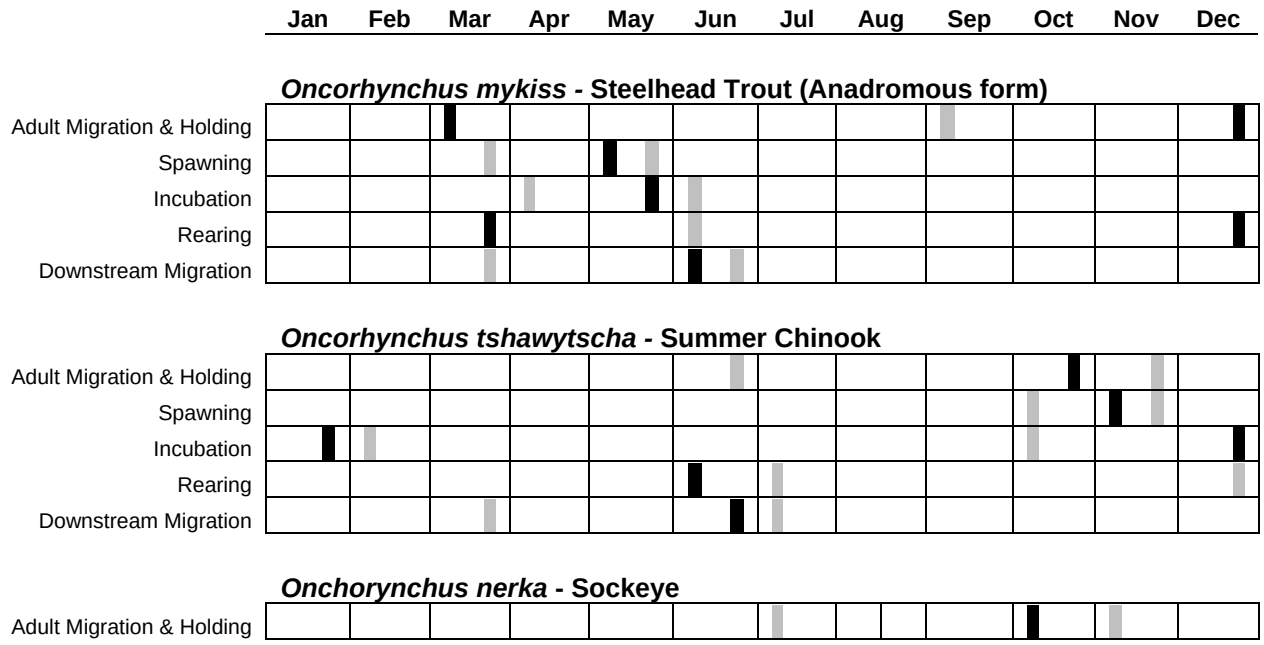
The Similkameen River serves as a refuge from higher water temperatures in the Okanogan River. All three species of anadromous fish (steelhead trout, summer Chinook salmon and sockeye salmon) will enter the Similkameen River during the summer to hold until temperatures in the Okanogan River decrease to a suitable level and they can migrate to spawning areas. Holding areas can occur anywhere in the lower river below the Similkameen Falls, but larger and deeper pools appear to be the preferred habitat, including the deep pool just below Similkameen Falls (Figure E.3-2, Arterburn and Kistler 2007, ENTRIX 2007a).

Life History Timing for Key Fish Species

Steelhead trout and summer Chinook salmon spawn and rear in the Similkameen River below Similkameen Falls (Table E.3-5). Steelhead trout spawn during the spring months and may be found rearing in the river throughout the year if summer temperatures are acceptable. Summer Chinook salmon spawn during late fall. Young Chinook salmon remain in the Similkameen River through the spring, but migrate out by early summer as water temperatures begin to increase.

Steelhead trout, summer Chinook salmon, and sockeye salmon all use the Similkameen River for holding prior to spawning. The Okanogan River typically reaches summer temperatures that are too warm for sustaining these cold water fish species. Because in the summer months, Similkameen River temperatures are lower than those in the Okanogan River, adult fish will use the Similkameen River as a thermal refuge. Although sockeye salmon do not typically spawn in the Similkameen River, they will hold in the cooler waters there until the Okanogan River cools sufficiently, and they can continue to migrate upstream. Steelhead trout and summer Chinook salmon will spawn in the Similkameen River, or in other areas of the Okanogan basin, after holding in the Similkameen River through the warmer period (Arterburn and Kistler 2006 and 2007, Hyatt et al. 2003).

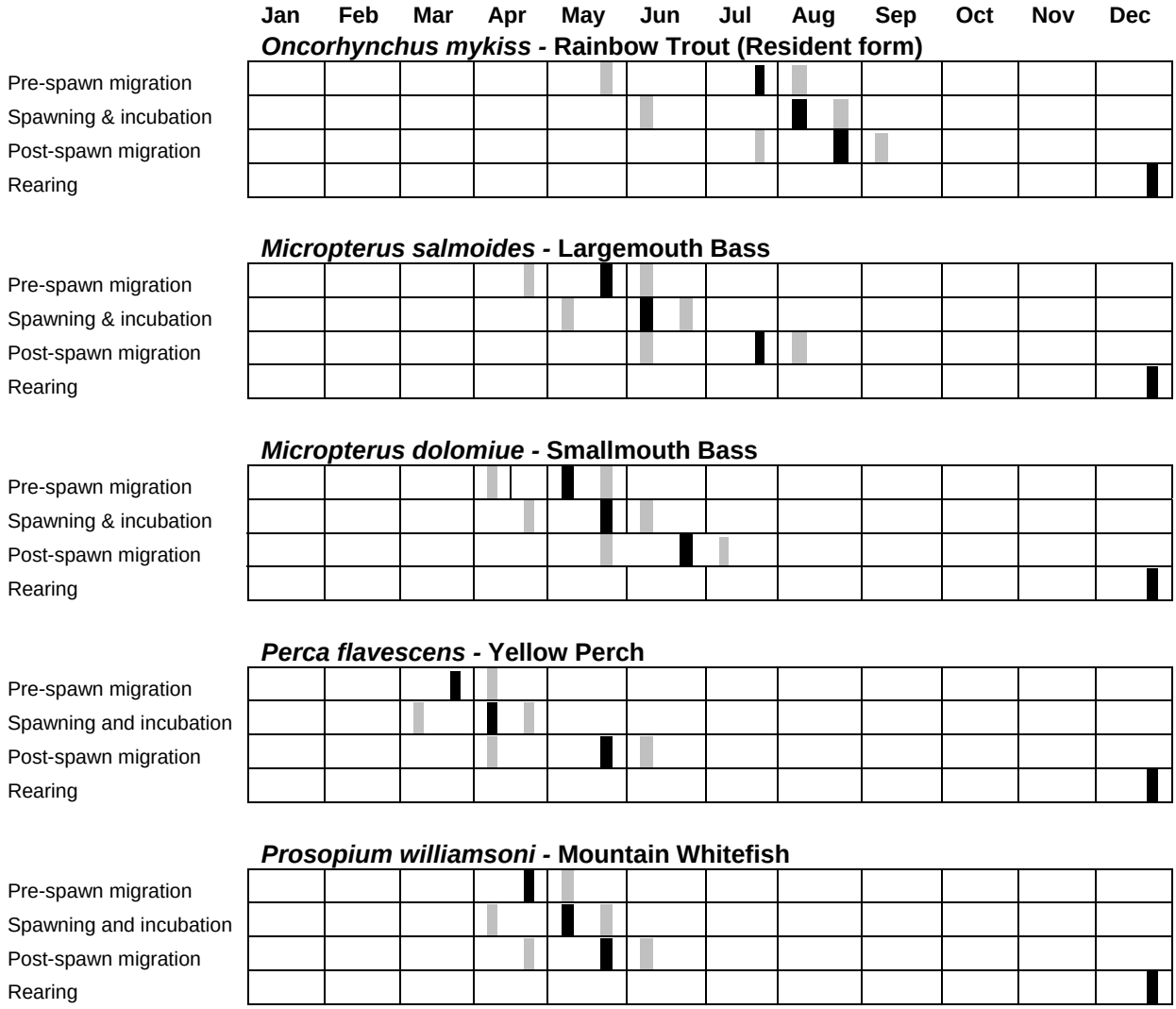
Table E.3-5: Seasonal Activity (Phenology) of Anadromous Fish Species in the Vicinity of the Enloe Hydroelectric Project*



**Black bars indicate peak activity and grey indicates low or sporadic activity.*

Table E.3-6 provides a summary of the timing of seasonal activity for several resident fish species considered to be of recreational or cultural importance. All resident fish species shown in Table E.3-6 spawn in the spring, except resident rainbow trout, which spawn in early summer. Rearing occurs in the Similkameen River throughout the entire year. Of the fish sampled in the reservoir, only largemouth bass, common carp, and yellow perch spawn in lake habitats (Wydoski and Whitney 2003). The larger fish, which dominated gill net captures in the reservoir included chiselmouth and northern pikeminnow. These fishes have similar life history traits and prefer riverine habitats with gravel to boulder substrates for spawning (Wydoski and Whitney 2003).

Table E.3-6: Seasonal Activity (Phenology) of Several Resident Fish Species with Potential Recreational or Cultural Significance in the Vicinity of the Enloe Hydroelectric Project*



**Black bars indicate peak activity and grey indicates low or sporadic activity.*

Aquatic Macroinvertebrates

No data was found regarding aquatic macroinvertebrates in the reach downstream of Enloe Dam. The macroinvertebrate communities in the canyon reach and the transition reach are likely similar to communities found in the upper Similkameen River (Table E.3-3). Composition of the macroinvertebrate communities in the lower reach would likely be somewhat different. The habitat in the lower reach exhibits lower current velocities, has limited exposure to extreme shear stress, and a greater abundance of small sediment particles. This difference in habitat from the upper reaches likely allows for a higher percentage of taxa that burrow, swim or sprawl, with a corresponding reduction in the percentage of invertebrates that cling and/or crawl. This could mean an

increase in taxa richness with a higher percentage of non-insect taxa in the benthic macroinvertebrate community in the lower reach, as described by Verberk et al. (2005) and, Mérigoux and Dolédec (2004).

Fisheries Management Framework

U.S. Fish Wildlife Service

The USFWS is part of the U.S. Department of the Interior (USDI). The agency is responsible for fish and wildlife on federal lands in the United States, with the stated mission of "working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people." The agency shares this role with NOAA Fisheries (U.S. Department of Commerce) in the administration of the Endangered Species Act of 1973 (ESA). USFWS activities include but are not limited to: enforcing the federal ESA; acquiring wetlands, fishery habitats, and other lands for restoration and preservation; insuring compliance with the National Environmental Policy Act (NEPA); managing National Wildlife Refuges and National Fish Hatcheries; and reviewing and commenting on all water resource projects. Under section 18 of the Federal Power Act (FPA), the Secretary of the Interior and the Secretary of Commerce have authority over and responsibility for fish passage facilities at federally licensed dams. USFWS is responsible for reviewing and approving all such facilities. Under the ESA, USFWS is also responsible for issuing Biological Opinions and incidental take statements for FERC Projects, if needed for "incidental" taking of a listed species while conducting an otherwise lawful activity. USFWS also oversees the designation of critical habitat and the development of recovery plans for listed species. Recovery plans characterize and assess the species' habitat needs, assess the cumulative effects of environmental variability and human-related activities, and include provisions to protect and conserve the habitat.

National Oceanic & Atmospheric Administration – National Marine Fisheries Service (NOAA Fisheries)

NOAA Fisheries is part of the U.S. Department of Commerce. Under the ESA, NOAA Fisheries, as delegated by the Secretary of Commerce, is responsible for the protection of those marine species listed as threatened or endangered, and for identifying candidate species for such listings. The ESA mandates that NOAA consult with other federal agencies to assess the impacts of actions that may affect listed species, and to minimize those impacts, either through regulation or other means. As described above for USFWS, NOAA Fisheries also mandates conservation of critical habitat for threatened and endangered species, and prepares recovery plans for listed species. Further, ESA allows NOAA to establish cooperative agreements with states so that they can implement conservation and recovery actions for listed species. The Magnuson-Stevens Fishery Conservation and Management Act, under which fisheries within the 200-mile Exclusive Economic Zone (EEZ) are regulated, places responsibility for fishery management jointly with the Secretary of Commerce (through NOAA Fisheries) and eight Regional Fishery Management Councils. NOAA Fisheries also provides support

and advice in the management of living marine resources in coastal areas under state jurisdiction. NOAA Fisheries, with the cooperation of the Councils, and Interstate Marine Fisheries Commissions, is responsible for administering Fishery Management Plans (FMP) for the Nation's fishery resources.

U.S. Bureau of Land Management

As part of the USDI, the BLM is responsible for balanced management of public lands and resources. BLM is the major landowner in the Project Vicinity and owns most of the land above the Ordinary High Watermark (OHW) within the FERC Boundary. As a part of their management directive, the BLM is responsible for managing habitat and fisheries resources.

Washington Department of Fish & Wildlife

An appointed commission of 9 members (The Washington Fish & Wildlife Commission) sets WDFW policy and makes regulatory decisions. The commission is responsible for the management of fish and wildlife resources within Washington. WDFW's mission is "to provide sound stewardship of fish and wildlife. The health and well-being of fish and wildlife is important not only to the species themselves, but to humans as well. Often, when fish and wildlife populations are threatened, their decline can predict environmental hazards or patterns that also may have a negative impact on people." WDFW is responsible for the long-term preservation of indigenous fish and wildlife populations.

WDFW's policy concerning fish and wildlife resources is formally established under the Washington Administrative Code (WAC). Chapter 220 WAC contains principles, policy and goals for managing Washington's fish resources. These rules cover fish management and hatchery operations information. Specific rules address classification of endangered species, management of non-native aquatic species, management of coastal waters, and establishment of regional fisheries enhancement groups. Chapter 220, division 32 (WAC 220-32-050 through 220-32-060) deals specifically with the management of the Columbia River Basin.

Washington Department of Ecology

Ecology is responsible for protecting and enhancing the state's water and air quality and for managing other environmental issues. The department works with state and federal agencies to implement the Clean Water Act. Under section 401 of the Clean Water Act (CWA), Ecology must certify compliance with applicable water quality standards before a license to operate a hydroelectric project can be issued by FERC.

Washington Department of Natural Resources

The WDNR is responsible for management of the aquatic lands, which includes the beds and banks of navigable water bodies. Protection of public trust values of public service, navigation, fisheries and public recreation are part of WDNR's responsibility.

The WDNR's mission is: "to provide professional, forward-looking stewardship of our state lands, natural resources, and environment and to provide leadership in creating a sustainable future for the Trusts and all citizens"

Colville Confederated Tribes – Natural Resources Department – Fish & Wildlife Division

The CCT is a co-manager of fish and wildlife with WDFW, USFWS, and NMFS. The mission for the CCT Natural Resource Department is to create a balance within natural resource management actions, which reflect social, cultural, economic, and natural resource values of reservation residents. The CCT Fish & Wildlife Division is responsible for the management of fish and wildlife resources in Washington that are designated for tribal use and management by treaty with the U.S. Government.

Fisheries Resource Management Plans

Under the authority of the FPA and as amended by the Electric Consumers Protection Act (ECPA) of 1986, the FERC has the responsibility for regulating non-federally owned hydroelectric projects. This is accomplished through the administration of Project operating licenses. Other federal laws and orders that affect the licensing process include the NEPA, the Fish and Wildlife Coordination Act (FWCA), the National Historic Preservation Act (NHPA), the CWA and the ESA.

This section provides a list of applicable state and federal comprehensive plans related to aquatic resources, including those on FERC's Revised List of Comprehensive Plans (FERC 2002). Through consultation, the District has also identified other comprehensive plans that pertain to Project Area resources.

The Okanogan River Watershed Management Plan

In 1996, Okanogan County entered into a contract with Ecology to help prepare a watershed management plan for the Okanogan River Basin (this is not the WRIA 49 Okanogan watershed plan, which is currently in preparation under the leadership of the Okanogan Conservation District). The contract charged the county with addressing point source pollution loads as well as non-point source pollution not associated with agriculture.

Columbia River Basin Fish and Wildlife Program (revised 2000)

In 1980, Congress passed the Pacific Northwest Electric Power Planning and Conservation Act, which authorized the states of Idaho, Montana, Oregon and Washington to create the Northwest Power Planning Council, which was eventually renamed as the Northwest Power and Conservation Council (the Council). The Act directs the Council to organize a program to protect, mitigate and enhance fish and wildlife of the Columbia River Basin that have been affected by the construction and operation of hydroelectric dams in the Pacific Northwest (particularly those in the Columbia and Snake River drainages) while also assuring the Pacific Northwest

adequate, efficient, economical and reliable power. The Council's Columbia River Basin Fish and Wildlife Program is the largest regional effort in the nation to recover, rebuild, and mitigate impacts on fish and wildlife. In 2000, the Council revised its program and established a new vision that focuses on the "Four H's" of impacts on fish and wildlife – hydropower, habitat, hatcheries and harvest.

Okanogan Subbasin Plan

The Okanogan Subbasin Plan is designed to provide the Northwest Power and Conservation Council with a method for allocating fish and wildlife mitigation and conservation resources within the Okanogan Basin. To involve the community, an outreach program is continuing.

Okanogan System Steelhead and Chinook Hatchery and Genetic Management Plans

The Anadromous Fish Agreements and Habitat Conservation Plans for Wells, Rocky Reach and Rock Island Hydropower Projects established a formal decision making body for the artificial production programs operated within the region. This decision making body, referred to as the Hatchery Committee has instituted Hatchery and Genetic Management Plans for Chinook and Steelhead in the Okanogan System.

The program goals are to mitigate for steelhead and Chinook salmon losses associated with inundation or operation of Columbia River dams. The program is designed to contribute to the recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecological integrity.

State and Tribal Hatchery Facilities

WDFW maintains salmon rearing and acclimation ponds on the Similkameen River approximately one mile north of the confluence with the Okanogan River. The Colville Tribes maintain an acclimation pond on the Okanogan River just south of Tonasket. The ponds are stocked yearly with Chinook salmon from the Eastbank Hatchery Complex in Wenatchee, Washington.

The fish that are released are composites of Methow and Okanogan stocks. Brood fish are collected at the Wells hatchery complex then transferred to the Eastbank complex. Once the collected salmon are spawned and the eggs hatch, the young are raised at Eastbank for six months. The fingerlings are then transferred to the Tonasket and Similkameen acclimation ponds, where the fish are held for six weeks before being released in mid-April.

The goal of this program is to mitigate for the loss of Chinook salmon that would have been produced in the Upper Columbia River Basin in the absence of hydroelectric dam development. This goal can be met by artificial fish rearing facilities that increase productivity of the population by increasing survival at life-history stages where competitive or environmental bottlenecks occur. The release strategy is managed so as

not to create a new bottleneck in productivity via competition with wild stocks of Chinook salmon. The purpose of the Similkameen Pond - Eastbank Hatchery program is to mitigate for the loss of summer Chinook salmon adults that would have been produced in the Okanogan River Basin in the absence of Wells, Rocky Reach, and Rock Island hydroelectric projects located downstream in the Columbia River.

Summer-run Chinook used in the program originate from natural or marked hatchery-origin fish collected at the Wells Dam and Wells Hatchery traps. These brood sources are representative of the summer-run population indigenous to the Okanogan River system. Up to 556 adult fish are collected in July and August each year as broodstock. WDFW's Eastbank Hatchery is used for fish spawning, incubation and early rearing. Summer Chinook juveniles produced at Eastbank Hatchery are transferred in the fall to Similkameen Pond in the upper Okanogan River watershed for acclimation and release. The fish are reared to yearling smolt size in the pond through the winter for release in the spring to acclimate the Chinook to the release site. Up to 576,000 summer Chinook salmon yearling smolts may be released in the spring each year (NARA 2001).

Threatened, Endangered and Sensitive Species in the Project Vicinity

Upstream of Similkameen Falls

Though little is known about bull trout (*Salvelinus confluentus*) distribution in the Okanogan Basin, bull trout in the Columbia River were listed as a threatened species in 1998 (USFWS 1998). The Upper Columbia River Bull Trout Recovery Unit team has identified this area for further research (NMFS 2006). However, bull trout are not expected to occupy areas above the Project because the anadromous form would be excluded by the presence of Similkameen Falls, and no populations of resident bull trout are known to occur in the Upper Similkameen Basin (NMFS 2006). Consequently, there are no state- or federally-threatened or endangered fish species known to occur in the Similkameen River above the Project and no protected fish species would be expected to pass downstream through the Project.

Downstream of Similkameen Falls

Fish

Upper Columbia River steelhead was listed as an endangered species under the ESA in 1997 and status was later changed to “threatened” in 2006 (NARA 1997, NARA 2006). A recent U.S. District Court ruling (June 2007) revised the Upper Columbia River steelhead status to endangered. Critical spawning areas for Columbia River steelhead have been designated in Omak Creek and Salmon Creek, both of which join the Okanogan River downstream of the confluence with the Similkameen River. The upper Columbia River summer run of Chinook salmon, which occurs in the Similkameen River, was found “Not Warranted for Listing” in 1998 and the federally-endangered spring run Chinook salmon have been extirpated from the Okanogan Basin. Efforts to reintroduce the spring run Chinook species are being considered by the CCT (NMFS 2006).

The Pacific lamprey (*Lampetra tridentata*) is neither state nor federally listed; however Pacific lamprey populations are declining in the Columbia basin and the species is considered sensitive by the WDFW. Historically, Pacific lamprey were an important resource for aboriginal tribes in the mid-Columbia River Basin (USACE 2001). Lamprey were a significant part of many tribes' diets, and also represented an important cultural resource (Close 2002). The historical distribution of Pacific lamprey coincided with the distribution of Pacific salmon (Close et al 1995); thus this species may have occurred in the Okanogan Basin. This historic distribution would likely have extended into the Similkameen River at least as far up as Similkameen Falls. In 2004, a petition to list four lamprey species, including the Pacific Lamprey, was presented to the USFWS. USFWS declined to list the Pacific Lamprey due to a lack of sufficient scientific evidence to warrant listing (NARA 2004).

Freshwater Mussels

Four species of freshwater mussels are thought to occur in the Similkameen River (WDFW 2005a, Parsons 2005, Nedeau et. al. 2005). The WDFW reported that two species occur in the vicinity of the Project: the "western ridged mussel" (*Gonidea angulata*), and the "western pearlshell"[1] (*Margaritifera falcata*). According to data from the WDFW, the western ridged mussel is the most abundant species in the Similkameen (Hallock, pers. comm. 2007a). WDFW also found the "western floater" (*Anondonta kennerlyi*) upstream of the Enloe Reservoir and only in Palmer Creek (Parsons 2005). The California floater (*Anodonta californiensis*) is known to occur in the Okanogan River (Nedeau et. al. 2005), and one individual has recently been identified in the Similkameen River (Iten, pers. comm. 2007).

Mussel relative abundance increases downstream from the dam as the prevalence of finer sediments increases. In 2006, the highest number of occurrences at Site 7 in Reach 3 was documented (ENTRIX 2007a). These mussels were typically buried in soft sediments with the upper edge of the shells exposed.

Though none of the mussel species known to occur in the Similkameen River are state- or federally-listed, all four species are listed by the WDNR as sensitive in the Washington State Natural Heritage Plan (WDNR 2005) and the California floater is a candidate for state-listing.

Habitat

Habitat Use

Enloe Reservoir

Fish in Enloe Reservoir appear to be relatively small in size; thus it is likely that the majority of fish occurring in the reservoir use the limited shallow littoral habitats, both to

[1] Standardized common and scientific names are from Turgeon, D.D. et al. 1998. Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks. Second Edition. American Fisheries Society Special Publication 26.

avoid the higher water velocities of the reservoir flow channel and to use cover in the shallower margins to escape predation. Normally small fish tend to congregate around boulders, aquatic plants, large woody debris and other instream structures. There is an abundance of steep rocky banks in the reservoir that limit habitat structure elements such as large wood pieces or aquatic macrophyte beds. Most fish captured in the reservoir were small and were found in shallow areas associated with the limited presence of cover (mostly vegetation). Larger fish (mostly northern pikeminnow, chiselmoth, and suckers) do use the open water areas of the reservoir. Resident salmonids that occur upstream of the Project do not appear to be using the reservoir, likely due to a combination of predation (e.g. from northern pikeminnow), warm temperatures, and lack of cover. Introduced warm-water species such as bass, yellow perch, and common carp may spawn in the littoral zones, but more likely are transported to the reservoir from upstream sources such as Palmer Lake.

Enloe Dam to Similkameen Falls

The area between the foot of Enloe Dam and the head of Similkameen Falls was surveyed by snorkel methods in August 2006 during low flow conditions when it was safe to work in the area. No fish were observed in the reach during the snorkeling effort. Later observations indicated that during high water events, flow in the bypass reach was extremely turbulent. If a fish managed to access the bypass reach during high flow, it would encounter extreme flow conditions with little access to flow refugia. It is unlikely that a fish would remain in such conditions for extended periods of time. In addition, during high flow events, it is likely that benthic macroinvertebrates would be subject to shear stress and flow velocities that would scour the substrate clean.

Downstream of Similkameen Falls

Downstream of Similkameen Falls, the river appears to support a more productive and diverse fishery. Anadromous salmonid habitat supports spawning, incubation, rearing, and adult holding areas. Anadromous salmonid species are found between the Similkameen Falls and the confluence with the Okanogan River; these fish stage in the cooler water prior to continuing spawning or migrating further upstream in the Okanogan River (Arterburn and Kistler 2006, ENTRIX and Golder Assoc. 2007). Adult salmonids hold in the deeper runs and pools throughout the canyon reach of the river and are commonly observed holding in the 500-foot reach between the old powerhouse and the falls. This same area contains habitats to support a variety of native and introduced resident species that appear successful in completing all life cycles (Table E.3-4).

Habitat Type and Quality

Reservoir

The reservoir between the Enloe Dam (RM 8.8) and approximately RM 10.2 was surveyed (Figure E.3-2, ENTRIX 2007a). Steep bedrock (conglomerate) slopes continue underwater, dominating large sections of the shoreline, especially at the

downstream portion of the reservoir. In the mid-to-upstream areas, the reservoir banks also have a relatively steep gradient. The mid-to-upstream areas of the reservoir exhibited increased amounts of shallow water habitat, but were dominated by deeper areas and open water. This results in the presence of small amounts of shallow-water habitat in the reservoir area.

Within the surveyed area, shallow submerged substrates consisted mostly of sand and silt, with gravel, and cobble at a few sites near the upstream end of the reservoir. Bank vegetation that provides provided cover (i.e. overhanging) was extremely limited along the reservoir and included a few willow trees. The bank vegetation was dominated by various grasses, shrubs and poison oak. Only small amounts of aquatic vegetation were observed, with the exception of a few patches of submerged grasses. Large woody debris was scarce and the most common elements that could provide refuge for fish were steep uneven rock walls, submerged boulders and partially submerged boulders along the shoreline.

Enloe Dam to Similkameen Falls

In August of 2006, during low flows, a snorkel survey between the toe of Enloe Dam and the top of Similkameen Falls was conducted. This 300 plus feet long reach consisted of flat bedrock substrate strewn with large boulders. Small substrate particles occurred only in sparse patches and margin habitat was minimal. The banks had no overhanging vegetation and no LWD was present at the time of the survey.

Downstream of Similkameen Falls

Examination of habitat characteristics downstream of Similkameen Falls indicated that three distinct reaches are present (Figure E-.3-2). The reaches are separated by differences in stream gradient, macrohabitat type, and dominant substrates (Kaumheimer 1988, ENTRIX 2007b).

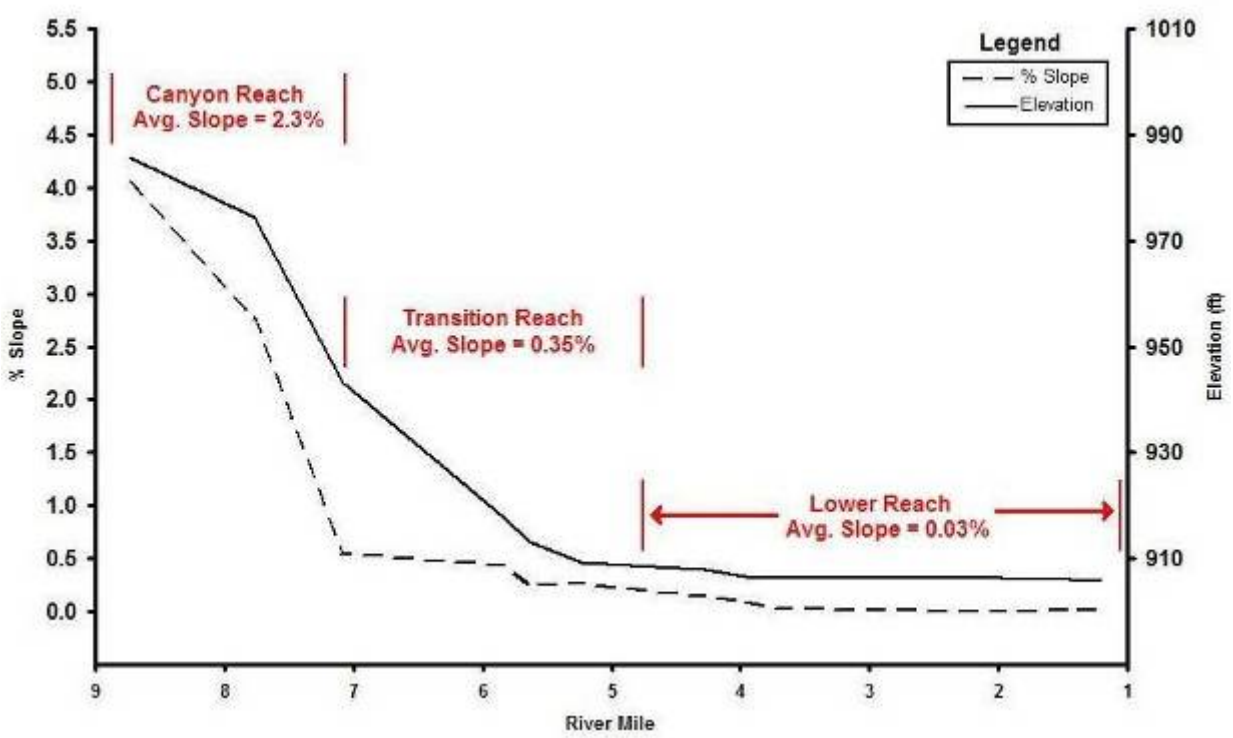
Reach 1 is the canyon reach (RM 8.8 to RM 7.1), with the Enloe Dam as the upper boundary (Figure E.3-2). Reach 1 is characterized by deep pools interspersed with rapids. This reach has a channel gradient that averaged over 2 percent, substantially greater than the lower reaches (Figure E.3-3). The dominant substrate is bedrock with a sand channel along the center. This reach also has the greatest depths (USFWS 1988, ENTRIX 2007b).

Reach 2 (RM 7.1 to RM 4.7) is transitional between the canyon and the lower gradient valley (survey sites U3 and U4 in Figure E.3-2). Reach 2 has a wider channel than Reach 1 with a few side channels and contains a mix of characteristics shared by the higher gradient canyon and the lower reach. Reach 2 progresses from a high (2 percent) to moderate slope (0.1 percent) and has an average stream gradient of approximately 0.4 percent (Figure E.3-3). Habitat is a mix of run, pool, and riffle types. While most of the reach contains smaller substrate such as cobble and sand as

compared to Reach 1 (the canyon reach), larger boulders are more common in the upstream areas near the canyon reach (USFWS 1988, ENTRIX 2007b).

Reach 3 (RM 4.7 to RM 0) is the lower reach and has a braided channel with a low gradient (less than 0.1 percent) (Figure E.3-2, survey sites 1 through 8). Cobble and gravel comprises most of the streambed substrate in Reach 3; however, pockets of sand and areas dominated by boulders are also present. Pools and runs dominate the main channel; riffles usually occur in the side channels (Table E.3-2) (USFWS 1988, ENTRIX 2007b).

Figure E.3-3: Channel gradient (defined as percent slope) and elevation of the Similkameen from the base of Enloe Dam at RM 8.8 to the confluence with Okanogan at RM 0.0



Note: Vertical vs. horizontal distance not to scale

Steelhead trout and Chinook salmon spawning habitat can be found throughout the lower section of the study area. The greatest concentration of potential spawning habitat is found in the lower five miles of the Similkameen River above the confluence with the Okanogan River. However, spawning habitat is also found scattered throughout the canyon reach and transition reach (Figure E.3-1). The relatively scarce amounts of gravel in the river result in limited spawning habitat; the Similkameen River appears to be a naturally gravel starved system (Arterburn and Kistler 2006, ENTRIX 2007a, Appendix E.6).

Naturally-occurring low flows in both summer and winter, and high summer water temperatures limit salmonid production in the Okanogan watershed. Winter habitat conditions can be extreme. Anchor ice can dewater streams and cause high levels of scour, affecting embryos and young over-wintering salmonids. In dry years, dewatered reaches are common in the side channels of both the transition reach and the braided reach. Low flows can restrict access to upstream habitat, dewater redds, and strand juveniles (ENTRIX and Golder Assoc. 2007). During the snorkel surveys conducted by ENTRIX in 2006, it was noted that small rainbow trout/steelhead were using small areas in side channels where water temperatures were several degrees cooler than the surrounding water. Side channels that contained water during the summer provide important rearing habitat, especially in those areas where overhanging vegetation provides cover. These may be areas of groundwater upwelling (ENTRIX 2007a).

In some portions of the Okanogan watershed, past disturbances have exacerbated the natural limiting factors by further reducing habitat quality and quantity available for salmonids. These alterations have primarily occurred in the lower gradient, lower reaches of sub-watersheds. These impacts result primarily from past timber harvest operations, road building and placement, and grazing (ENTRIX and Golder Assoc. 2007). In general, the Similkameen River appears to have only small amounts of cover contributed by LWD. The river (most notably adjacent to the town of Oroville) has been channelized and diked, greatly reducing the habitat diversity in that reach (ENTRIX and Golder Assoc. 2007, ENTRIX 2007b, and Appendix E.6.2).

Water Quality Habitat Parameters

As explained in Exhibit E.2, water temperatures do not increase along the mainstem of the Similkameen River as it flows downstream through the Project Area to the Enloe Dam. High water temperatures (typically exceeding 17.5 °C) naturally occur in the area of the Enloe Reservoir and downstream during late July, August, and into September. These water temperatures generally exceed optimal conditions for salmonids, and lethal temperatures (26 ºC or higher) have been recorded during summer months in the lower portion of the river, near the confluence with the Okanogan River.

Prespawn mortality of summer Chinook salmon and sockeye salmon in the Similkameen and Okanogan Rivers has been associated with lethal temperature levels. Recent observations (2004 and 2005) have noted both of these species may die prior to spawning, based on sightings near the Okanogan River confluence (Arterburn and Fisher, pers. comm.). Arterburn and Kistler (2005 and 2006) have examined dead females for the presence of eggs to estimate pre-spawn mortality of summer Chinook salmon in the Similkameen River over several years. Samples in 2004 and 2005 indicate approximately one percent or fewer females die prior to spawning. This proportion could vary greatly depending on the flow and temperature conditions in the river in a given particular year. High temperatures can delay upstream migration of sockeye salmon in the Okanogan River (Hyatt et al. 2003). As noted above, adults of all

anadromous salmonid species use the Similkameen River as a pre-spawning thermal refuge, escaping unsuitable temperatures in the Okanogan River (ENTRIX 2007a, ENTRIX 2007b, and Appendix E.2.1).

Total dissolved gases (TDG) are elevated downstream of the Project, due to the conditions at Similkameen Falls. Refer to Appendix E.2.1 for more detailed information (ENTRIX 2007b, and Appendix E.2.1).

E.3.2.2 IMPACTS

This section describes impacts on fish populations and aquatic habitat associated with the construction, operation and maintenance of the Project.

Construction Impacts

Sediment

Construction activities including stripping, excavating, placing fill, stockpiling granular material, dewatering and construction traffic can cause increased emissions of airborne dust and increased flow of sediment to adjacent water courses.

Erosion control measures will be employed on construction sites to minimize soil erosion and migration of sediment. A site specific erosion and dust control plan employing approved BMPs will be developed to control soil erosion and protect the Similkameen River from any significant increase in sediment inflow or turbidity due to construction activities.

Sedimentation has filled in approximately 1,500 acre-feet (2.43 million cubic yards) of the original reservoir volume, of unconsolidated fine particles. These fine sediments may contain concentrations of arsenic and copper from both natural sources and runoff of upstream mining operations (ENTRIX 2007b, and Appendix E.2.1).

Sediment entering the water is also possible during construction of the intake for the power facility. Erosion during construction of the Project could temporarily increase the proportion of fine sediment in the water passing over the dam. A significant increase in fine sediments released downstream of the dam could negatively affecting spawning or fry rearing if sediment was deposited in these habitats (Burns 1970, Meyer 2003). In addition, suspended sediments containing concentrations of copper or arsenic could lead to bioaccumulation of those constituents in fish eggs or fry, and to acute levels of bioaccumulation in predatory fish and insectivores such as salmonids and bass (Petersen and Kristensen 1998, May et. al. 2000).

While these potential impacts are of concern, they will be short term during construction and as described in Exhibit E.6.6, the greatest impact will result from the construction of the new intake channel and penstocks. The potential for such impacts will be addressed by using BMPs, which typically include silt fences and carrying out excavation work

during low flow periods when there is less river current and less potential for entrainment.

Refer to Exhibit E.6 for a more complete discussion of the potential for increased sediment transport associated with construction of the Project.

Rock Excavation

Rock excavation by controlled blasting and mechanical excavation techniques will be required to construct the intake channel, penstock intake, powerhouse and tailrace channel. Modern controlled blasting techniques involve careful planning of blasting, use of small charges, and careful monitoring of blast vibrations to avoid vibration damage to existing structures and to limit pressure waves in nearby water bodies, which can potentially harm fish. Mechanical excavators with hydraulic rock hammer attachments will also be used to trim the excavation and excavate loose rock

Most rock excavation will occur in dry ground away from the river bank except for the mouth of the intake channel and the exit of the tailrace channel. These portions of the work which will each last about one week will be carried out during low flow periods so that fish can be temporarily excluded from the excavation area by nets.

The final connection of the tailrace to the large pool at the base of the falls would pose the greatest risk to fish from blasting. Although fish will be removed from the pool prior to rock exaction, the size and depth of the pool make it likely that some fish will remain and may be exposed to blasting vibration. Mitigation measures discussed below have been incorporated in the PM&Es to address this potential impact.

Operational Impacts

Reservoir Impacts

Resident fish may be affected by changes in elevation of the reservoir, inundation of lotic habitat at Shanker's bend, and entrainment through the Project intake. Enloe Dam is a shallow reservoir (average depth is 8.4 feet at the existing dam crest elevation). Several species of native and warm water fish reside in the reservoir and a few of the introduced species (bass and perch) may spawn in the littoral zones (Figure E.3-4).

Elevation of the Reservoir

Installation of crest gates would increase the minimum reservoir water surface elevation by about four feet. Additionally, whereas under existing conditions the reservoir level varies continuously with varying river flow, the crest gates will allow for maintaining a more constant reservoir level over a wider range of river flows. Operation of the crest gates is described in Exhibit B.

Given the steep sides of the valley along the existing reservoir, the reservoir would probably not substantially increase in width, but would extend 0.4 miles further

upstream, above Shanker's Bend. Inundation of the area around Shanker's Bend would convert approximately 0.4 miles of lotic (moving water) environment into more of a lentic (slow or pooled water) environment. The increased amount of lentic habitat would likely have a beneficial effect on lake-oriented and warmwater fish species. Many of the species found in the reservoir provide potential sport fisheries opportunities (e.g., perch and bass), and most are introduced species. The decreased amount of lotic habitat would have a detrimental effect of those species requiring a stream-type environment during part of their life history. Mountain whitefish are known to inhabit the river above the reservoir and provide some sport fishing opportunities.

As with fish, the invertebrate community in Shanker's Bend would be affected by conversion of lotic environment to lentic environment. However, the change would likely have little effect on the overall abundance of invertebrates. Impacts to invertebrate communities would likely be expressed as changes in community composition. Eggleton et al (2004) found that differences between invertebrate communities at reference and impact sites on Lake Texoma were characterized by changes in the ratios of invertebrate families or guilds. For example, at impact sites oligochaete worms showed increased abundance compared to chironomid larvae. The conversion of lotic to lentic habitat would tend to favor certain macroinvertebrate guilds, such as filterers and grazers over those that prefer running water such as collectors and clingers (Hershey and Lamberti 2001).

[Figure E.3-4]

Legend

Trophic Zones

- Littoral (0-2m depth): 15.42 acres
- Limnetic (>2m depth): 41.78 acres
- Enloe Dam
- Road
- FERC Boundary

N W E S

0 250 500 1,000 Feet

Image source: 2005 USDA National Agriculture Imagery Program

Enloe Dam Licensing Project

Figure E.3-4 Enloe Reservoir Trophic Zones

ENTRIX

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Entrainment of Fish at the Project Intake

Entrainment into the intakes and passage through the turbines could result in injury or mortality to reservoir fish. Fish passing through the turbines would be lost to the upstream fishery regardless of the survival rate through the turbines. Because the population density of fish in the reservoir appears to be relatively low, the rate of entrainment is also likely to be low. Smaller fish are expected to be more susceptible to entrainment as sampling in the reservoir substantiated the correlation between presence of shallow water and cover and use by smaller fish (ENTRIX 2007a).

Based on the sampling in the reservoir, larger individuals of two native species (chisel mouth and northern pike minnow) would likely have a greater potential of occupying the area near the intake. Native suckers, mountain whitefish and introduced species such as largemouth bass, carp and yellow perch may be present in the vicinity of the intake. Rainbow trout could potentially be present, but previous studies have not found any rainbow trout between the U.S./Canadian border and Enloe Reservoir (IEC Beak 1984, Public Utility District No. 1 of Okanogan 1991, ENTRIX 2007a).

Larger fish would be excluded by the trashrack (described in Exhibit A). The project intake will have close-spaced trashrack bars that will prevent larger fish from becoming entrained in the intake. These larger fish will have the swimming capability to move back upstream, away from the intake and avoid impingement on the trashrack. If smaller fish that might be incapable of swimming upstream against the intake flow do encounter the intake, they can fit through the bars and move downstream through the turbines.

Survival of fish passing through the turbines was estimated using predictive models developed by U.S. Department of Energy's Advanced Hydro Turbine System Program (Franke, et. al. 1997). The calculation methodology has been documented, and it is provided in Appendix E.3.2. Estimates of mortality were prepared for a variety of non-salmonid species encompassing the range of sizes found in the reservoir during the 2006 surveys. The survival estimates (Table E.3-7) indicate relatively high survival, especially for small fishes (approximately 2 inches) with about 5 percent mortality. Estimated survival rates decrease with increasing fish length; however larger fish (6 inches long or longer) would be discouraged, if not physically excluded, from passage through the close-spaced trashrack bars proposed for the intake. And as described above, would likely be able to swim away from the intake structure.

Table E.3-7: Estimated Non-Salmonid Survival through Proposed Turbines (R2 Resource Consultants 2008)

Fish Length	Turbine Survival Estimate
50 mm (approximately 2 inches)	95.3% +/- 3.2%
100 mm (approximately 4 inches)	91.0% +/- 6.4%
150 mm (approximately 6 inches)	87.2% +/- 9.6%

Although no salmonid species were captured during the 2006 reservoir field studies, mountain whitefish and rainbow trout are known to be present in the Similkameen River upstream of the Project, therefore, estimates were also performed for salmonids passing through the turbines, including larger fish up to a length of 10 inches to represent adult resident salmonids. These results are below in Table E.3-8. However, as previously stated for the non-salmonids, fish in the range of 6 inches long would be very reluctant to pass through the trashrack bars, especially considering that they do not have a biologically-driven need to do so as would be the case for an anadromous fish. Fish in the range of 10 inches long would be physically precluded from passage through the trashrack.

Table E.3-8: Estimated Salmonid Survival through Proposed Turbines (R2 Resource Consultants 2008)

Fish Length	Turbine Survival Estimate
50 mm (approximately 2 inches)	92.2% +/- 4.0%
100 mm (approximately 4 inches)	88.7% +/- 6.6%
150 mm (approximately 6 inches)	84.0% +/- 9.6%
250 mm (approximately 10 inches)	73.2% +/- 16.1%

Fish that are entrained in the intake are lost from the reservoir population and pass into the Similkameen River downstream of Enloe dam. The entrainment rates are not expected to cause a depression in reservoir populations due to the location of the intake. Large fish which would likely occupy the reservoir near the intake are excluded by the trashrack and the deeper water habitat near the intake is not suitable for small fish. Because of the high survival rate expected for fish passing through the turbine, most of the entrained fish would recruit to local populations.

Fish are currently lost from the reservoir fishery when they go over the dam in the spill flow. Although it will occur less frequently with project operations, loses such as these will continue to occur when the dam is in spill mode. The current loss of fish from the reservoir over the existing spillway would likely be greater than the loss from entrainment into the intake due to the design of the trashracks as described above and in Exhibit A. This design attempts to exclude larger fish and as described below a high survival rate of small fish through the turbines is expected.

Water Temperature

Studies conducted for this application indicate that water temperatures naturally increase during the summer in the Similkameen River with potential for lethal effects on salmonids. Recent studies indicate that the Project does not contribute significant cumulative effect (see Appendix E.2.1 and ENTRIX 2007b). Accordingly, operation and maintenance of the Project is not expected to have significant negative impacts on fish populations related to high water temperatures.

Sediment Transport

As described above for mobilization due to construction disturbance, there is also concern that sediment mobilized due to operation of the Project could impact fish, eggs and fry if deposition occurs in their habitats. The results of a two-dimensional hydraulic model of the reservoir (described in Exhibit E.2 and Appendix E.2.3) suggest the new intake channel upstream of the dam will change flow patterns and increase local water velocities near the east bank of the river. The change in flow patterns is expected to entrain sediment deposits from the area immediately upstream of the intake. Entrained sediment would either pass through the intake channel and powerhouse or pass over the spillway and be discharged downstream (see Exhibit E.6). It is expected that most of this would occur during the project startup and testing. Additional erosion may occur during the annual flood cycle when most of the naturally occurring scour and deposition in the reservoir takes place. At this time background suspended sediment concentrations and turbidity in outflow from the reservoir are high.

The two dimensional model described in Appendix E.2.3 also suggests that the Enloe impoundment forebay undergoes an annual cycle of erosion and deposition, and that the additional erosion that would occur due to Project operations at relatively low flows is minimal compared to the amount of erosion that occurs every year during the peak flows.

There is concern that any disturbance to sediment that has already accumulated in the reservoir could result in increased discharge of sediment in outflow from the reservoir, which could then be deposited in spawning or rearing areas (Burns 1970, Meyer 2003). The presence of elevated levels of copper and arsenic increases the potential for adverse impacts. In addition, suspended sediments with elevated levels of metals could lead to bioaccumulation of those constituents in fish eggs and fry, and could in extreme cases result in acute levels of bioaccumulation in predatory fish and insectivores such as salmonids and bass (Petersen and Kristensen 1998, May et. al. 2000).

Modeling indicates that the general pattern is such that sediment builds up in the forebay during relatively low-flow portions of the year and is largely flushed out during annual peak flows, and this pattern would continue during proposed project operations. Therefore impacts of the project may not be any greater than those expected naturally during high flow periods.

Gravel Transport

Habitat quality for salmon and steelhead is determined in part by the grain size, compaction, and permeability of the substrate. Thus, a stream with small amounts of gravel can be as unfavorable to salmonid recruitment as a stream with an overabundance of fine sediments (Schett-Hames and Pleus 1996). The Similkameen basin is a gravel-poor watershed, and there is some concern that gravel transport is interrupted by Enloe Reservoir (J. Arterburn, pers. comm. 2007). Field observations and recent studies (see Exhibit E.6 and Appendices E.6.1 and E.6.2) indicate that there are some sources of gravel between Similkameen Falls and areas where anadromous species are known to spawn. Although these gravel sources are contributing spawning gravel to this reach, Enloe Reservoir will continue to interrupt gravel transport from upstream sources. To address this potential impact, a gravel supplementation program is included as a PM&E.

Invertebrate Drift

Presumably there is a significant amount of invertebrate drift that is generated by the reservoir and passes over the dams and supplements downstream foodwebs. During generation, water would be diverted from the spillway; however, any associated drift would be entrained through the generation facilities and end up in the pool below Similkameen Falls. In the event of an unplanned shutdown, water would flow over the spillway, carrying with it invertebrates suspended in the water column. Consequently there will likely be no impacts on invertebrate drift associated either with power generation or shutdown and start-up procedures.

Enloe Dam to Similkameen Falls Impacts

The 370 feet long bypass reach lies between the toe of Enloe Dam and the pool below Similkameen Falls where powerhouse outflow rejoins the river. The portion of reservoir outflow that is released through the proposed power plant will bypass this reach. Flow in this reach would therefore be reduced by up to 1600 cfs when the power plant is in operation. When river flow is less than 1600 cfs and both generating units are operational, there would be no flow in the bypass reach.

Normally, the only fish that could occupy this reach are individuals from resident populations above Enloe Dam that pass over the spillway. As described in the habitat and habitat use sections above, the bypass reach is extremely poor fish habitat and no fish were observed using the area. It consists of a scoured bedrock sheet that forms the stilling basin area for outflow over the spillway of the existing dam. During the annual flood, this reach acts as a large stilling basin to dissipate residual energy in the high velocity near-horizontal jet of water that exits the spillway chute near the toe of the dam. Flow in the reach is turbulent due to high water velocities, which scour the channel of any substrate. During the rest of the year, when river flows are lower, the energy dissipating zone is confined to the area immediately downstream of the toe of the dam; below this point water flows through the scoured bedrock channel to the falls.

Due to low substrate diversity, the absence of a hyporheic zone, and catastrophic macroinvertebrate drift associated with high spring flows over the dam, macroinvertebrate production in the bypass reach is likely to be limited (Cushman 1985, Bourassa and Mourin 1995). The combination of low productivity, the relatively short length of this reach, and its limited habitat diversity, indicate a very low potential for the bypass reach to sustain significant fish populations or contribute to downstream fish populations. Because Similkameen Falls prevents downstream fish from accessing the bypass reach, the channel is also unavailable as either a staging or spawning area for downstream fish populations. Because of limited productivity and poor habitat quality, it is unlikely that the bypass reach would contribute significantly to invertebrate drift. Consequently, Project-related impacts on aquatic fauna or habitat resulting from dewatering the bypass reach would be minimal or insignificant.

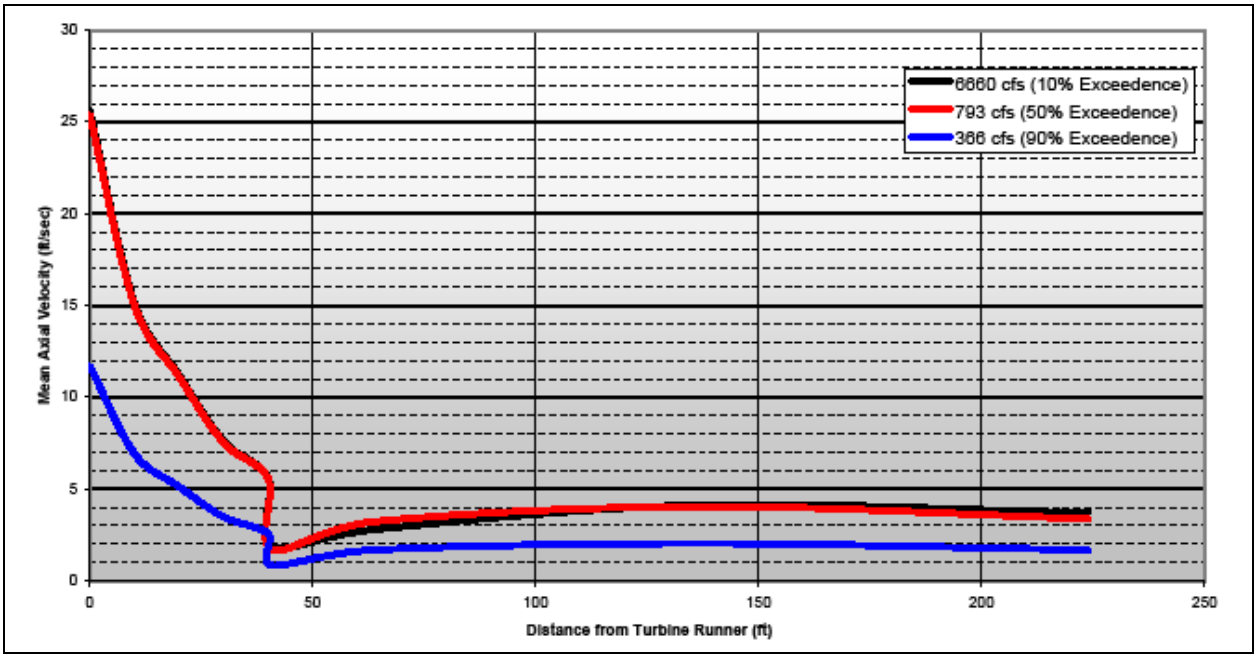
Powerhouse and Tailrace Impacts

The powerhouse tailrace will discharge into the pool below the falls. Fish may swim upstream into the tailrace and could, theoretically, continue swimming upstream into the draft tube environment, if no barrier is in place. Chinook salmon, sockeye salmon, and steelhead trout have been documented as utilizing the pool below the falls as a holding area. During full turbine flow operations, fish cannot travel sufficiently far upstream in the draft tube to be injured by the turbine. This is due to the high-velocity flow passing through the turbines. Fish would need to swim for a distance at speeds in excess of the velocity in the upper reaches of the draft tube to reach the turbine, an achievement that is beyond the ability of even the largest anadromous fish.

Figure E.3-5 provides velocity profiles from the turbine runner downstream through the draft tube and tailrace for the 10 percent exceedence, median, and 90 percent exceedence river flow conditions. The reduction in velocity approximately 40 feet downstream of the turbine represents the exit of the draft tube, with the remainder of the profiles downstream of that point representing the conditions through the tailrace channel.

Steelhead trout, which are considered the strongest swimmers of salmonids in the Pacific Northwest, have burst speed of between 13.7 and 26.5 fps (Powers and Orsborn 1985). Only the largest and healthiest of these fish could approach the upper end of this range, and even then only for a few seconds, which is not a long enough period of time to reach the turbine during high turbine flow conditions.

Figure E.3-5: Axial Velocity in Draft Tube and Tailrace Channel at 10%, 50%, and 90% Exceedence River Flows



During periods of reduced turbine flows, when the larger anadromous salmonids could theoretically reach the turbine, a physical net barrier would be installed at the outlet of each draft tube. The net barrier is described in Exhibit A. The net barriers include a small opening at the downstream end of the net to allow any fish that had safely passed through the turbine to exit and move downstream. Given the conical shape of the net barrier, the relatively small size of the opening, and net and streamer attachments to the draft tube outlet, it is unlikely that an adult salmonid would swim upstream through the barrier net and into the draft tube. However, if a fish were able to swim into the net, or is already present in the lower reaches of the draft tube when the net barrier is installed, it would be able to escape through the net opening. The net barriers would also be installed prior to planned shut-down or start-up of the turbines. The barriers would not be deployed during high turbine flow conditions to prevent the high-velocity flows and debris loads from damaging the net. During these conditions velocities through the turbine are high enough to prevent fish from reaching the turbine, as described above. In the event of an unplanned shutdown, It may be necessary to deploy the barrier before restarting, depending on flow conditions and fish presence.

Downstream Impacts

The reach of the Similkameen River between Similkameen Falls and the confluence of the river with the Okanogan River hosts runs of Chinook salmon, sockeye salmon and steelhead, as well as supports a number of resident fish species. The braided reach near the town of Oroville provides the largest amount of spawning habitat for Chinook

salmon and steelhead in the Project vicinity. Although adult lamprey have not been observed in the Similkameen River, they may use this area as indicated by the presence of unidentified ammocoetes in holding ponds in the Hatchery Pond on the lower reaches of the Similkameen River below Oroville (Hallock, pers. comm. 2007b). The Project has the potential to adversely affect fish during construction and operations. The following section address the effects associated with instream flows, minimal effects on downstream fisheries as described in the following sections.

Instream Flows

Project operation will be run-of-river and will not significantly affect the flow regime of the Similkameen River downstream of the proposed project. Flow through the powerhouse and over the spillway both will be automatically regulated to maintain a stable water level in the reservoir so that total outflow from the reservoir will closely track inflow. During large flood events the crest gates on the spillway will be fully open and water levels on the reservoir will be controlled by the capacity of spillway as it is today. Powerhouse and crest gate operation are further described in Exhibit B.

During a planned unit outage, outflow from the reservoir would be maintained by switching flow to the other generation unit. During a planned outage of both units, outflow from the reservoir would be maintained by partially opening the spillway crest gates to maintain tailwater level and therefore flow downstream of the powerplant. In the event of an emergency outage of both units of the powerplant due to a transmission line outage or similar causes, a warning siren will sound and then the crest gates will be gradually lowered to increase downstream flow to pre-outage flow rates. The pneumatic crest gates do not require power to open. The control system will be operated by a DC power supply with battery backup. A small, short-term fluctuation in downstream flows could occur as flow through the powerplant is reduced and flow over the spillway crest gates increases. The estimated travel time from the spillway to the pool below the falls depends on flow, but is in the order of about one minute. Any fluctuation in river flow downstream of the project would be of short duration and would be attenuated by water storage in the large pool below the tailrace and in the river channel further downstream. Therefore no significant effects on fish are expected.

Fish Passage

Fish passage above the Project has been vigorously opposed by the Upper and Lower Similkameen Indian Bands (Canadian First Nations), and the Colville Confederated Tribes (co-managers of the Similkameen River Fisheries). The focus of opposition for passage includes cultural and social issues (see Cultural Resources Section E.4) and concerns about the introduction of disease to fisheries, mostly in Canada. Because of this policy, there is a general regional consensus, including state and federal agencies, that passage of anadromous fish past the Similkameen falls and Enloe Dam will not be part of the Project. Historically, Canadian fish managers have also opposed fish passage above the falls.

Water Quality

Water Temperature

Recent studies by ENTRIX indicate that the Project does not contribute to increase of water temperatures in the Similkameen River below the Project (see Exhibit E.2 and Appendix E.2.1, and ENTRIX 2007b). Since the Project will not contribute to elevated temperatures in the summer, no negative effects to fish health and survival are expected.

Total Dissolved Gasses (TDG)

The proposed Project is expected to decrease TDG levels during nearly all flows because spill that would normally pass over the dam and then the falls will be passed through the powerhouse, reducing the entrainment of gas. This would have a beneficial effect on fish downstream (Exhibit E.2, Appendix E.2.1, and ENTRIX 2007b).

Dissolved Oxygen

During the summer, when flow is reduced and temperatures are high, naturally occurring low DO concentrations in the downstream reach might adversely affect fish. Elevated water temperatures reduce the amount of oxygen that can remain in solution (Horne and Goldman 1994), and chronic low concentrations of DO can lead to significant impacts on fish growth and reproduction (Herrmann et. al. 1962, Carter 2005). Just as undesirable TDGs may be reduced by the Project, the diversion of flow into the powerhouse may reduce aeration and DO during summer low flow periods from current levels. The decrease in DO from current elevated levels is not expected to have a significant effect on fish below Similkameen Falls. Nevertheless, to offset the reduced aeration that would otherwise occur with water flowing over the dam and falls, the powerhouse flow tubes will be equipped with aeration vents and operated to increase DO during critical periods. Adaptive management monitoring will determine when the aeration vents should be opened after high flows have receded in the early summer (see Exhibit E.2).

Large Woody Debris (LWD)

Enloe Dam has the potential to prevent LWD from passing downstream, and thus reducing downstream habitat quality. LWD is an integral part of fish habitat because it: 1) provides shelter where fish can avoid predation, 2) provides a substrate for the production of macroinvertebrates on which many fish forage (Johnson et. al. 2003), 3) alters river hydraulics resulting in creation of pools and gravel bars (Beechie and Sibley 1997), and 4) provides refuge from extreme flows, thereby reducing the energy that fish must expend to swim (Harvey et. al. 1999). Field observations indicate that both the upper and lower Similkameen River basins have limited deposits of LWD. Restoring hydropower generation at this existing dam would have no significant impact on movement of large woody debris through the reservoir. However, to improve habitat downstream, large woody debris will be transported over the dam as a PM&E.

E.3.2.3 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

A summary of Project PM&Es is provided in Appendix D.1. The District's approach to developing protection, mitigation and enhancement focuses on avoidance of, or mitigation for, anticipated impacts and also includes undertaking actions (enhancements) that will improve habitat conditions with a special emphasis on special status species. In developing PM&Es, the District focused on measures that address factors that control or limit resident and anadromous fish populations in the Project area. An important component of this approach is estimation of potential population response associated with implementation of a mitigation measure. This approach allows for the development of cost-effective actions that will benefit the targeted resources. Agency interaction is a critical element of mitigation planning efforts, and tribal, state and federal agencies have been consulted in determining species and populations of concern based on the resources affected by the Project.

ISSUE: SEDIMENT IMPACTS DURING CONSTRUCTION

Potential Impact

Construction of access roads, excavation of the intake channel, penstock foundations, powerhouse foundation, and the tailrace channel could result in increased soil erosion and migration of sediment to adjacent water courses.

Proposed PM&E WQ-06: Erosion and Sediment Control Plan

During construction, the District will implement BMPs for erosion control as described in the Exhibit E.2.7 Water Quality PM&Es (WQ-06) and further detailed in the Bank Stability and Erosion Assessment (Appendix E.6.2). The costs associated with WQ-06 PM&E are provided in Section E2.7.

In addition, the following specific avoidance and minimization measures are proposed to avoid and minimize impacts to aquatic resources:

1) The project is designed so that most excavation will take place in dry areas away from the river. Proposed sediment and erosion control measures are designed to prevent migration of soil into the river.

2) Construction of the entrance to the intake channel and exit of the tailrace channel on the banks of the river would be conducted under low flow conditions to minimize entrainment of sediment. A silt curtain would be used in the reservoir adjacent to the mouth of the intake channel to exclude fish and contain turbidity.

3) Excavation of bedrock at the exit on the tailrace channel would be scheduled for a period of low flow during fall or winter so that anadromous fish can be excluded from the area by nets. Installation of the proposed crest gates, which involves drilling and concrete work, would be conducted under dry conditions by bypassing flow through the completed power plant.

Expected Outcome

Scheduling instream construction during the low flow time and the implementation of BMPs will minimize anticipated impacts to fishery resources from erosion and sediment associated with construction activities.

ISSUE: BLASTING DURING CONSTRUCTION

Potential Impact

Excavation for project facilities will be accomplished using excavators and controlled blasting. Blasting has the potential to adversely affect fishery resources, including sensitive and federally listed species.

Proposed PM&E FISH-01: Blasting Plan and Best Management Practices

The following measures will be implemented to avoid and minimize the potential impacts associated with blasting to aquatic resources including federally listed or sensitive species:

- The project is designed so that most facilities are located out of the present river channel so that rock excavation will be carried out in dry conditions and that rock between the excavation and the river will attenuate vibration.
- Proven controlled blasting techniques will be employed for rock excavation. This involves careful planning of the timing of blasting operations, use of special drilling patterns, and use of small charges that are set off with time delays to minimize peak vibration and pressure waves.
- Blasting pressure waves that could coincide with occupation of area by fish will be monitored using hydro phones. Pressure wave criteria that are potentially harmful to fish will be established and a contingency plan for construction will be developed if pressure wave criteria are exceeded. It is estimated that creation of hydrostatic pressure waves in exceedance of 100 kilopascals (kPa or about 14.5 pounds per square inch) or noise levels exceeding 190 decibels (dB) should be avoided, as practical.
- Impacts will be minimized by timing near- and in-water blasting to coincide with the lowest water levels (low flows) combined with lowest low potential for fish occupation in the area with a focus on avoiding periods where federally listed or sensitive salmonid species are present. Blasting adjacent to the stream will take place prior to spring high flow or during fall low flow.
- The amount of time that near or in water construction and blasting occurs will be minimized. The area of most concern is excavating the downstream end to the

tailrace channel where construction activities will be expedited to reduce the amount of time fish may be exposed to effect of blasting activities.

- Impacts will be minimized or avoided by removing as many fish as practical from the area adjacent to the proposed blasting and installing an exclusion barrier downstream of the potentially affected area to prevent entry of additional fish into the affected area.

- Mechanical excavators with hydraulic rock hammer attachments will also be used in lieu of blasting to trim the excavation, excavate rock in areas unsuitable for blasting and to excavate loose rock. When removing materials from areas that are excavated through blasting, the District will remove residues from the blasting operation to the extent practical.

The expected costs associated with FISH-01 are $100,000. Further breakdown of the costs include:

- Specialized controlled blasting consultant - $15,000
- Developing a controlled blasting specification - $10,000
- Contractor's controlled blasting plan - $10,000
- Acquire blast monitoring equipment - $15,000
- Monitoring blasting - $35,000
- Temporary Downstream Barrier and Fish Relocation - $5,000
- Monthly Data Reports/correspondence - $10,000

Expected Outcome

Implementation of the BMP for blasting, including removal and exclusion of fish present is expected avoid or minimize mortality and injury associated with blasting in and adjacent to aquatic habitat.

ISSUE: OPERATIONAL IMPACTS UPSTREAM OF THE DAM – INUNDATION OF RIVERINE HABITAT

Potential Impact

Operation of crest gates will extend the reservoir pool approximately 0.4 miles upstream of Shanker's Bend. With respect to baseline conditions, the inundation period would extend further into the low flow months, potentially affecting resident fish species.

Proposed PM&E FISH-02: Placement of Boulder Clusters

In the reach of river upstream of the impoundment, the habitat has very little diversity and habitat quality is most likely a limiting factor for resident fish. The District proposes to place two clusters of one ton to two ton boulders in riffles or in plane-bed sections of the Similkameen River upstream of the reservoir. The PM&E will increase structural diversity and improve the quality of habitat. The objective of boulder cluster placement is to 1) alter patterns of scour to promote formation of small pools, 2) alter patterns of sediment deposition to trap spawning gravels for resident fish species, 3) increase cover for resident fish species and 4) increase hydraulic complexity including velocity refugia and feeding lanes.

The costs of these habitat improvements are estimated to be $50,000. Approximately $10,000 would be needed to research the best location for the clusters, $25,000 would be used for construction of the clusters, and approximately $15,000 would be used in monitoring and reporting.

Expected Outcome

Implementation of FISH-02 will increase habitat quality and provide structure needed to increase occupancy of this reach.

ISSUE: OPERATIONAL IMPACTS UPSTREAM OF THE DAM – TRAPPING OF LARGE WOODY DEBRIS

Potential Impact

The existing reservoir has the potential to trap LWD that is transported from upstream sources.

Proposed PM&E FISH-03: Transport of Large Woody Debris

LWD can be an important element of fish habitat. To prevent the loss of LWD from downstream habitats, logs and other LWD will be allowed to pass over the spillway during the annual flood and will continue downstream naturally. If needed, some LWD may be transported around the dam and placed in the river downstream of the dam. From there, the natural hydraulic force of the river will transport the LWD to downstream habitats.

The annual cost of transporting LWD, including temporarily removing the log boom, is estimated to be $4,000 annually. The transport activity is expected to occur once during the recession of the high flow period.

Expected Outcome

Implementation of FISH-03 will minimize impacts related to trapping of LWD.

ISSUE: OPERATIONAL IMPACTS AT THE PROJECT POWERPLANT – ENTRAINMENT OF FISH AT THE PROJECT INTAKE

Potential Impact

During operation of the Project, there is a potential that fish will become entrained in water diverted for power generation.

Proposed PM&E FISH-04: Modified Intake Trashrack

Several factors were considered in developing this PM&E to protect the existing fishery upstream of Enloe Dam including:

- There are no state- or federally-listed threatened or endangered species upstream of the Enloe Dam.
- The potential for the presence of salmonids in the area of the intake is minimal and therefore the risk of entrainment is low.
- Fish abundance in the reservoir is low, and the majority of the species present are cyprinids (minnow species).
- Turbine survival for smaller fish that might be incapable of avoiding entrainment if they come in close proximity to the intake would be relatively high (Tables E.3-7 and E.3-8 and Appendix E.3.2).

Larger fish capable of swimming away from the intake should be discouraged or prevented from passing through the intake so that they remain in the upstream fishery.

The proposed intake trashrack will have bars spaced such that smaller fish can pass safely through the racks without becoming impinged and larger fish will be discouraged or prevented from passing through the turbines. As described previously in this Exhibit, larger fish have a greater swimming ability and can easily move back upstream and avoid impingement on the rack. A description of the proposed trashrack is included in Exhibit A. The cost of reducing the trashrack bar spacing from that which would otherwise be required solely for protection of the turbine unit from large debris is estimated to be about $30,000.

Expected Outcome

Smaller fish (100 mm or less) that pass through the project intake would have a high survival rate through the turbine (see Appendix E.3.2) and would become part of the downstream fishery population. Larger fish would remain in the upstream fishery. In fact, given the significant reduction frequency of unrestricted spills over the dam per year, it is reasonable to assume that loss of larger fish from the reservoir will be reduced as compared natural unrestricted spills in the absence of the Project.

ISSUE: OPERATIONAL IMPACTS UPSTREAM OF THE DAM – LOSS OF FISH TO RESERVOIR POPULATION

Potential Impact

Entrainment and passage through the turbine will remove fish from the reservoir population.

Proposed PM&E FISH-05: Entrainment Studies and Fish Monitoring

During the initial phase of project operation, the magnitude of entrainment impacts will be estimated with studies designed to 1) examine seasonal variation in entrainment susceptibility, 2) observe trauma and mortality associated with placement of fish species in the power canal, and 3) sample fish in the reservoir to relate the entrainment observations with the fish distribution and abundance in the reservoir. Potential losses will be mitigated through the habitat enhancement project described below.

Entrainment susceptibility represents a potential loss of fish from the upstream fishery regardless of the survival rate through the turbine. Possible injury or mortality through the turbine represents a potential impact on the ability of the downstream fishery to recruit resident fish from the upstream fishery. These issues will be examined by placing nets in the tailrace discharge for the purpose of trapping fish that may pass through the turbines. Live fish captured in the nets will be examined for evidence of physical trauma and mortality, and results will be recorded. Entrainment into the power canal is a function of seasonal variation in fish density, seasonal variation in approach velocities (as a function of discharge), fish size, and species-specific swimming capability. Surveys in the reservoir suggest that fish densities in nearshore environments vary substantially with season (Table E.3-2). To gain an understanding of the magnitude of the potential impact, it will be necessary to seasonally examine fish entrainment. The District proposes to conduct quarterly fish sampling over a one-year period. Sampling will occur at fixed intervals (e.g., every six hours) over two consecutive 24-hour periods for each quarterly sampling period.

Given the low fish densities observed in the reservoir, field crews may capture only small numbers of fish in the tailrace. In this event, the sampling crew will capture fish in the reservoir margins with a seine and place fish directly in the intake canal to observe actual mortality and trauma associated with passage through the turbine, given a known quantity and size of fish. This information will allow an estimate of mortality and injury of fish passing through the power plant, but not the number of fish entrained under normal operating conditions. If the number of fish entrained is low under normal conditions, then the loss of fish from the upstream fishery would be low, and the potential for recruitment of individuals to the downstream fishery would also be low, regardless of the injury or mortality rate. If the number of entrained fish is higher, at least for certain portions of the year, the mortality and injury estimates will assist in determining the magnitude of the reduction in potential recruitment of individuals to the downstream fishery.

To relate the fish entrainment data with the fish distribution and relative abundance of fish in the reservoir, a fish monitoring program would be conducted in conjunction with the entrainment studies. The reservoir sampling efforts would be enacted using methods outlined in the ENTRIX technical fisheries report on Enloe Reservoir (ENTRIX 2007). The methods would involve minnow traps and seining in the margins of the reservoir and gill netting in the deeper portions. The expected costs associated with the study are $80,000 for entrainment sampling and $20,000 for the reservoir monitoring study.

Expected Outcome

The study results will allow an assessment of the impact of entrainment on the upstream fishery, and the impact of turbine mortality on the recruitment of upstream species to the downstream fishery.

ISSUE: OPERATIONAL IMPACTS UPSTREAM OF THE DAM – RIPARIAN VEGETATION

Potential Impact

The larger reservoir will inundate vegetation and wetland along the shore of the current impoundment.

Proposed PM&E BOTA-02: Plant Riparian Vegetation Along the Reservoir

As part of the Botany PM&Es, riparian vegetation will be planted along the reservoir. BOTA-02 will also benefit fish and aquatic resources along the impoundment shoreline. Costs are described in Exhibit E.3.4.

Expected Outcome

BOTA-02 will provide several benefits to aquatic resources in terms of organic (e.g., leaf litter) input that is important to insect production, shade that is important for reducing water temperatures, and cover for fish to hide and rest in terms of wood that falls in the water or overhanging vegetation.

ISSUE: POWERHOUSE AND TAILRACE IMPACTS

Potential Impact

Fish may be attracted into the tailrace and potentially travel into the draft tubes.

Proposed PM&E FISH-06: Tailrace Net Barriers

The District proposes to make the tailrace a safe refuge for fish. The walls and floor of the tailrace will be excavated bedrock similar to the existing bedrock channel downstream of the falls. Conical net barriers are proposed for the draft tube exits to prevent fish in the tailrace from swimming upstream into the draft tubes during periods of low flows. The net barriers are described in Exhibit A; operation of the net barriers is described previously in this Exhibit. The initial cost of the net barriers including frames and guides is estimated to be about $20,000. Operation and maintenance of the barriers, including annual repair or replacement of the nets is estimated as an annual expense of $5,000.

Proposed PM&E FISH-07: Tailrace Video Monitoring

Observations of the openings of the net barriers will be conducted using suspended underwater video cameras. The study will document that adult salmonids are not entering the nets at the downstream end of the barriers, or if some individuals do enter the nets, they are able to safely exit the barrier. Observations will be made during periods of peak presence in the tailrace for each of the three anadromous salmonid species during each of the first two years of operation. If fish are observed entering the openings, different materials could be attached to the downstream ends of the barriers to further discourage entry. The cost of this video monitoring study is estimated to be $20,000.

Expected Outcome

With the implementation of FISH-06 and FISH-07, fish may safely occupy the tailrace. During periods of low flow when the draft tube environment could be hazardous because they might be able to swim upstream and reach the turbines, fish will be prevented from entry into the draft tubes. During high turbine flow operation, the velocity through the turbine and draft tube will prevent fish from moving sufficiently far upstream into the draft tubes to reach the turbine.

ISSUE: DOWNSTREAM IMPACTS – INSTREAM FLOWS

Potential Impact

Operation of the crest gates may cause flow fluctuation downstream of Similkameen Falls.

Proposed PM&E FISH-08: Run-of-River Operations

During normal operations the Project will be true run-of-the-river and there would be no detectable changes in flow below Similkameen Falls. Downstream flow impacts that might occur from operation of the crest gates will be prevented by operating the crest gates to maintain a constant predefined reservoir elevation. During an unexpected shutdown, the flows would switch from running through the powerhouse to spilling over the crest gates. There is no additional cost for implementation of the FISH-08.

Expected Outcome

Implementation of this FISH-08 is expected to avoid flow fluctuations that might adversely affect downstream resources.

ISSUE: DOWNSTREAM IMPACTS – PROTECTION OF HABITAT DOWNSTREAM OF SIMILKAMEEN FALLS

Potential Impact

Adverse impact to the habitat downstream of Similkameen Falls through diversion of streamflow.

Proposed PM&E FISH-09: Relocation of Tailrace

To avoid impacts to fish that use the holding area below Similkameen Falls, the original tailrace location was changed. The original tailrace entrance was located downstream of the large pool that serves as a holding area for salmon and steelhead and would have not provided fresh water circulation to the pool. The new location of the tailrace was chosen to provide improved circulation and water exchange in the pool, therefore providing good water quality for fish. This is an important feature of the Project and was implemented to avoid impacts to pool habitat below the falls.

The estimated cost of relocation of the tailrace was $112,000.

Expected Outcome

With the implementation of this FISH-09, the potential loss of important holding habitat will be avoided.

ISSUE: DOWNSTREAM IMPACTS – BYPASS REACH IMPACTS

Potential Impact

The bypass reach (the area that lies between the toe of Enloe Dam and the pool below Similkameen Falls where powerhouse outflow rejoins the river) would experience reduced flow, and would be dewatered during low flows.

Proposed PM&Es FISH-10 and FISH-11: Fisheries Enhancement Project

Although fish and invertebrate use in this area is limited and minimization of this impact is not feasible, a fish enhancement project incorporating two separate PM&Es (FISH-10 and FISH-11), will be provided as mitigation. The objective of FISH-10 and FISH-11 is to mitigate for impacted aquatic resources where other protection, mitigation, or enhancement measures are not practical on a site-specific basis. This enhancement project will address impacts such as mortality associated with entrainment of fish in the turbines and decreased production in the Similkameen River between the dam and the tailrace. There are two enhancement projects directed towards salmon and steelhead. One, FISH-10 is a pilot project that will enhance an existing side channel area to

improve spawning, rearing, and summer thermal refugia habitat. The second, FISH-11 is a gravel supplementation program. The habitat focus is to increase the amount of gravel dominated habitat with cooler water in an area protected from extreme (high and low) flow variation.

FISH-10: Side Channel/Off Channel Development/Enhancement

This enhancement project would be feasible at several locations in the lower Similkameen River or nearby in the Okanogan River as described in the technical memo provided in Appendix E.3.3. Appendix E.3.3 provides criteria and conceptual design descriptions for several sites visited in the Project vicinity. A final enhancement project would be chosen by considering input from tribal, state and federal fisheries managers and available resources. The channel will be chosen to focus on addressing two of the most substantial limiting factors for salmonids in the system: high temperatures during low flow and the limited rearing habitat for salmon and steelhead in the system. A channel would need to be of the appropriate size, shape, and geomorphology to maintain suitable physical components during all flow conditions. A shallow well would be constructed to extract the cooler water flowing through the gravel of the streambed. This water would be pumped to perforated PVC pipe buried with spawning-sized gravel in a modified (but existing) side channel. Water would be pumped through the PVC pipe during critical warm water periods and would provide upwelling of the cooler water. A “low-technology” structure (e.g., boulders or log(s)) could be anchored at the head of the channel to allow water to enter the side channel during all flow conditions (low flow channel) while deflecting the larger flood flows back into the main channel. The channel would be approximately 300 feet in length and about 30 feet to 50 feet in average width.

The side channel enhancement would be accomplished in three phases. The first phase would involve enhancement of the preliminary information including: 1) the use of existing data sources (LIDAR topography, aerial photographs) to evaluate candidate channel construction sites, 2) identification of sources of cold water and pump house locations, 3) examination and comparison of characteristics of known sites, and 4) the selection of one to three candidate project sites for further development and assessment. The second phase would include a more detailed examination of the channel stability, development of flow duration curves, choosing a site, and conducting preliminary design of the project. The last phase would be building, operating, and monitoring the project. It is assumed that monitoring would occur over a five-year period and would be coordinated with other monitoring efforts in the basin. Fish distribution and relative abundance would be monitored in the enhanced side channel and at three other areas considered important spawning and rearing areas. Identified trends would be incorporated into the biological review process (see FISH-12).

The costs associated with this FISH-10 are expected to range from $400,000 to $600,000. Phases one and two are estimated to cost about 15 to 20 percent of the

budget, phase three would be distributed into about 60 percent of the total budget for design, building and operating, and 15 to 20 percent for monitoring.

FISH-11: Gravel Supplementation

The Similkameen River is a gravel-poor system. Gravels may be held behind Enloe Dam reducing the gravel supply to the lower river. Increasing the amount of gravel in the river downstream of Enloe Dam would improve spawning habitat and has the potential to increase the overall reproductive success of sensitive salmonid species.

Spawning gravels (1 to 3 inches in size) will be placed in the active flood plain adjacent to the wetted area during the low flow period. Gravels will be place in areas that would facilitate the transport of gravel under winter and spring flows. The gravel would be distributed downstream by the hydraulic forces of the river. To be effective at replenishing gravels in existing spawning areas or in developing gravel bars or deposits that might be considered “new” habitat, it has been suggested that gravel be placed in the main channel of the Similkameen upstream of the bridge crossing in Oroville (J. Arterburn, pers. comm. 2008), which is also upstream of spawning habitat areas currently utilized in the Similkameen River (see Figure E.3-1). Truck access to this site appears to be good, it is an area where gravel would be transported downstream by river flow, and it is located upstream of a 3-mile long reach known to be utilized by spawning steelhead. The District would place a large volume of gravel in the active channel during the low flow season.

The estimated volume of gravel to be placed would be 3,000 cubic yards. This amount would provide for approximately 5 percent coverage of the first mile of river channel downstream of the gravel stockpile. It may require 1 to 3 years to distribute the stockpiles. At an estimated cost of $15.00 per cubic yard, costs would be approximately $45,000 for a one-time stockpiling of gravel in the transport zone. Gravel placement would begin post license at Year 3 when the Project is constructed. The subsequent stockpiles would be placed every 5 years for the next 20 years (e.g. Year 8, Year 13, Year 18, and Year 23).

Expected Outcome

Implementation of FISH-10 and FISH-11 will benefit the native species found in the Similkameen River, but the focus will be on salmon and steelhead fisheries by increasing spawning and rearing habitat. The two measures together will more than compensate for loss that could occur as a result of the construction and operation of the project for fishery resources. The actions are designed to target federally-listed species, and species of special concern that inhabit the river downstream of the Project.

ISSUE: BIOLOGICAL REVIEW PROCESS

Potential Impact

The potential impacts described above for fish have been assigned PM&Es to reduce the level of impact expected. The Biological Review Program (FISH-12 and FISH-13) is proposed to improve the success of the proposed PM&Es (FISH-1 through FISH-11).

Proposed PM&E FISH-12: Development of the Biological Review Process

To provide for ongoing refinement and measure of effectiveness of the PM&Es, the District plans to establish a Biological Resources Program, Technical Review Group (TRG). The TRG will be composed of specialists from the CCT, BLM, Ecology, WDNR, NOAA Fisheries, USFWS, and WDFW. The TRG will be formed to: a) consult with the agencies in the design of management and monitoring plans, b) review and evaluate data, and c) develop resource management proposals or other recommendations. The group's meetings will be open to the public. The District will prepare the agendas, conduct the meeting, and maintain and make public all records of consultation. The District will provide these records with any recommendations to the appropriate agencies. The group will establish communication protocols to facilitate interaction among group members, which will allow for open participation, peer review, and communication among all parties. Data and information from these programs will be used to examine long-term trends and make decisions regarding adapting the PM&Es to protect the aquatic resources.

Development of the biological review process is expected to be $15,000. Implementation of the program on an annual basis is expected to be $10,000 a year.

Proposed PM&E FISH-13: Development of a Fisheries Monitoring Data Base

As part of the biological review process, a central database will be developed by the District for organization and storage of the monitoring data related to aquatic resources. Database format and development will be consistent with other aquatic data gathered in the Okanogan River basin. The monitoring programs that would be included in the biological review process are:

1. Entrainment study including reservoir sampling,
2. Tailrace barrier monitoring
3. Monitoring the use of boulder clusters upstream of reservoir
4. Side Channel habitat monitoring program, and

Data and information from these programs will be used to examine long-term trends and make decisions regarding adapting the PM&Es to protect the aquatic resources.

Development of the biological database is expected to be $45,000.

Expected Outcome

With the implementation of the biological review process under FISH-12, the effectiveness of FISH-1 through FISH-11 will increase, resulting in improved conditions for fish and aquatic resources in the Project Area.

E.3.2.4 CONSULTATION SUMMARY

The Federal Power Act (FPA) has multiple sections that apply to FERC and this project. Section 10(j) requires FERC to include license fish and wildlife measures for the protection, mitigation of damages to, and enhancement of fish and wildlife resources potentially affected by the Project based on recommendations from NOAA fisheries, USFWS, and state fish and wildlife agencies. Section 4(e) requires terms and conditions to be included in the issued license where the proposed licensed project is located on a federal reservation. Section 18 requires terms and conditions for fishways if prescribed from Secretaries of Commerce and the Interior. Finally, Section 30(c) states that exemptions from licensing are subject to mandatory terms and conditions from federal agencies (the services) and state fish and wildlife agencies.

Early consultation related to fisheries resources began in July 2005 with initial outreach to agencies and stakeholders by telephone and email, followed up by individual meetings. The general purpose of these communications were to explain the District's intention to develop the Project, give general background information on the Project and the Traditional FERC process, ask if there were questions or comments and discuss possible dates for the Initial Consultation Meeting (ICM). Key comments received during the early consultation addressed temperature effects, the importance of Similkameen River for recovery of listed species, dam removal, habitat quality upstream of the dam and upstream passage of anadromous fish.

A joint follow-up meeting held in Portland during October 2005 included representatives from NOAA, USFWS, the District and ENTRIX. ENTRIX explained the Project and the traditional licensing process. The District provided an overview of the potential facility design alternatives and explained options and associated environmental impacts/benefits. Other topics of conversation included downstream passage, tailrace barrier, and the recovery plan for steelhead. In separate consultations with the Canadian Upper and Lower Similkameen Indian Bands, Department of Ecology and WDFW in September 2005 the main topics of discussion were fish passage, resident fish and shellfish both upstream and downstream of the dam, and the recovery of steelhead.

Early consultation with tribal resource managers included multiple consultations with the CCT. The fisheries issues of concern raised by the CCT were contaminated sediments, water temperature, TDG, Chinook salmon acclimation ponds, and spawning in Similkameen River.

Early consultation continued with tribal and agency conferences held in January and February 2006. The January 3, 2006 conference included state and federal agencies with jurisdiction over fisheries (WDFW, USFWS, and NOAA Fisheries). This meeting provided input on the ICD and Supplement. Discussion continued in the February 3, 2006 agency/tribe technical conference on work plans for fisheries studies. The fisheries related issues that were discussed include changes in sediment transport and potential to affect fish habitat, potential changes in flow and effects on habitat and stranding (e.g., crest gates and emergency shutdowns), LWD recruitment (e.g., log jam) and effects on habitat, sediment toxicity and effects on fish and invertebrates, reservoir changes to system (e.g., habitat and temperature), sampling of adult and juvenile fish, fish and habitat upstream of the Project, reduced flow between falls and dam, total dissolved gas and potential to impact fish, and intake screening.

Key written comments on the ICD related to fisheries were returned by CCT, CRITFC, Ecology, and Okanogan Highlands Alliance. In addition to the comments provided at the meetings, three major changes were suggested for the ICD:

- Add Sediment Resources Quantity and Quality to Section 4.0, Environment
- Add Sediment Resources Quantity and Quality to Section 7.0, Licensing Study Plans, and
- Sediment quality/quantity as a driver of adverse impact on other trust resources, such as salmon and steelhead must be incorporated as appropriate into the licensing study plans for each of the potentially affected resources.

Consultation continued in 2007 with general public and agency outreach meetings held in January and February as described above in Exhibit E.2. A follow-up meeting with CCT fisheries managers on March 6 involved detailed discussions of potential impacts and proposed PM&Es. The District met with NOAA Fisheries on March 19 to discuss the engineering of the Project. The majority of the discussion was focused on issues associated with a tailrace barrier. NOAA Fisheries expressed concern about potential for fish to be injured in the turbines and the potential to create a velocity barrier in a portion of the tailrace. It was suggested that the DLA consider fish friendly flows and different operational scenarios provided by the flexibility of two units.

The Draft Technical Memorandum was discussed with Ecology in a meeting March 23, 2007, relating fisheries concerns to water quality, including temperature, dissolved oxygen and TDG. On April 26, 2007 the District met with the USFWS to discuss potential impacts and request ideas on PM&Es. A consultation meeting was held with

WDFW on May 1, 2007 to discuss potential impacts and PM&Es. On June 11, 2007 further discussions were held with the lead fisheries biologist of the CCT, focusing on specific PM&E measures that would likely be proposed in the draft application.

In May 2007 a consultation meeting was held among representatives of the District and various Non-governmental Organizations (NGOs, i.e., American Rivers, CRITFC, Hydroreform, and Sierra Club). The purpose of the meeting was to solicit input and ideas from NGO stakeholders and provide a forum for them to ask questions about the Project. Participation was primarily in the form of questions asking for clarification and details on the Project, licensing process, and studies conducted. CRITFC suggested that an upstream fish passage alternative should be studied. It was explained that this was not considered because previous attempts have not been accepted and the current understanding is that a regional consensus supports no upstream passage. CRITFC noted that some parties further down the Columbia still support upstream passage.

In April 2008 a consultation meeting was held with State and Federal Agencies and Tribes to discuss comments on the DLA. This meeting was attended by WDFW, WDNR, DOE, CCT, Yakima Nation and CRITFC representing the Confederated Tribes of the Umatillia Reservation. A discussion of potential project impacts and Proposed PM&E's was conducted at the meeting. Since NOAA Fisheries was unable to attend the April meeting, a follow up meeting was held with them on May 20, 2008 to discuss their comments on the Draft License Application. It was agreed at that meeting that the District would propose including the draft tube net barriers previously described as part of the application.

E.3.3 WILDLIFE RESOURCES

The Project Area supports a variety of wildlife associated with habitat types commonly found throughout the region. The following discussion is based on wildlife surveys conducted in or near the Project Area along the Similkameen River in the mid 1980's, early 1990s, and most recently in 2006 for this license application. The following sections describe the existing resources, anticipated impacts, and proposed protection, mitigation, and enhancement measures.

The existing wildlife resources include general wildlife species, game species, and sensitive species. General wildlife species include those species of interest to people pursuing recreational activities in the Project Area, such as wildlife watching, hiking, and boating. In this evaluation, non-commercial hunting is considered a recreational activity. Sensitive species include those listed as threatened or endangered by the federal government or Washington State.

E.3.3.1 EXISTING CONDITIONS

GENERAL WILDLIFE AND GAME SPECIES

The Project Area is inhabited by a variety of general wildlife species, most of which are of interest to visitors to the Project Area. Recreational use occurs throughout the year, and is highest in the spring through fall. Hunting is restricted to the fall and winter. Game species include mule deer (*Odocoileus hemionus*), waterfowl, and upland game birds such as California quail (*Callipepla californica*) and the introduced chukar partridge (*Alectoris chukar*). A more complete description of wildlife species is provided below, emphasizing the more prominent or representative species associated with the Project Area.

The reservoir proper supports waterfowl, aquatic furbearers, and amphibians. Prominent among the waterfowl are mallards (*Anas platyrhynchos*), common mergansers (*Mergus merganser*), and scaups (*Aythya marilla, A. affinis*). Canada geese (*Branta canadensis*) are resident in the Project Vicinity and small numbers may nest along the water in the Project Area. Beaver (*Castor canadensis*) are the most prevalent aquatic furbearer, feeding primarily on willow found in the riparian shrub and tree habitats bordering the reservoir. Amphibian observations have not been reported in the Project Area, but they are likely present along the reservoir and river. Amphibian species present in the Project Vicinity include Pacific tree frog (*Pseudacris regilla*).

Riparian habitat, generally recognized as having a high diversity of wildlife species, supports a number of song birds best represented by the western flycatcher (*Empidonax difficilis*), eastern king bird (*Tyrannus tyrannus*), American robin (*Turdus migratorius*), Bullock's oriole (*Icterus bullockii*), cedar waxwing (*Bombycilla cedrorum*), and various species of warblers, sparrows, and woodpeckers. The upland area contains habitats dominated by sagebrush, bitterbrush, service berry, and rock outcrops, which support mule deer, yellow-bellied marmot (*Marmota flaviventris*), black-billed magpie (*Pica pica*), and ground-nesting species such as chukar partridge and California quail. Reptiles are also common in these habitats including western rattlesnakes (*Crotalus viridis*), racers (*Coluber constrictor*), and gopher snakes (*Pituophis melanoleucus*).

Wildlife species that use a wider variety of habitat types in the Project Area include swallows, vultures, raptors, and coyotes (*Canis latrans*). Common swallow species in the Project Vicinity are barn swallows (*Hirundo rustica*), bank swallows (*Riparia riparia*), and violet-green swallows (*Tachycineta thalassina*). Vultures and raptors are primarily represented by turkey vultures (*Cathartes aura*). American kestrels (*Falco sparverius*), red-tailed hawks (*Buteo jamaicensis*), sharp-shinned hawks (*Accipiter striatus*), golden eagles (*Aquila chrysaetos*), and bald eagles (*Haliaeetus leucocephalus*) which are also present, but in smaller numbers. Except for swallows, these species may occur in the Project year-round. Swallows only occur in the summer months.

Project Area use by most of these species, as well as other less common species, is greatest in the spring and summer and lowest in the winter, when many species migrate, move upslope away from the river, or hibernate. Prominent exceptions are mule deer and bald eagles (see below), which winter in the Project Area and remain active in this season.

SENSITIVE SPECIES

The bald eagle (*Haliaeetus leucocephalus*) is the only federally or state-listed wildlife species in the Project Area. Other sensitive species may occur in the region but they would not be expected to occur in the immediate Project Area, which does not have habitats suitable to them. While the Project Area is within the historical range of the state-listed sage grouse (*Centrocercus urophasianus*), the nearest existing population of this species is over 60 miles to the south (Stinson, et al. 2004).

Bald Eagle

The bald eagle was recently delisted as a species protected under the federal Endangered Species Act (USFWS 2007, FR 2007). The Bald and Golden Eagle Protection Act (BGEPA) is now the primary federal law protecting the species. This eagle is still state-listed as threatened in Washington, although it has been recommended for downlisting to sensitive by the Washington Department of Fish and Wildlife (WDFW 2007).

Bald eagles occur along the Similkameen River during most of the year, but they are most abundant from approximately October to April. Very small numbers may occur during summer, but no nests have been located along the river, below Palmer Lake, since 1989. It appears that most bald eagles observed in the Enloe Area are recorded as they cross the area and fly up- or downriver. When present, eagles range widely within the area depending on water conditions, prey availability, perch site locations, and human disturbance. Consequently, although bald eagles may be observed in the Enloe Project Area throughout much of the year, they neither nest nor appear to have communal roosts there.

Bald eagles have been observed in the Enloe Dam Enloe Vicinity since the late 1970's. SAI (1984) reported up to eight eagles from Oroville to south of Palmer Lake in 1979 to 1981. The WDFW reported two eagles seen during winter each year from 1984 to 1988; one eagle was seen over the Enloe Dam reservoir, one occurred about 4 miles upstream of the dam, and one to two eagles were reported well south of the dam, within 1 or 2 miles of Riverside in March 1986 (Okanogan Public Utility District 1991). The District reported 19 eagle observations between October and March, 1990, with the highest single count of five eagles observed in March 1990 (HDR and Beak 1991). Most eagles were observed in winter and early spring; only one eagle was recorded in the fall. Eagles were either flying or perched in trees along the river upstream or

downstream of the dam. These results demonstrate that the Enloe Vicinity has historically been used by relatively small numbers of wintering bald eagles.

More recently, the District conducted five single-day bald eagle surveys in February, March, May, and August, 2006, from below Enloe Dam to Palmer Lake. Surveys were conducted on foot and from a vehicle. Eagles were recorded relative to distance (miles) along the Similkameen River Road from the junction of Central and Deerpath Roads to Palmer Lake, and these observations were later correlated to distance along the river below or above Enloe Dam. Eleven eagles were observed during four of five surveys (see Table E.3-9; Figure E.3-6 maps eagle locations).

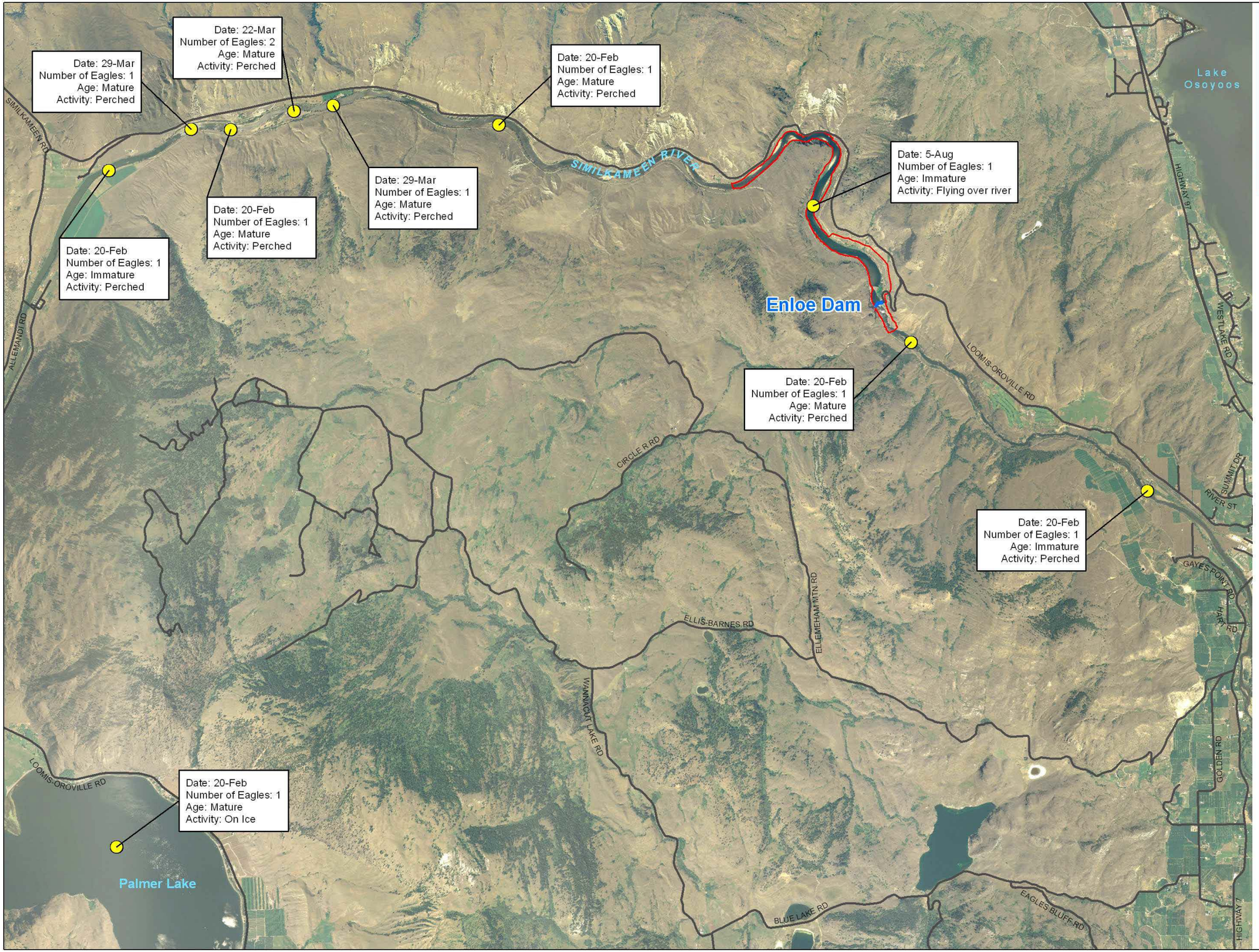
Table E.3-9: Bald Eagles Observed on the Similkameen River below (-) and above (+) Enloe Dam to Palmer Lake, 2006

Survey Date	Number	Location from Enloe Dam	Age	Activity
February 20	1	-0.4	Mature	Perched
	1	-2.7	Immature	Perched
	1	4.5	Mature	Perched
	1	6.6	Mature	Perched
	1	7.6	Immature	Perched
	1	Palmer Lake	Mature	On Ice
March 22	2	6.1	Mature	Perched
March 29	1	5.8	Mature	Perched
	1	6.9	Mature	Perched
May 28	No bald eagles			
August 5	1	1.0 Above tunnel	Immature	Flying over river

Note: The Project Area extends to approximately 0.3 miles (RM 8.7) below the dam and 2.4 miles (RM 11.4) above the dam.

No eagles were observed during the May survey when the river was high, swift, and muddy from spring runoff. Of the 11 eagles observed, ten occurred during February and March including six in February and two during each of the March surveys. Only one eagle was observed in August. Eight eagles were mature and three immature. These results are consistent with historic counts, confirming that eagles continue to be present in small numbers along the Similkameen River during winter and early spring (but also during summer), with the greatest use occurring in winter. Use in the fall can only be inferred from surveys conducted between 1979 and 1990, since the most recent surveys did not include October or November. Earlier surveys reported the most concentrated use of the Similkameen region to be from October to April (Okanogan County Public Utility District 1991). These data suggest a primarily wintering use of the vicinity by bald eagles. Wintering eagles are drawn to concentrations of spawned out salmon, feeding through the winter on their carcasses. If this is true of the Similkameen, use would be concentrated downstream of Enloe Dam, as anadromy does not occur above it.

[Figure E.3-6]



Legend

- Bald Eagle Location
- Road
- Enloe Dam
- FERC Boundary

N W E S

0 0.25 0.5 1 Miles

Image source: 2005 USDA National Agriculture Imagery Program

Enloe Dam Licensing Project

Figure E.3-6
Locations of Bald Eagles Observed During 2006 Surveys of the Similkameen River

ENTRIX

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Most eagles sighted were outside the Project Area, primarily upstream of Enloe Dam. Only one eagle was seen in the Project Area, flying over the river about 1 mile above the dam during the August survey. The other eagles were observed more than 4 miles above the Project Boundary, upstream of the dam, and more than 0.5 mile below the Project Boundary, downstream of the dam. All but two eagles were observed perched in ponderosa pine trees along the river, with most on the roadless side of the river (south and east). Of the remaining eagles, one was observed flying and the other perched on ice covering much of Palmer Lake in February. No eagles were observed feeding or engaged in breeding behavior.

E.3.3.2 IMPACTS

The Project is expected to have minimal effects on wildlife, since the footprint for the hydroelectric facility will be small, and effects on flows and reservoir waters level will be minimal.

The primary impact will be associated with noise and human activity associated with Project construction and demolition of the original powerhouse (see Exhibits A and C for a description of construction activities and schedule, and Exhibit E.5 for a discussion of workforce). Construction noise is expected to result from the use of such equipment as industrial trucks, pile drivers, earth moving equipment, and blasting to remove bedrock in or adjacent to the river.

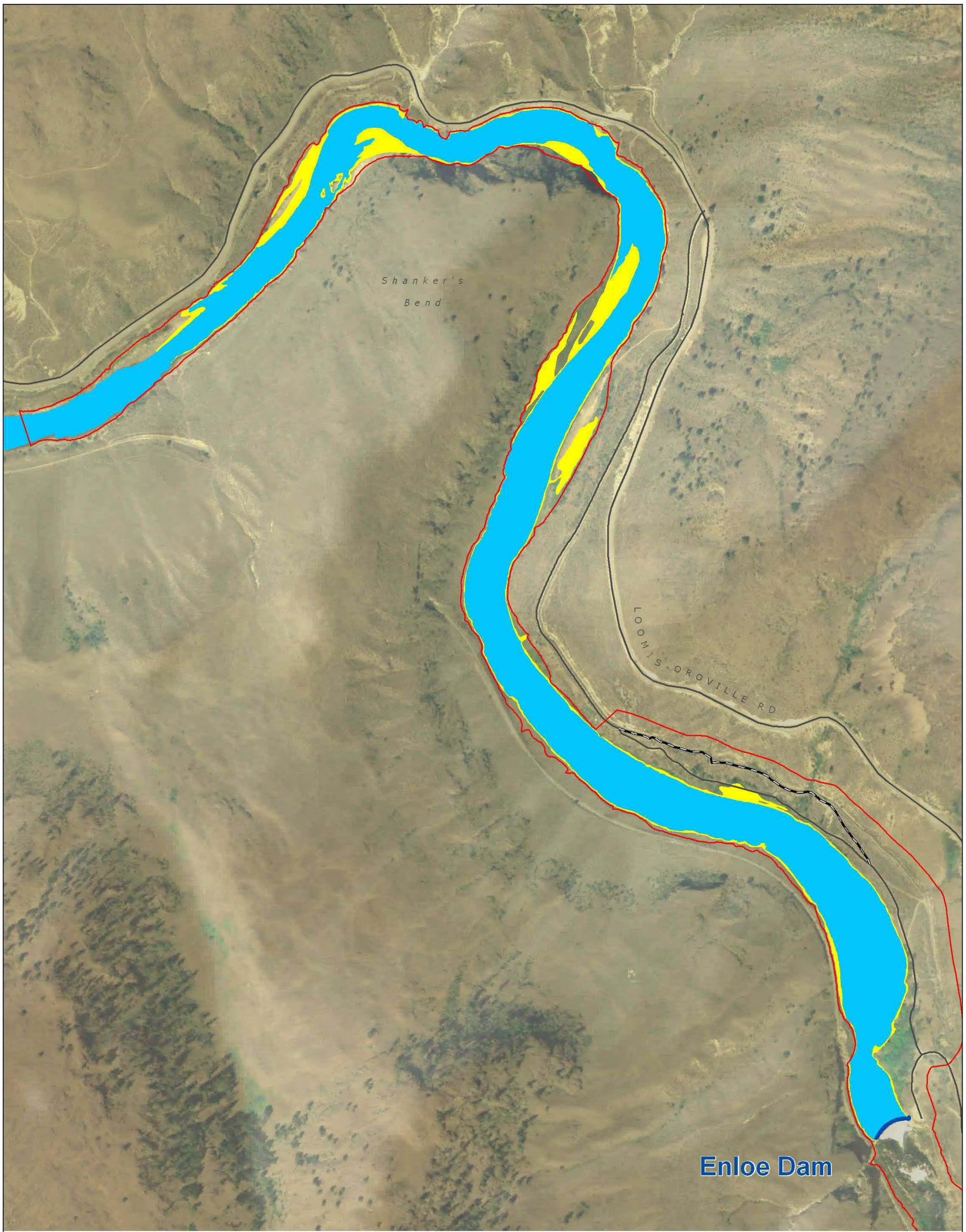
Construction, demolition, and blasting may disturb wildlife in the immediate vicinity of these activities. Bald eagles and other wildlife may be temporarily displaced from the immediate Project Area. Bald eagles may avoid perching or feeding near the Project. Since most perch trees are located considerably upriver from the Project, the impact should be minimal. Other birds and mammals also may avoid the area around the Project, particularly during blasting or period of intensive construction activity. Most would be expected to return to the Project Area habitats as once activities diminish and work is completed. Because there are no unique or rare habitats in the Project Area, most wildlife may temporarily occupy nearby similar habitats. Most habitats in the Project Area are already affected by some level of human disturbance, due to existing informal recreational access (see Exhibit E.7).

Once the Project is complete, minor noise will be associated with the operation and maintenance of the hydroelectric facility, but generally would be masked by the sound of water flowing through the Project Area over the dam or falls, or through the canyon immediately below the dam. Noise levels at the facility will be fairly constant at all times. Bald eagles and other wildlife commonly habituate to constant noise levels, provided they are not harassed by people working at the facility. For example, bald eagles appear undisturbed by the current residential construction near the river below Enloe Dam or by activities at the nearby Oroville Golf Club.

Minor impacts from the Project will be associated with installation of crest gates, connection to the District's nearby power distribution line, and relocation of a portion of the unimproved access road along the reservoir. Crest gates will not raise the ordinary high water level behind the dam, but will inundate narrow strips of riparian habitat along the reservoir for longer periods than now occur (see Figure E.3-7). Because the habitat (about 12.2 acres) that could be permanently affected is small compared to the amount of riparian and other habitats available along the reservoir, the long-term impact will be small. Habitat loss partly will be short-term and will be naturally mitigated, as the inundated area will be replaced by the establishment of new riparian habitat upslope within a few years. Fringe riparian strips will eventually reestablish along the new water line, in response to the higher water levels. Permanent alteration of about 5.1 acres of wetlands and riparian vegetation currently occupying seasonally exposed flats or benches along the reservoir will occur. Alteration may include type conversion to other wetland types or conversion to unvegetated waters. Much of the riparian vegetation is willow, which is quite tolerant of seasonal and perennial flooding.

Relocating the access road bordering the reservoir would not significantly impact wildlife. The route will follow an abandoned irrigation ditch through highly disturbed terrain largely comprised of rocky habitat and debris. Relocating this road will allow riparian habitat along low-lying sections of the current road corridor to naturally reestablish itself, resulting in a net gain for wildlife.

[Figure E.3-7]



Legend

- FERC Boundary
- Enloe Dam
- Reservoir Without Crest Gates (Current Low-Flow Waterline) Surface Elevation at Dam: 1045.3'
- Zone Inundated by Crest Gates (Proposed Low-Flow Waterline) Surface Elevation: 1048.3' Approximate Surface Area: 12.2 acres
- Planned Road
- Existing Road

N W E S

0 250 500 1,000 Feet

Image source: 2005 USDA National Agriculture Imagery Program

Enloe Dam Licensing Project

Figure E.3-7
Reservoir Inundation Zone With and Without Crest Gates

ENTRIX

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E.3.3.3 PROTECTION, MITIGATION, AND ENHANCEMENT MEASURES

A summary of Project PM&Es is provided in Appendix D.1.

Potential Impact

Project construction noise and powerlines may adversely affect bald eagles.

Proposed PM&E BOTA-03: Abandon Existing Shoreline Road and BOTA-04: Plant Riparian Species Along the Corridor

As discussed in Exhibit E.3.4 for BOTA-03 and BOTA-04, the existing unimproved shoreline road along Enloe Reservoir will be returned to natural condition, eliminating the current interruption between the shoreline and upland habitat. Riparian species will be planted along the corridor. These PM&Es not only will eliminate traffic disturbance, but will also substantially improve habitat along the reservoir for wildlife, both aquatic/riparian species such as beaver, waterfowl, and riparian birds, and upland species such as coyotes, deer, snakes, and many birds that forage in both upland and riparian areas. This is some of the most valuable wildlife habitat in the Project Area. Costs and details of BOTA-03 and BOTA-04 are described in Exhibit E.3.4.

Proposed PM&E WILD-01: Transmission Line Pole Relocation

The transmission line pole located within the FERC Boundary will be constructed or modified to prevent raptor electrocutions. This modification is estimated to cost $500.

Proposed PM&E WILD-02: Construction Timing to Minimize Effects on Bald Eagles

WILD-02 proposes to concentrate construction activities with the loudest noise to occur in summer and early fall to minimize effects to over wintering birds and bald eagles as much as possible. For planning purposes it is assumed that the contractor would be required to work 20 members of the construction crew an additional 10 hours of overtime per week for 20 weeks. Assuming that the average increased cost for overtime is $25 per hour and adding in a contractor markup of 25 percent, the total estimated cost for this PM&E is $125,000.

Expected Outcome

Implementation of BOTA-03, WILD-01, and WILD-02 will reduce the effects of construction on bald eagles and other wildlife that utilize the eastern side of the reservoir. Modification of the transmission line pole will reduce the adverse effects of the power line on raptors and other birds.

E.3.3.4 CONSULTATION SUMMARY

Initial wildlife consultation was limited because little concern had been expressed regarding project impacts on wildlife resources. Wildlife consultation meetings were

conducted with Neal Hodges at BLM and Steve Lewis of USFWS. Discussion with BLM occurred February 15, 2007 during a meeting between the BLM staff and Enloe project licensing team. Primary concerns expressed by the BLM included riparian disturbance, grazing, snake dens and water supply for cattle and wildlife.

A consultation meeting was held with Steve Lewis at USFWS during April 2007. Discussion focused on bald eagles in the Project Area. He suggested tree planting along the shore to replace trees that fall in the river. The trees provide perch sites for the eagles and decrease the vulnerability of erosion along the shoreline. He also suggested conducting an assessment of which transmission line poles occur in the Project Area that are used by bald eagles and other raptors in order to target the poles needed raptor-proofing. He agreed with the idea of moving the road along the reservoir upslope and restoring riparian habitat.

Following issuance of the Draft License Application, WDFW provided comments expressing concerns about the potential impact of the Project on ground-nesting birds and amphibians. A wildlife consultation conference call was conducted with Patrick Verhey and Scott Fitkin of WDFW on June 13, 2008 to discuss these resources. Ground-nesting birds in the vicinity of the Project include chukar and California quail, both introduced game birds. Impacts to these species are not expected because they nest in the spring, when the river under existing conditions is high or rising. Discussion of potential impacts on amphibian species focused on whether the species are likely to be able to successfully breed in the area that will be permanently inundated by crest gate operation. These species breed in the spring and early summer, so potential breeding sites in the affected area are already inundated by the high flows of the Similkameen during most of the breeding season. WDFW proposed that one of their staff do surveys in late March to early May of 2009, followed by a fall survey, to determine whether any of these species can successfully reach metamorphosis prior to the freshet flows. WDFW will provide a cost estimate for the surveys to the District.

E.3.4 BOTANICAL RESOURCES

This section provides a description of existing botanical resources in the Project Vicinity. The information presented here represents a combination of historical material from a literature review, the 1991 Application (Okanogan County Public Utility District 1991), and recent material from field studies conducted in 2006 in support of relicensing the Enloe Project.

The Project Area is located in the Similkameen River Valley, within the Okanogan Highlands Province (Franklin and Dryness, 1988). This valley is a transitional zone between the Cascade Mountains to the west and the Okanogan Highlands to the east. Columbia Basin steppe vegetation reaches its northernmost extension in this valley. Vegetation is a complex mosaic of three steppe vegetation units, including the big sagebrush/bluebunch wheatgrass association, the bitterbrush/Idaho fescue community,

and the threetip sagebrush/Idaho fescue community (Franklin and Dryness, 1988). Soil, slope, aspect, topography, and grazing practices influence the distribution of these communities within the valley.

Previous botanical studies in the vicinity of the Project Area include a vegetation mapping study conducted along the Similkameen River in 1984 by the U.S. Fish and Wildlife Service (USFWS) for the U.S. Army Corps of Engineers (USACE) and vegetation studies conducted for the 1991 license application (Okanogan County Public Utility District, 1991). Additional vegetation mapping and riparian vegetation studies were conducted for the District in 2006 (Appendices E.3.4 and E.3.5). More detail on special status plants is provided in Appendix E.3.6. The 2006 studies were completed in consultation with state and federal agencies responsible for the management of terrestrial biological resources in the Similkameen River.

E.3.4.1 EXISTING CONDITIONS

VEGETATION COMMUNITIES

Five vegetation communities were mapped in the Project Area for the 1991 license application, and again in 2006-2007 (Figure E.3-8). These communities are shrub-steppe, upland meadow, riparian forest, riparian shrub, and herbaceous wetland. In addition to these communities, Figure E.3-8 shows areas in rock, unconsolidated shore, developed land and water.

Shrub-Steppe

The shrub-steppe community occurs throughout the Project Area on hillsides above the river. It is the most extensive community, covering approximately 27.0 acres in the Project Area (Table E.3-10). Dominant species in this community include big sagebrush (*Artemisia tridentata*), threetip sagebrush (*Artemisia tripartita*), bitterbrush (*Purshia tridentata*), grey rabbitbrush (*Chrysothamnus nauseosus*), bluebunch wheatgrass (*Agropyron spicatum*) and Idaho fescue (*Festuca idahoensis*). Other common grass and forb species include Sandberg's bluegrass (*Poa sandbergii*), cheatgrass (*Bromus tectorum*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and prickly pear (*Opuntia* spp.). Within the shrub-steppe community, the bitterbrush/Idaho fescue community is found on steeper slopes with coarse soils, while the big sagebrush/bluebunch wheatgrass is found on gentler slopes. Invasive exotic species, including knapweeds (*Centaurea* spp.), thistles (*Cirsium* spp.), and tumble mustard (*Sisymbrium* sp.), are also common, particularly in disturbed sites.

A deciduous component of the shrub-steppe community occurs in draws and the steepest slopes of the hillsides on both sides of the river. Common shrub species in these areas are smooth sumac (*Rhus glabra*), serviceberry (*Amelanchier* spp.), and Wood's rose (*Rosa woodsii*). Rocky Mountain maple (*Acer glabrum*) occurs in some

stands of this community. Scattered ponderosa pine trees (*Pinus ponderosa*) occur within the shrub-steppe community, particularly with the deciduous component.

Table E.3-10: Vegetation Communities/Habitats in the Project Area

Community	Acres
Shrub-steppe	27.0
Riparian forest	2.9
Riparian shrub	7.4
Upland meadow	4.3
Herbaceous wetland	3.5
Unconsolidated shore	5.0
Rocky cliff	4.2
Developed	1.1
Reservoir	76.8
Riverine, downstream	4.2

Upland Meadow

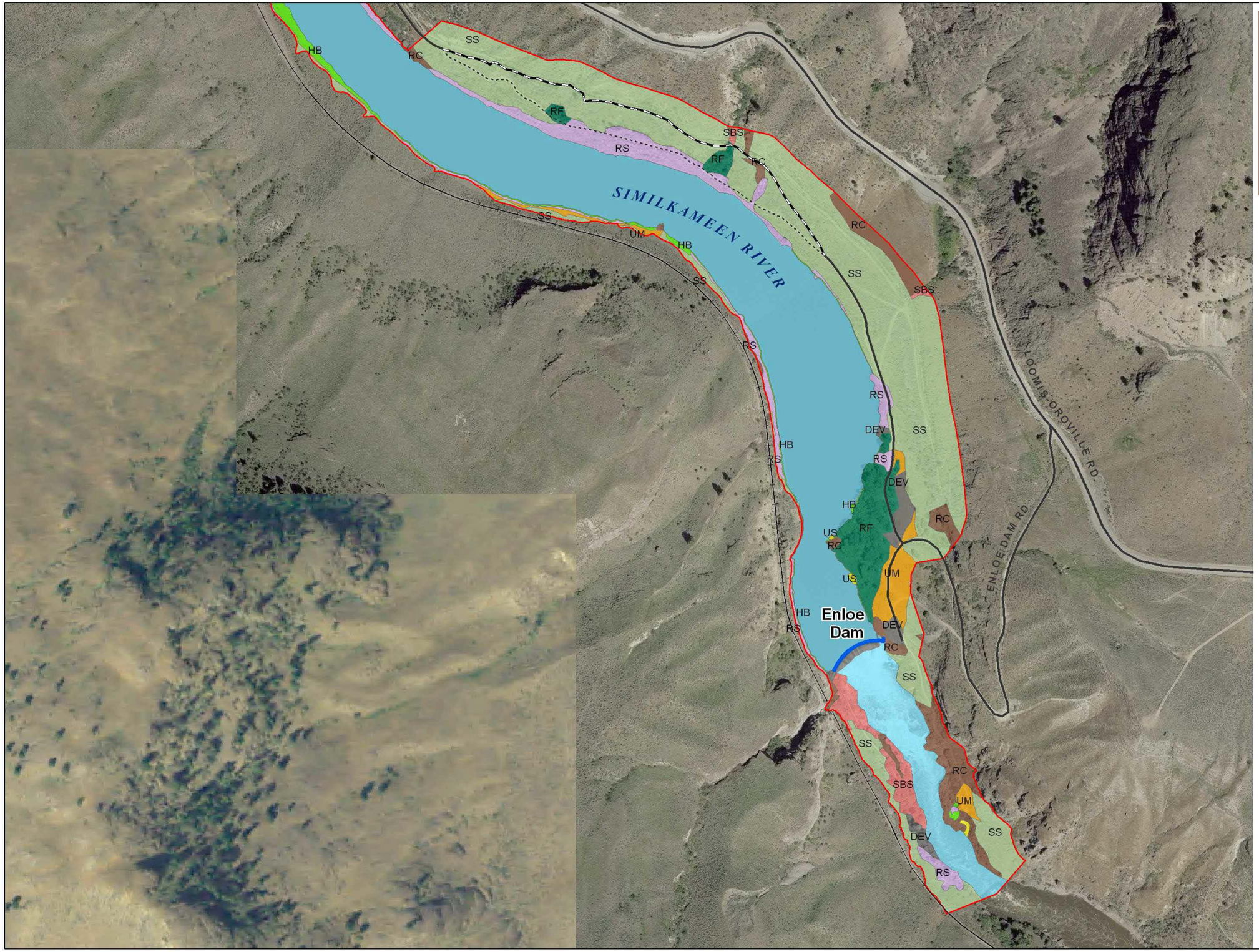
The upland meadow community occurs where shrub steppe vegetation has been cleared and replaced by grasses and forbs. Cheatgrass usually dominates in these areas. Common grass and forb species include Idaho fescue, knapweeds, and tumble mustard. This community occupies approximately 4.3 acres of the Project Area and occurs primarily at two locations. Both of these locations are old homestead sites, with the larger situated near Enloe Dam on the east bank of the river.

Riparian Forest

Riparian forest in the Project Area consists of stands of woody vegetation from 12 to 80 feet tall. This community occupies approximately 2.9 acres in the Project Area and is found primarily along the reservoir. The largest stand is on the east bank of the river at Enloe Dam. The dominant tree in this community is black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), but quaking aspen (*Populus tremuloides*) and water birch (*Betula occidentalis*) contribute to overstory canopy in some areas. Common understory trees and shrubs include willow (*Salix* spp.), red-osier dogwood (*Cornus sericea* = *C. stolonifera*), chokecherry (*Prunus virginiana*), black hawthorn (*Crataegus douglasii*), Rocky Mountain maple (*Acer glabrum*), and mountain alder (*Alnus incana*). Common herbaceous species include clematis (*Clematis* spp.), rushes (*Juncus* spp.), sedges (*Carex* spp.), and horsetail (*Equisetum* spp.). Introduced species such as maple (*Acer* sp.), juniper (*Juniperus* sp.), yucca (*Yucca* sp.) and lilac (*Syringa* sp.) are found at the former homestead site near Enloe Dam.

[Figure E.3-8, Map 1 of 2]

[Figure E.3-8, Map 2 of 2]



Legend

- Enloe Dam
- FERC Boundary
- Planned Road
- Abandoned Road
- Existing Road
- Railroad

Vegetation Classes

- Developed (DEV)
- Herbaceous (HB)
- Rock (RC)
- Riparian Forest (RF)
- Riparian Scrub (RS)
- Serviceberry Shrub-steppe (SBS)
- Shrub-steppe (SS)
- Upland Meadow (UM)
- Unconsolidated Shore (US)
- Water

N W E S

0 200 400 800 Feet

Image sources: P.U.D. No. 1 of Okanogan County, May 2006 and USDA National Agriculture Imagery Program, 2005

Enloe Dam Licensing Project

Figure E.3-8
Vegetation in the Project Area (Map 1 of 2)

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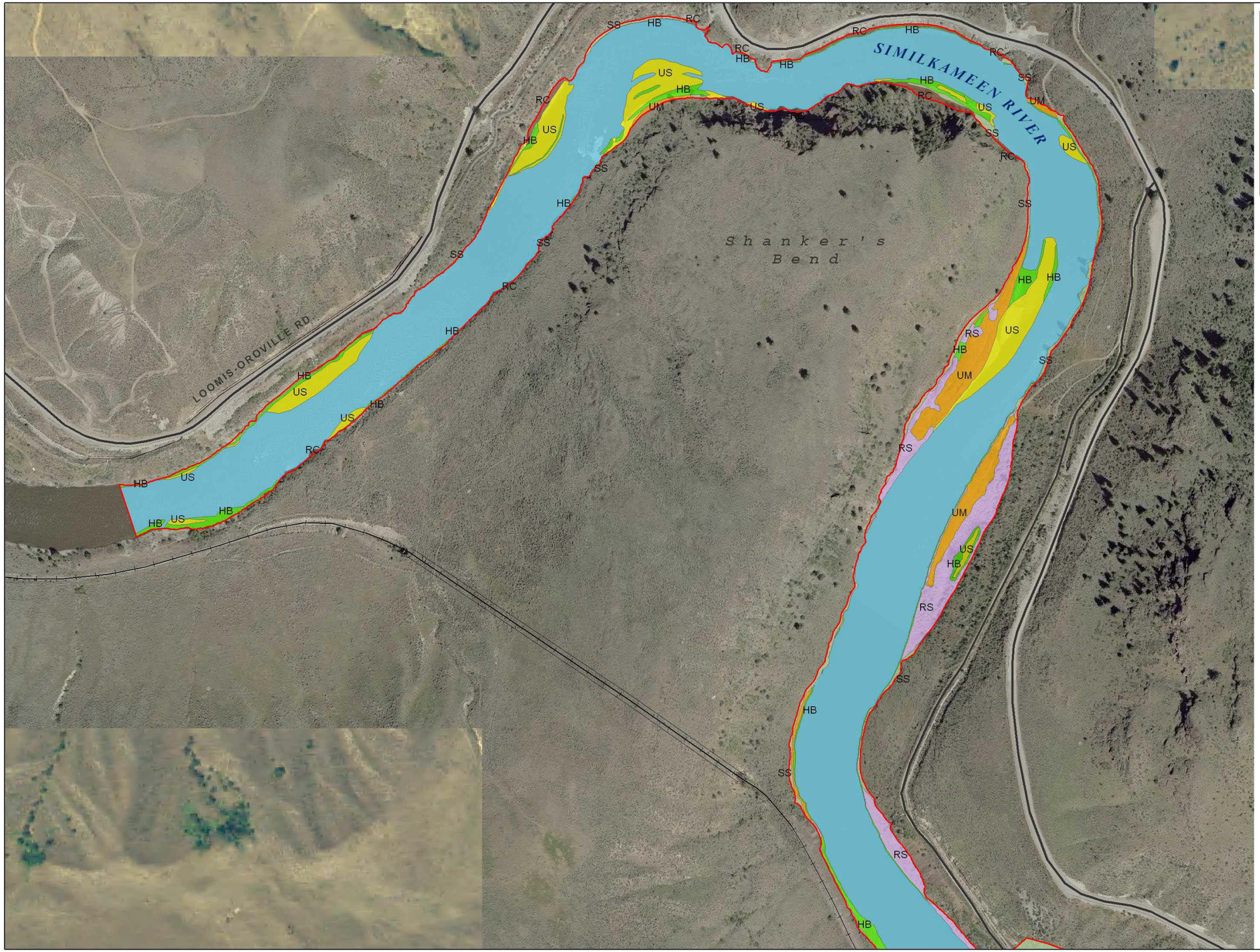

Legend

- FERC Boundary
- Existing Road
- Railroad
- Railroad Tunnel

Vegetation Classes

- Developed (DEV)
- Herbaceous (HB)
- Rock (RC)
- Riparian Forest (RF)
- Riparian Scrub (RS)
- Serviceberry Shrub-steppe (SBS)
- Shrub-steppe (SS)
- Upland Meadow (UM)
- Unconsolidated Shore (US)
- Water

N W E S

0 200 400 800 Feet

Image sources: P.U.D. No. 1 of Okanogan County, May 2006 and USDA National Agriculture Imagery Program, 2005

Enloe Dam Licensing Project

Figure E.3-8
Vegetation in the Project Area (Map 2 of 2)

ENTRIX

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Stands of riparian forest on the east side of the river have been burned since 1991. Many of the larger black cottonwoods are at least partly dead, although resprouting is occurring.

Riparian Shrub

The riparian shrub community consists of woody vegetation that is less than 12 feet tall. This community occupies approximately 7.4 acres in the Project Area and is found primarily along the east bank of reservoir where the slope is gentle. It also occurs as a narrow fringe elsewhere along the reservoir. Willow stands, varying in size from bands of seedlings or small shrubs to large dense thickets, provide over 75 percent of the total shrub canopy cover. The dominant willow species are Bebb willow (*Salix bebbiana*) and yellow willow (*Salix rigida*). Other species in this community include red-osier dogwood, chokecherry, clematis, smooth sumac, and young black cottonwoods.

Herbaceous Wetland

The herbaceous wetland community is found on wet or seasonally flooded areas. This community occupies approximately 3.5 acres in the Project Area and occurs in scattered patches on low-elevation terraces immediately adjacent to the reservoir. Dominant species are perennial grasses, including reed canary grass (*Phalaris arundinacea*) and bluegrass. Other species include cattail (*Typha* spp.), horsetail, milkweed (*Asclepias* spp.), and knapweed. Woody species found in these areas include Wood's rose, red-osier dogwood, black hawthorn and willow, but provide less than 5 percent of the cover in this community.

Unvegetated Habitats

Several types of unvegetated areas are found in small portions of the Project Area. These areas include rock outcrops along the hillside slopes, bare soil, and sand and gravel bars (unconsolidated shore) along the reservoir shoreline. Unconsolidated shore areas were mapped as 5.0 acres in the Project Area. Some sandbars support a sparse herbaceous cover and intergrade with the herbaceous meadow community. The open water of the reservoir and the Similkameen River downstream of Enloe Dam occupy much of the Project Area (76.8 acres and 4.2 acres, respectively).

Developed

Developed areas exist within the Project Area. These areas include the dam itself, the old powerhouse, and various roads. These areas are also unvegetated and represent 0.5 acre in the Project Area.

SENSITIVE SPECIES

Based on the literature review and discussions with resource agencies, one special-status plant species was identified as potentially occurring in the vicinity of the Project prior to the initiation of botanical surveys (Sheviak 1984, USFWS 2000). This plant is Ute ladies'-tresses (*Spiranthes diluvialis*). An additional special-status plant species has

since been documented in the Similkameen watershed. This species is Snake River cryptantha (*Cryptantha spiculifera*).

Ute Ladies'-tresses

Ute ladies'-tresses is federally listed as threatened (FR 1992) and is state-listed as endangered (WNHP 2006). Having received information that supported the delisting of this species, U.S. Fish and Wildlife Service initiated a status review in 2004 (FR 2004). This review has been completed (Fertig et al. 2005), but USFWS has not yet issued a determination on that review.

This species is a perennial terrestrial orchid that flowers from mid-July through August in Washington (WNHP 2005). It is found in early to mid-seral vegetation in wet meadows, stream or river banks, irrigated hay meadows, and wetlands associated with wet meadows, springs, streams, lakes, irrigation ditches, and reclaimed gravel and peat mines (Fertig et al. 2005).

Although this orchid was reported as historically found in riparian areas in Colorado, Utah, and Nevada when it was listed (FR 1992), existing populations were known only in Colorado and Utah at that time. Since 1992, populations have been found in Montana, Wyoming, Idaho, Nebraska, and at four locations in Washington (MTNHP 2006, WNHP 2005). The historical Nevada population was rediscovered in 2005 (Fertig et al. 2005). One Washington location is in a periodically flooded alkaline flat. The other three are on stabilized gravel bars along the Columbia River (WNHP 2005). Washington populations are at elevations ranging from 720 to 1,500 feet (WNHP 2005). The nearest known population to the Enloe Project is at Wannacut Lake, approximately 5 air-miles to the southwest. Wannacut Lake is in the Whitestone Creek watershed, and the Whitestone Creek confluence with the Okanogan River is approximately 9.8 miles downstream of the Similkameen River confluence with the Okanogan River.

No individuals of Ute ladies'-tresses or any other species of *Spiranthes* were observed during botanical surveys in 2006 or 2007.

Snake River Cryptantha

Snake River cryptantha is a State Sensitive species. This cryptantha is a perennial that is recognizable from May to July. It is found on dry, open, flat or sloping areas, generally in relatively unvegetated areas in stable or stony soils (WDNR 2000).

No individuals of this species were observed in the study area during botanical surveys in 2006 or 2007. The study area for special-status plant species was primarily in dense vegetation along the perimeter of the reservoir, although an additional area along the proposed OTID Ditch Road Segment C was included.

E.3.4.2 IMPACTS

Project-related impacts to botanical resources in the Project Area will occur from the reconstruction of the OTID Ditch Road Segment C, powerhouse and related facilities, as well as on-going or emergency maintenance and vegetation management procedures. Inundation impacts will occur from crest gate operations. Potential impacts for each part of the Project Area are discussed in the following sections.

Access Road Construction

Most of the OTID Ditch Road Segment C will follow an abandoned irrigation ditch and the old access road for this ditch through a highly disturbed area largely comprised of rocky habitat and debris. Adjacent vegetation is primarily shrub steppe. Near the dam, the segment will follow the old irrigation ditch access road down to meet the existing dam access road (Segment D) north of the existing pump, near the proposed new parking area. Improving this segment is not expected to result in significant impacts to the upland or riparian vegetation communities in this area.

Powerhouse Construction

Upland vegetation in the vicinity of both proposed powerhouse locations and the proposed new access road is primarily shrub-steppe. This vegetation is subject to non-Project-related disturbance from natural rock falls and grazing. Potential Project-related construction impacts are limited to vegetation removal and possible noxious weed encroachment in the vicinity of the powerhouse and the access road.

Much of the area is rocky and mostly unvegetated. Some upland meadow and developed areas at the east end of the dam would also be affected by access road construction. A small area of riparian vegetation at the dam would be removed during installation of the intake structure.

Powerhouse Operation

Potential Project-related operations impacts are limited to vegetation management, maintenance activities, and other uses in the vicinity of the powerhouse and the access road. Vegetation management may include the application of one or more types of herbicides to vegetation in the immediate vicinity of the powerhouse. Because the area subject to vegetation management is small, and the local vegetation communities are common, Project operations activities are not expected to result in significant impacts to the upland vegetation communities in the powerhouse area.

Crest Gate Operation

Operation of the proposed crest gates would result in the extended inundation of 12.2 acres along the shoreline of the reservoir that are only seasonally inundated under current conditions. Of these new inundation acres, 1.1 acres supported upland vegetation in 2007, and 5.1 acres supported herbaceous wetland or riparian vegetation.

Some of the shallower inundated areas may continue to support or develop herbaceous wetland vegetation after the crest gates become operational. Fringe riparian scrub is expected to develop along the new waterline, resulting in a temporary loss of most of this type of habitat. The increase in the water elevation may enable herbaceous wetland vegetation to dominate on benches that currently support upland meadow.

E.3.4.3 PROTECTION, ENHANCEMENT, AND MITIGATION MEASURES

A summary of Project PM&Es is provided in Appendix D.1.

ISSUE: EFFECTS OF WATER ELEVATION CHANGES AND SEDIMENT MANAGEMENT ON RIPARIAN AND WETLAND VEGETATION

Potential Impact

Riparian and wetland vegetation is in good condition, but project changes such as the installation of flashboards will increase the current area of inundation and impact riparian and wetland habitat. However, elevated groundwater levels associated with the higher low-water elevation are expected to result in the conversion of some upland meadow areas along the reservoir to herbaceous wetland, as well as the establishment of fringe riparian scrub along the new waterline. Several PM&Es (BOTA-01 through BOTA-07 are proposed to address these potential impacts.

Proposed PM&E BOTA-01: Prepare a Mitigation and Monitoring Plan

BOTA-01 proposes to prepare a Mitigation and Monitoring Plan (MMP) for impacts to riparian and wetland vegetation at an estimated cost of $30,000. The MMP will be developed in consultation with BLM, Ecology, and other stakeholders, following issuance of the license. This MMP will include goals, the species to be used, methods, and benchmarks of success for botanical resources. Restoration of abandoned roadbeds will be part of this MMP, which will have details on surface preparation to deal with compaction issues, seeding, mulching, and planting. Details of cattle exclusion fencing to protect mitigation/restoration areas will be included in the MMP and are also provided as Appendix E.3.7 of this document. Noxious weed control measures for the mitigation areas also will be included in the MMP (see Appendix E.3.8 for the District's BLM-approved Noxious Weed Control Plans). The BLM will have approval authority for the elements of the plan that apply to BLM-administered lands. Monitoring provisions in the MMP will include monitoring of sites that may convert from upland meadow to herbaceous wetland.

Proposed PM&E BOTA-02: Plant Riparian Vegetation

BOTA-02 proposes to plant riparian vegetation at previously identified sites along the west and east banks of the reservoir to mitigate for temporary loss of habitat while fringe riparian vegetation establishes along the new low water line. The cost associated with this restoration is expected to be $30,000.

Proposed PM&E BOTA-03: Abandon Existing Shoreline Road and Restore Existing Road

Under BOTA-03, the existing access road that traverses the riparian zone at several points (Segment B) will be abandoned and restored to natural conditions; the cost of abandoning the Segment B is limited to weed control while natural vegetation reestablishes (estimated to be 3-5 years) and is estimated to be $5,000. Costs for restoring the existing road in the riparian zone (Segment C) are included in the cost of riparian mitigation; and are estimated to be $350,000.

Proposed PM&E BOTA-04: Plant Riparian Species Along Abandoned Road Corridor

BOTA-04 proposes the planting of woody riparian species such as willow, alder, or black cottonwood, in the riparian areas of the abandoned road at an expected cost of $15,000.

Proposed PM&E BOTA-05: Plant Riparian Species on East and West Banks Downstream of Shanker's Bend

This PM&E will plant woody riparian species in the riparian area on the east bank, just downstream from Shanker's Bend and on the west bank downstream of Shanker's Bend, at an estimated cost of $20,000.

Proposed PM&E BOTA-06: Install grazing Control Measures

This PM&E will install grazing control measures, including fencing, to protect riparian plantings from cattle grazing, at an estimated cost of $20,000. Install similar grazing controls, to protect sensitive areas (to the extent consistent with existing BLM grazing leases), at an estimated cost of $32,000 (see Fencing Plan provided as Appendix E.3.7).

Proposed PM&E BOTA-07: Monitor Restored Areas and Replant if Necessary

Under BOTA-07, the District will monitor restored areas annually for five years and provide an annual report of the monitoring results to the USACE and Ecology. The estimated annual cost for monitoring including report preparation, is $10,000; the total cost for 5 years would be $50,000. If the original plantings do not meet the performance criteria in the MMP, additional willows would be planted at an expected cost ranging from $5,000 to $15,000.

Expected Outcome

Implementation of BOTA-01 through BOTA-07 would result in a net increase in riparian habitat over what currently exists. The fencing and other grazing exclusion from sensitive areas will allow a greater diversity of plants and woody species to survive. Abandoning the road will benefit wetland habitat.

ISSUE: DISTURBANCE OF VEGETATION RESULTING FROM CONSTRUCTION, ROAD GRADING AND GROUNDS MAINTENANCE

Potential Impact

Existing impacts to vegetation will continue and additional impacts will occur from construction of the new powerhouse, penstocks and tailrace. Constructing a new access road will disturb existing vegetation.

Proposed PM&E BOTA-08: Employ BMPs to Protect Riparian and Wetland Vegetation

BOTA-08 would employ the following BMPs as necessary to protect vegetation:

- Flag and temporarily fence any wetland and riparian vegetation in the vicinity of Project activities that can be avoided in order to prevent accidental impacts. This measure is estimated to cost $2,500.
- Limit construction-related disturbance of native vegetation as much as possible. No cost is assigned to this BMP.
- Limit vegetation maintenance in sensitive habitats to the extent possible. No cost is assigned to this BMP.

Proposed PM&E BOTA-09: Environmental Training Program

BOTA-09 requires that the District provide environmental training to inform their employees, as well as employees of contractors and subcontractors who work on the Project Site or related facilities during construction and operation, regarding the sensitive biological resources associated with the Project Area. The training is estimated to cost approximately $5,000.

Proposed PM&E BOTA-10: Provide a Biological Construction Monitor

Under BOTA-10 the District would provide a biological construction monitor to check construction sites on a weekly schedule to ensure that protected areas are not disturbed and that fencing is intact. Estimated costs for this PM&E assume one monitor for 10 hrs a week at $100 per hour for the 18 months of construction, for a total of $72,000.

Proposed PM&E BOTA-11: Implement a Noxious Weed Control Program

BOTA-11 requires that the District implement a Noxious Weed Control Program to control noxious weeds along roads and construction sites, following the District's approved Plan (Appendix E.3.8). Weeds likely to be subject to control measures include three Class B weeds; houndstongue (*Cynoglossum officinale*), diffuse knapweed (*Centaurea diffusa*), and sulfur cinquefoil (*Potentilla recta*), as well as one Class C weed; babysbreath (*Gypsophila paniculata*). Elements and costs of this program would include:

- Noxious weed control treatments for the specific areas where vehicles involved in construction activity have the opportunity to spread weed seeds on federal lands. Proposed treatments for noxious weeds include using herbicide and/or manual removal methods for controlling this vegetation. Weed species have already infested the Enloe Dam area and are currently targeted for eradication/reduction. These include the following Class B and C weeds:

  Class B:

  1. Houndstongue (Cynoglossum officinale)
  2. Diffuse knapweed (Centaurea diffusa)
  3. Sulfur cinquefoil (Potentilla recta)

  Class C:

  1. Babysbreath (Gypsophila paniculata)

  The proposed method of application is chemical treatment using broadleaf herbicides for control. Methods will be a combination of hand sprayed, via hose reel from slurry tank on 4WD pickup and backpack sprayer. No boom use from truck will be used. All chemicals will be mixed off-site and no chemicals will be stored, flushed or mixed on the Enloe site. Near the Similkameen River bank, where there is a small infestation of diffuse kliapweed near the high-water line, hand pulling and bagging of knapweed is the preferred method.

  Proposed herbicides for broadleaf control will be combination of 2,4-D Amine 4, Roundup. Use of other broadleaf herbicides such as Tordon and Redeem will also be considered to aggressively treat heavily infested roadway edge for diffuse knapweed. Application rates will follow Specimen Labels for each respective herbicide. The herbicide program is anticipated to cost $50,000 over the life of the Project.

- Once the desired control and reduction in noxious weed infestations has been established, the District proposes to re-establish native grass using native grass mix recommended by WDFW[4] or, a Western Native Grass Mix.[5] The rate of seeding per acre will depend on mix used. Seed costs are estimated at $1,000, total costs are estimated at $10,000.

[4] Consisting of: 30% hard fescue (*Festuca trachyphylla*), 20% sheep fescue (*F. valesiaca*), 20% crested wheatgrass (*Agropyron cristatum*), 20% intermediate wheatgrass (*Thinopyrum intermedium*), and 10% Sherman big bluegrass (*Poa secunda*).

[5] Consisting of: 25% sheep fescue (*F. valesiaca*), 25% sandberg bluegrass (*Poa sandbergii*), 20% Indian ricegrass (*Achnatherum hymenoides*),10-15% bluebunch wheatgrass (*Agropyron spicatum*) and 10-15% prairie junegrass (*Koelena macrantha*).

- In areas with known infestations and where soil disturbance is necessary, grade and stockpile vegetation and topsoil on the side of the site, adjacent to the area from which they were stripped, in order to isolate soil that may contain noxious weed seeds. This action would reduce the potential for construction equipment to transport seeds, roots, or rhizomes from site to site. Estimated cost to remove and stockpile soil and plants is $3,000.

- Avoid fertilizer application to reclaimed areas with known weed infestations, because nutrients can enhance the growth of weeds. No cost is assigned to this element of PM&E BOTA-11.

- Use only certified weed-free straw bales for sediment barriers or mulch. No cost is assigned to this element.

Proposed PM&E WQ-06: Erosion and Sediment Control Plan

As described in Exhibit E.2.8, n Erosion and Sediment Control Plan (ESCP) will be prepared when designs have been finalized. Standard erosion and sediment control measures and site-specific BMPs developed in the ESCP would also protect riparian and wetland habitats. No additional cost is assigned to this PM&E.

Proposed PM&E WQ-07: Spill Plan

One aspect of the Spill Plan identified in WQ 07 would be to minimize spills to the river and reservoir by prohibiting fueling of heavy equipment within 500 feet of the river and reservoir during construction. This PM&E would also serve to protect riparian and wetland habitats. No cost additional is assigned to this PM&E.

Expected Outcome

Through the implementation of BOTA-08 through BOTA-11, WQ-06, and WQ-07, the impacts associated with construction activities will be avoided or reduced. Careful implementation of BMPs can avoid many construction related effects.

E.3.4.4 CONSULTATION SUMMARY

Construction of the intake for the proposed powerhouse and installation of the crest gates are expected to require a permit from the USACE) under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, Construction and operation of the powerhouse will require a permit from the Washington State Department of Ecology (Ecology) under Section 401 of the Clean Water Act. The permit application to the USACE must include a delineation report on jurisdictional wetlands and other waters of the U.S. that could be affected by the Project. Ecology may require mitigation for impacts to these areas as part of the 401 permit and is likely to require compliance with Okanogan County's Master Program for Shoreline Management. The Bureau of Land Management (BLM) may stipulate 4(e) mandatory conditions to the FERC license for impacts to wetlands and riparian areas.

On January 12, 2007, ENTRIX contacted Debbie Knaub at the Wenatchee USACE office to identify the correct contact person for the Enloe Project. The Project (including the new powerhouse location and the crest gates) and the need for a permit were briefly discussed. Ms. Knaub is responsible for the 404 permit and review of the wetland delineation report, but was unable to attend the Consultation Informational Meeting.

On January 26, 2007, ENTRIX contacted Kathy Kunz and then Olivia Romano at the Seattle USACE office. The Project (including the new powerhouse location and the crest gates) and the need for a permit were briefly discussed. Ms. Romano confirmed that she will be involved in the USACE' review of the re-licensing application, but that she would not be able to attend the Consultation Informational Meeting. The USACE announced the implementation of the new *Interim Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Arid West Region* in January. ENTRIX asked Ms. Romano if this supplement applied to the Enloe Project Area. Ms. Romano instructed ENTRIX to consult with Ms. Knaub on this issue.

On January 29, 2007, Ms. Knaub confirmed that the new *Interim Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Arid West Region* should be used for the wetland delineation.

Because the State of Washington has not incorporated the approach in the *Interim Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Arid West Region* in the 1997 Washington State Wetlands Identification and Delineation Manual, it was agreed that the data for the delineation would be collected in a format that allows evaluation by the procedures in both the 1997 Washington State Wetlands Identification Manual and the new U.S. Army Corps of Engineers Wetlands Delineation Manual, and that wetlands would be rated according to the Washington State Wetland Rating System for Eastern Washington (2004 revised version).

At the Consultation Informational Meeting in Okanogan on January 31, 2007, wetland issues for the Project were discussed briefly with Char Beam (Natural Resources, Okanogan County). Subsequent discussions with Okanogan County staff related to the County's Shoreline Management Plan have been held between County and Highlands Associates staff.

At the Consultation Informational Meeting in Wenatchee on February 1, 2007, wetland and riparian issues for the Project were discussed briefly with Pat Irle and other Ecology staff. No additional information needs were identified.

At an informational meeting held February 15, 2007 in Wenatchee, botanical and wetlands issues were discussed with BLM staff, including Pam Camp (Botanist) and Angela Link (Range Management Specialist). Ms. Camp reiterated that any historical occurrences of sensitive plant species, including those considered sensitive by the state but not by federal agencies, should be discussed in the Exhibit E. It was agreed that

additional information on potential habitat for Ute ladies'-tresses, the only federally listed species potentially present in the Project Area, would be added to the Exhibit E after field work in 2007. Angela Link was identified as the contact for coordinating riparian/wetland mitigation/restoration plans with the needs of the grazing lessee for the area.

On May 8, 2008, ENTRIX contacted Olivia Romano at the Seattle USACE office to discuss mitigation requirements for Project impacts to jurisdictional wetlands. The area of jurisdictional wetland that would be affected by excavation and fill at the intake structure is limited to a few square feet (estimated on the draft plan for that structure). The USACE does not regulate water as fill, but would look at all changes associated with a project when considering a permit application for work at a dam.

On June 16, 2008, a conference call was held to discuss wetlands, recreation, and grazing issues with BLM staff, including Joe Kelly, Neal Hedges, and Diane Priebe, and Ecology staff, including Pat Irle, John Merz, Mark Schuppe, and Gary Graff. Gary Graff commented that Ecology will want to see that there is no net loss of wetland ecological function, based on the current guidance. John Merz asked about lifestock access to water along the Project reach of the Similkameen River. Typically, Ecology requires some sort of fencing, off channel water provision, or sometimes restriction to gaps with hardened bottoms, in order to limit livestock access. BLM staff thought that fencing the area downstream from Shanker's Bend with two access points might be adequate for the needs of the two grazing permittees. However, that much fencing would also restrict recreational access to the river. Grazing and livestock access are both existing conditions not related to the Project. A meeting was arranged for July 1, 2008, so that BLM and Ecology staff could visit the Project Area with District staff and consider these issues at the site.