Mason Dam Hydroelectric Project

FERC Project No. P-12686

Draft Biological Assessment

October 2009

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List of Acronyms and Abbreviations

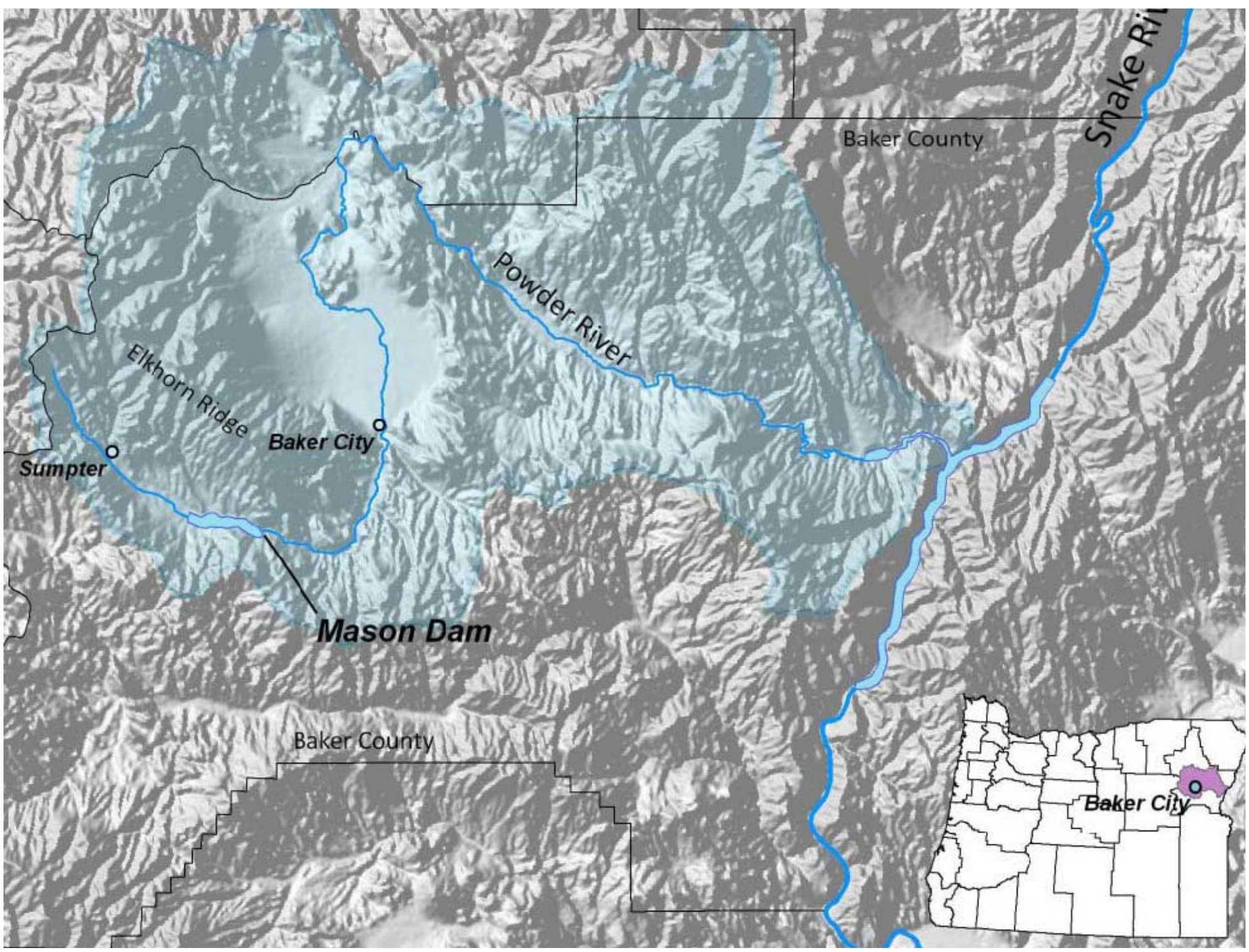
BA	Biological Assessment
BEMA	Bald Eagle Management Area
BOR	United States Department of the Interior Bureau of Reclamation
BVID	Baker Valley Irrigation District
° C	Degrees Centigrade
CFS	Cubic Feet per Second
DO	Dissolved Oxygen
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FERC	Federal Energy Regulatory Commission
FS	United States Department of Agriculture Forest Service
FWS	United States Fish and Wildlife Service
IPC	Idaho Power Company
MG/L	Milligrams per Liter
ODFW	Oregon Department of Fish and Wildlife
ODEQ	Oregon Department of Environmental Quality
PPM	Parts Per Million
PSI	Pounds Per Square Inch
TES	Threatened, Endangered and Sensitive Species

1.0 INTRODUCTION

Baker County has applied to the Federal Energy Regulatory Commission (FERC) to develop hydroelectric energy at the existing Mason Dam. Mason Dam is located along the Powder River in Baker County, Oregon approximately 15 miles southwest of Baker City off of State Highway 7 and in the Wallowa-Whitman National Forest (figure 1-1).

Baker County is seeking a new hydroelectric license for this 3.4 megawatt project and must evaluate the potential effects of the project through this Biological Assessment (BA). The Endangered Species Act (ESA) requires a Federal agency to ensure that any action taken will not likely "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat of such species." The Section 7 consultation with the agencies provides a means whereby the ecosystems upon which threatened or endangered species depend may be conserved and to provide a program for the conservation.

In order for a license to be considered the licensee, Baker County, must insure that any actions through project development and operations do not adversely effect the environment or ecosystems. In this BA, Baker County evaluates the effects of the proposed project operations.



2.0 FEDERAL ACTION AND ACTION AREA

The federal action to which this BA pertains is the issuance by FERC of a new 30 to 50 year license to commence operations of the Mason Dam Hydroelectric Project.

The Mason Dam action area is located within the upper Powder River watershed. The Powder River begins near Sumpter, Oregon (River Mile [RM] 144), flows into Phillips Lake at RM 136 and exits Phillips Lake at RM 131. The Powder subsequently flows through Baker City (RM 113) and enters the Snake River through the Powder Arm of Brownlee Reservoir (RM 10) near Richland, Oregon.

Mason Dam is located at Powder River RM 131. The action area consists of the area within or within 100 feet of the following structures or work areas:

- Intake valve and piping changes (within Mason Dam)
- Powerhouse and discharge outlet
- Construction staging area
- Underground transmission line
- Substation and hookup to an Idaho Power Company transmission line

This area is approximately 40 acres in size and extends up to 850 feet downstream of Mason Dam (Figure 2-1; approximately RM 131.4). Two additional indirect areas of influence for some species and parameters include:

- Phillips Lake and adjacent bald eagle sensitive areas, and

- Powder River extending from the stilling basin to a point 2.3 river miles downstream (RM 131.2 to RM 128.4; water quality).

This area in which there could be direct or indirect effects to ESA-listed species from project operations.

Any additions to the Baker Project from the Bureau of Reclamation will be licensed only to the extent necessary for the operation of the proposed hydroelectric project. No changes are proposed to the existing dam, spillway, and outlet works. These project works will remain unlicensed project structures.

Figures 2-1, 2-2 and 2-3 show the location of the Mason Dam Hydroelectric project area, Phillips Lake and the Bald Eagle Management Area and the Water Quality Study Area.

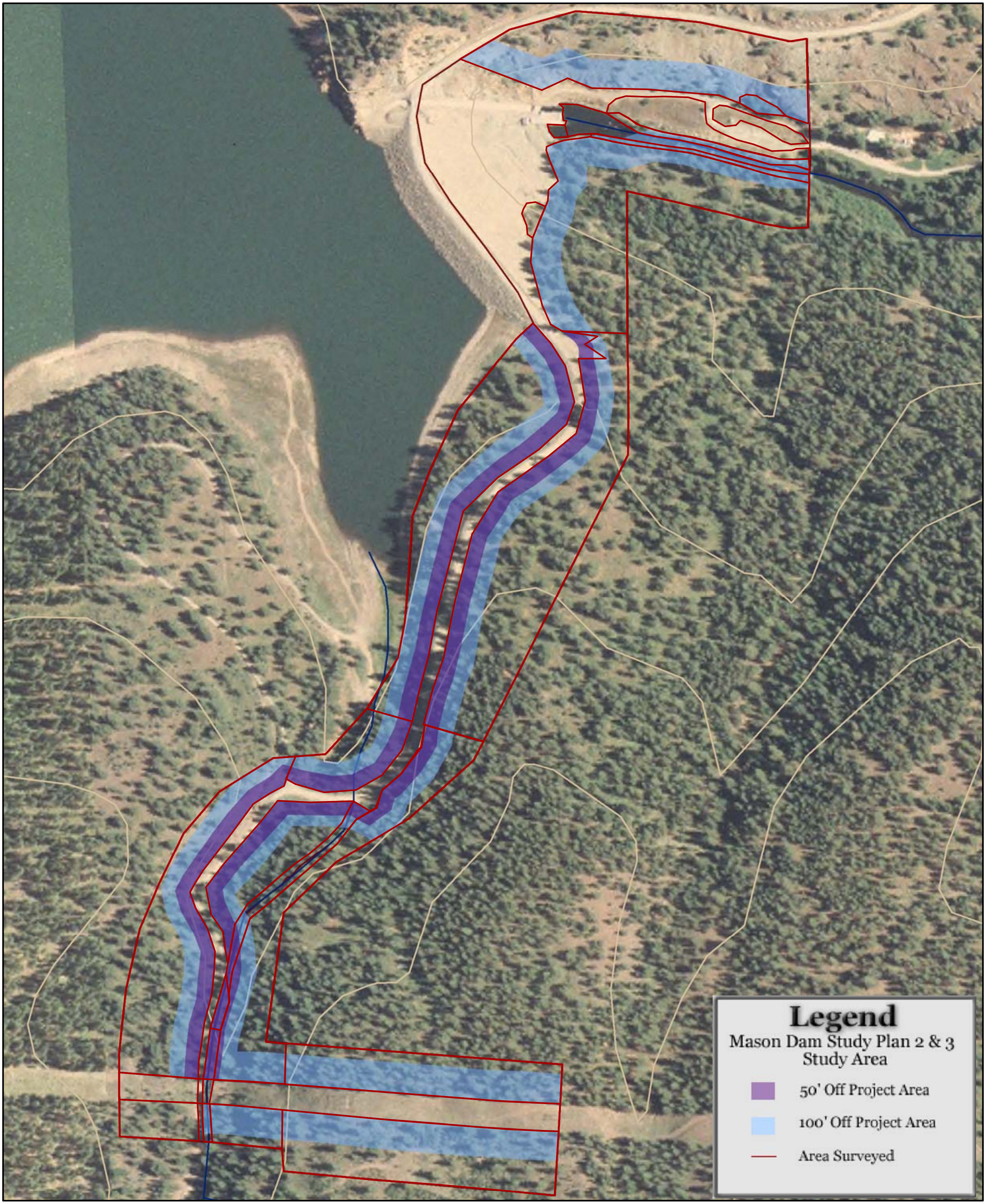


Figure 2-1 Mason Dam Project Area for TES Species

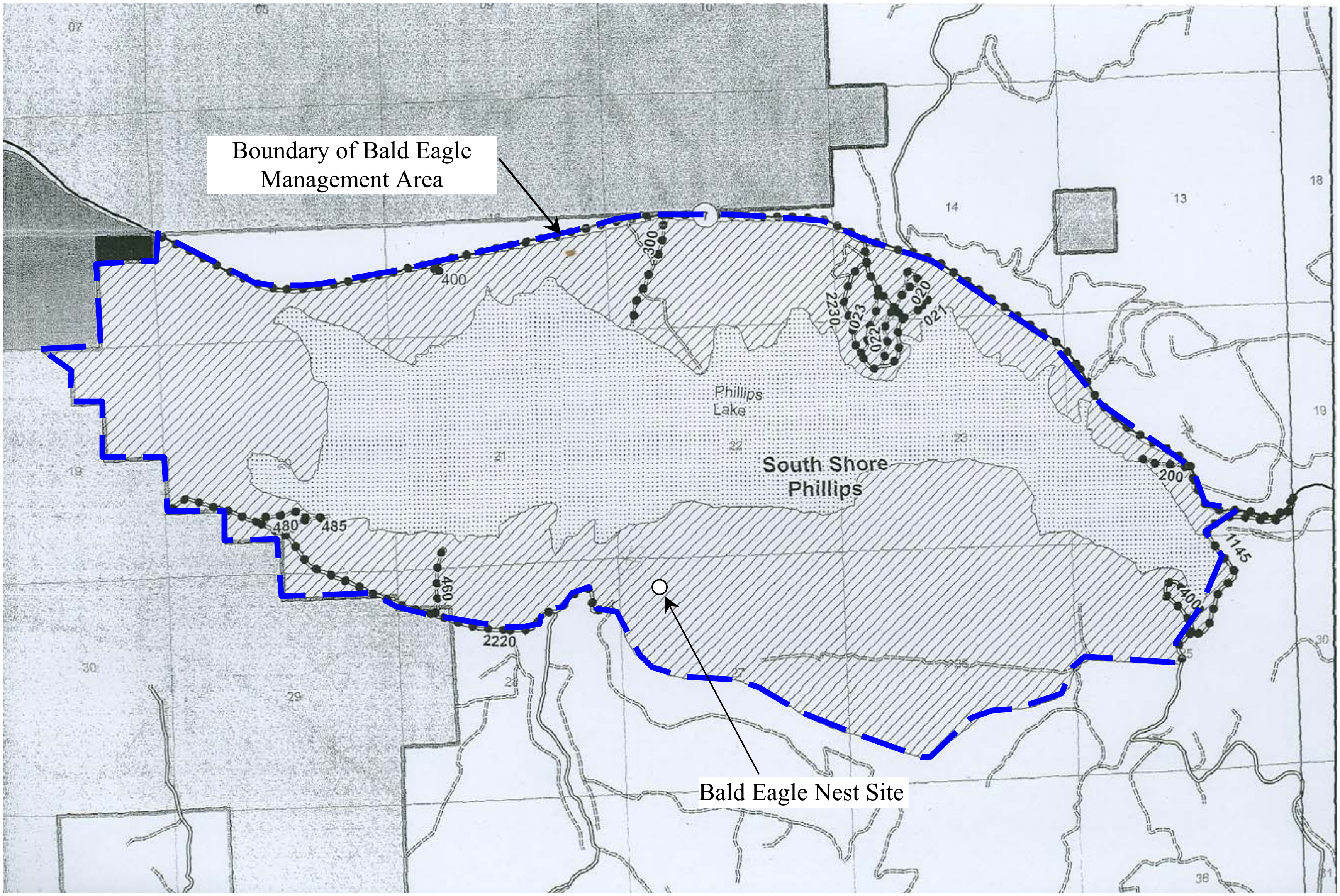


Figure 2-2. Phillips Lake Bald Eagle Management Area.

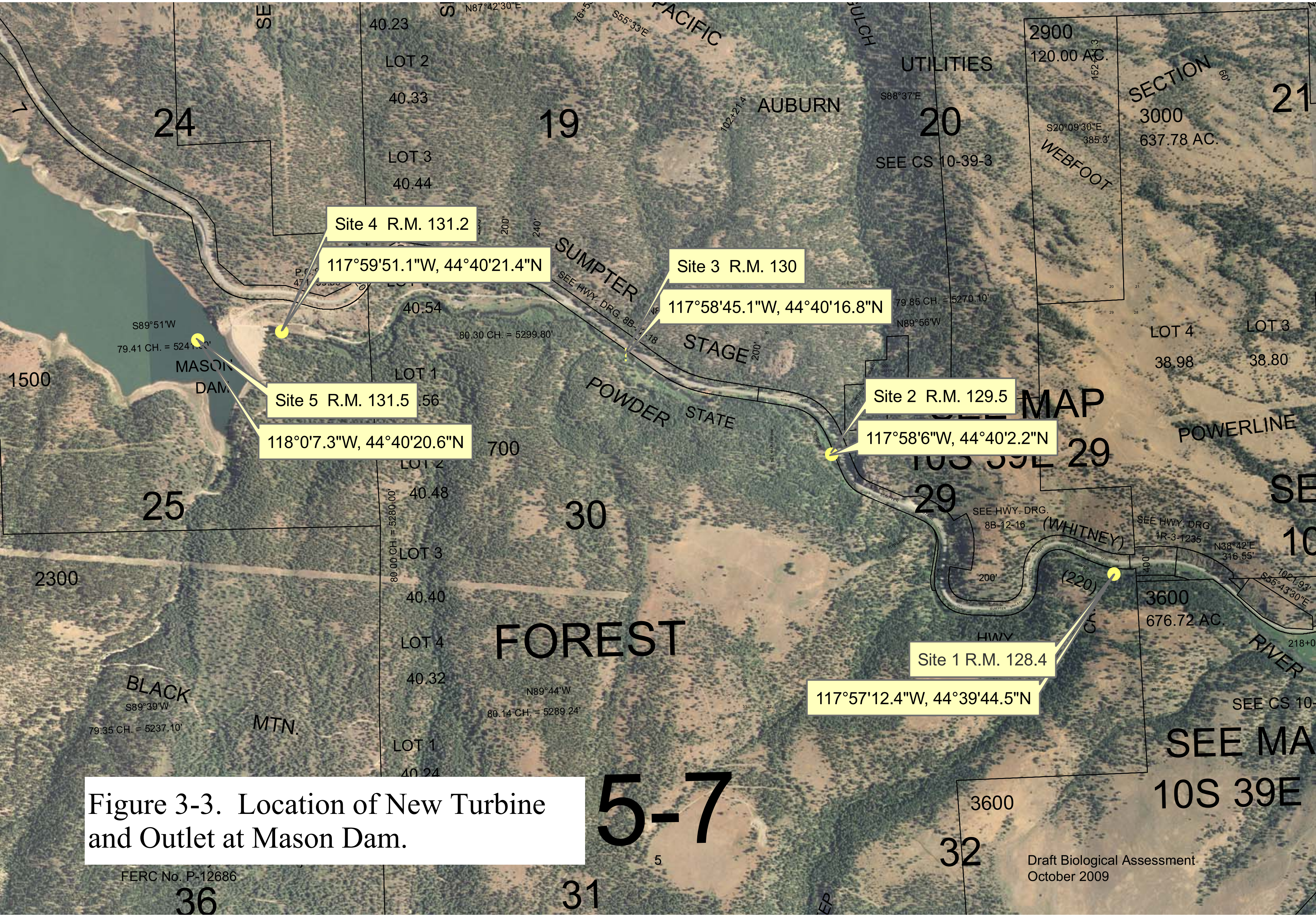


Figure 3-3. Location of New Turbine and Outlet at Mason Dam.

3.0 DESCRIPTION OF THE PROJECT

3.1 Project Area and Facilities

Mason Dam was built by the US Bureau of Reclamation (BOR) on the Powder River for irrigation, water delivery, and flood control. Mason Dam is 173 feet high, 895 feet long and 875 feet wide from upstream to downstream toe. Phillips Reservoir, formed from Mason Dam, covers 2,235 acres and has a total of 95,500 acre-feet, with 90,500 acre-feet being active.

Water is stored behind Mason Dam in Phillips Reservoir, and released during the irrigation season by Baker Valley Irrigation District (BVID). Water is generally stored between October and March and released April through September (see figure 3-1). Releases average approximately 10 cubic feet per second (cfs) between October and January, increase to an average of 20 to 50 cfs during February and March and generally remain above 100 to 200 cfs through the remainder of the year.

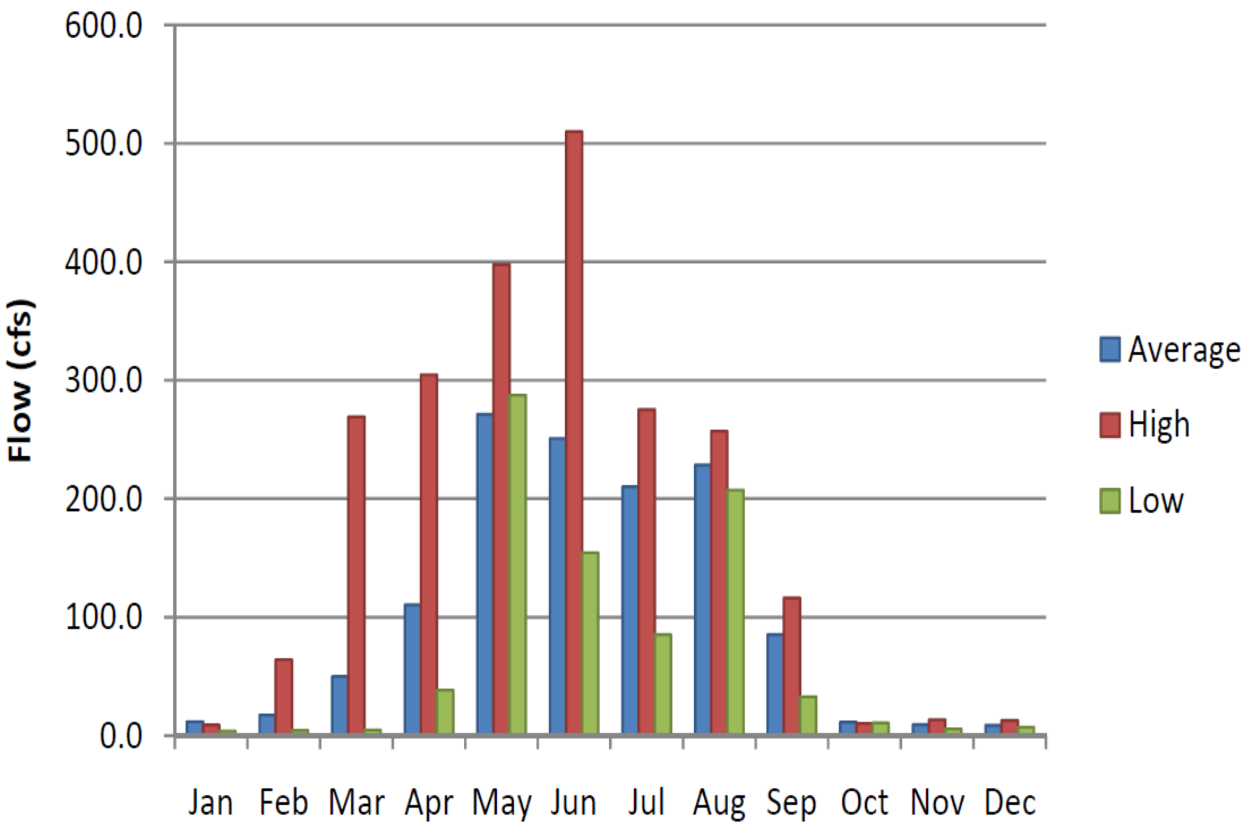


Figure 3-1. Average Monthly Flows in the Powder River Below Mason Dam for Low, Average and High Flows Years .

The intake of Mason Dam is located within a 17 foot by 17 foot by 13.3 foot high barrier with large bars that act as a trash rack. The intake itself is 13 feet high, extending between 3,975 to 3,988 feet above MSL. The trash rack bars are spaced 6 inches apart.

There are two pipes that run through the dam that can be used to release water. One is a 56 inch diameter pipe and the other is a 12 inch diameter pipe. The 56 inch pipe is split into two 33 inch, high pressure valves, that are located in the valve house to control the release into the stilling basin via the tail race. The 12 inch pipe uses a sleeve/weir type valve to release water into the stilling basin.

The outlet works consists of a tunnel controlled by two 33 inch high pressure gates with hydraulic hoists that have a capacity of 875 cfs at 4070.5 feet. The spillway has an uncontrolled crest and is concrete lined with a maximum capacity of 1,210 cfs at 4077.25 feet. The spillway and outlet works share a common stilling basin.

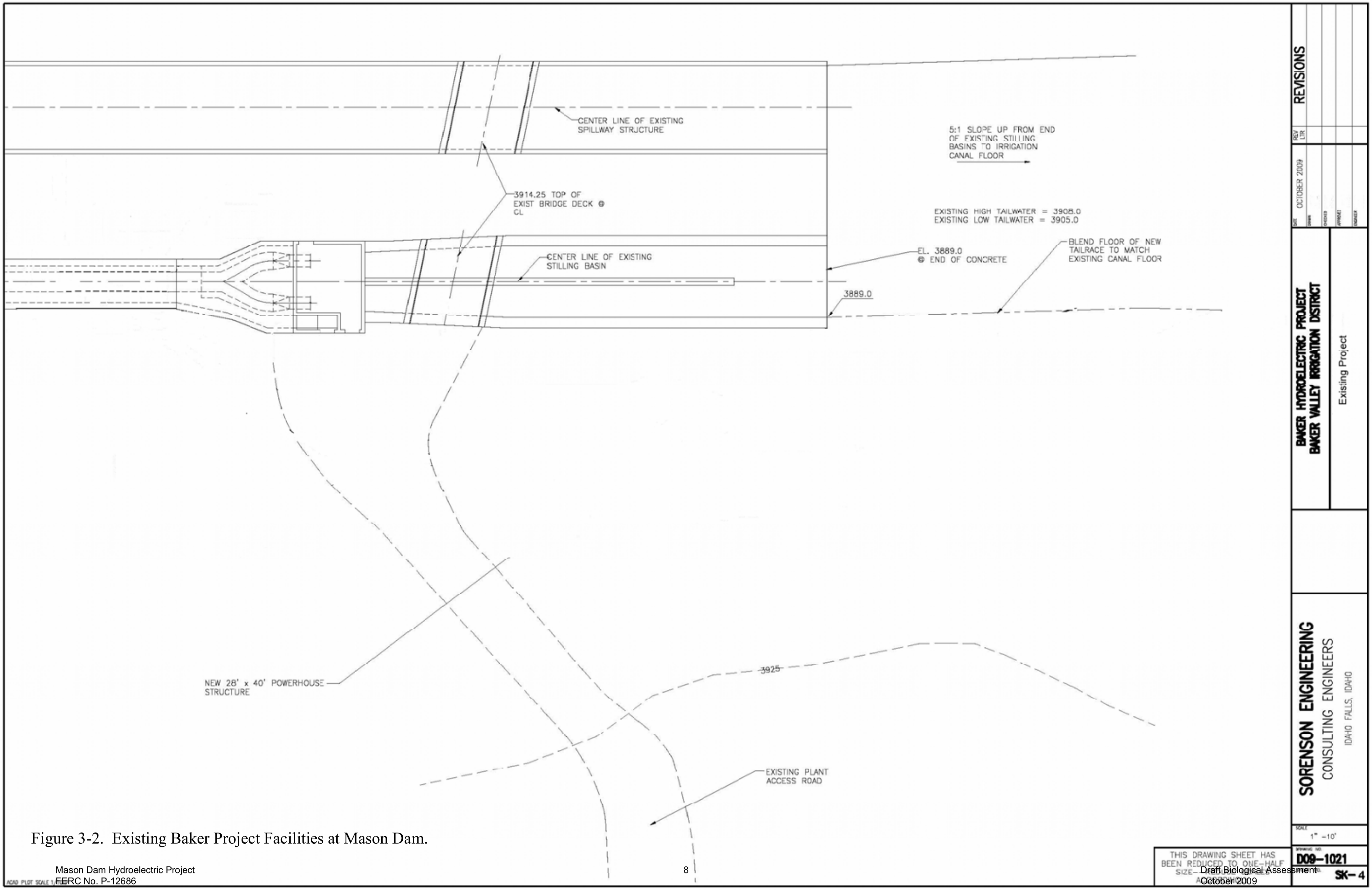


Figure 3-2. Existing Baker Project Facilities at Mason Dam.

3.2 Existing Project Operations

The Baker Project is operated to provide flood control regulation and satisfy downstream irrigation water requirements, as distributed by the Baker Valley Irrigation District (BVID).

The irrigation season officially begins on March 1 and ends November 1, but in practice the season usually runs between April 15 and October 1. During the irrigation season, releases generally remain above 100 to 200 cfs and can go up to 350 cfs. The Baker Valley Irrigation District has an agreement with the Oregon Department of Fish and Wildlife to release enough water to meet a 10 cfs (cubic feet per second) minimum instream flow at Smith Dam, which is about 10 miles below Mason Dam. As a result of this requirement and the need to release water for flood storage during the spring, flows, releases average approximately 10 cubic feet per second (cfs) between October and January and increase to an average of 20 to 50 cfs during February and March.

When the reservoir water surface is within the flood control pool, elevation 4062.40 to elevation 4070.50, discharges form the reservoir are to be made in accordance with the flood control approved by the Corps of Engineers entitled “Flood Control Regulations, Mason Dam and Reservoir”. If the water surface in the reservoir exceeds the top of the flood control pool at elevation 4070.50, water is to be released simultaneously through the spillway and the outlet works with all high-pressure gates fully open. When practicable, discharges through the outlet works are to be made with both regulating gates opened equal amount.

3.3 Project Purpose and Objectives

The proposed action to be considered in this BA is the issuance of a license for the development of the Mason Dam Hydroelectric Project. The purpose of the project is to develop a community-based renewable energy project in Baker County.

3.4 Description of Proposed Action

3.4.1 Project Components

The Mason Dam project would consist of the following physical components:

- A powerhouse consisting of one turbine, generator and automated control equipment to be built near the base of the existing dam spillway. The facility would consist of a concrete foundation, be approximately 30 feet by 40 feet in size, metal building located in a bare, fenced upland area.

- The existing Mason Dam water intake would be used for the facility. There would be no change to the existing intake. The existing pipe would be bifurcated within the dam to deliver water to the turbine. The facility would include a 56” by 56”by 72” steel bifurcation, approximately 105 feet long penstock feeding a horizontal shaft Frances turbine connected to a 3.4 MW synchronous generator. See Figure 3-3

- Water would be returned to the existing Powder River stilling basin via a new discharge outlet. The water would enter the Powder River below the water surface instead of above as under the current Baker Project operation.

- A new underground transmission line (approximately 0.8 miles long) would be constructed between the new powerhouse and connect with an existing 138 kv Idaho Power Company transmission line. The majority of the transmission line would be buried within an approximately 3 feet deep by 3 feet wide trench within Black Mountain Road. The transmission line between the powerhouse and Black Mountain Road would cross the existing dam face and be shallowly buried at a depth of 1-2 feet within a hand-dug trench.

- A new substation would be built within the existing Idaho Power Company transmission line right-of-way.

- A construction staging area located on bare ground within the existing parking lot and access road at the base of the dam.

Construction would be restricted to bare or sparsely vegetated ground (less than 5% vegetative cover) with the following exceptions:

- The transmission line from the powerhouse to Black Mountain Road would traverse the edges of approximately 400 feet of pine forest.

- The transmission line interconnect would cross 0.06 acres of riparian shrub wetland and up to 2.5 acres of grassland.

- Discharge valve installation would occur within a 0.34 acre area of open water, riverine, cobble bed habitat.

Incidental travel outside of bare areas in all other locations would be prohibited. Silt fences or fiber rolls would be installed between construction areas and adjacent wetlands or streams to prevent sediment from construction entering these areas. Discharge valve and other construction within the Powder River would occur under dewatered conditions, with a cofferdam placed immediately downstream of the construction area to prevent downstream sedimentation. Use of the 12 inch bypass sleeve valve, that is used during winter months, will make it possible to provide continuous flows during construction.

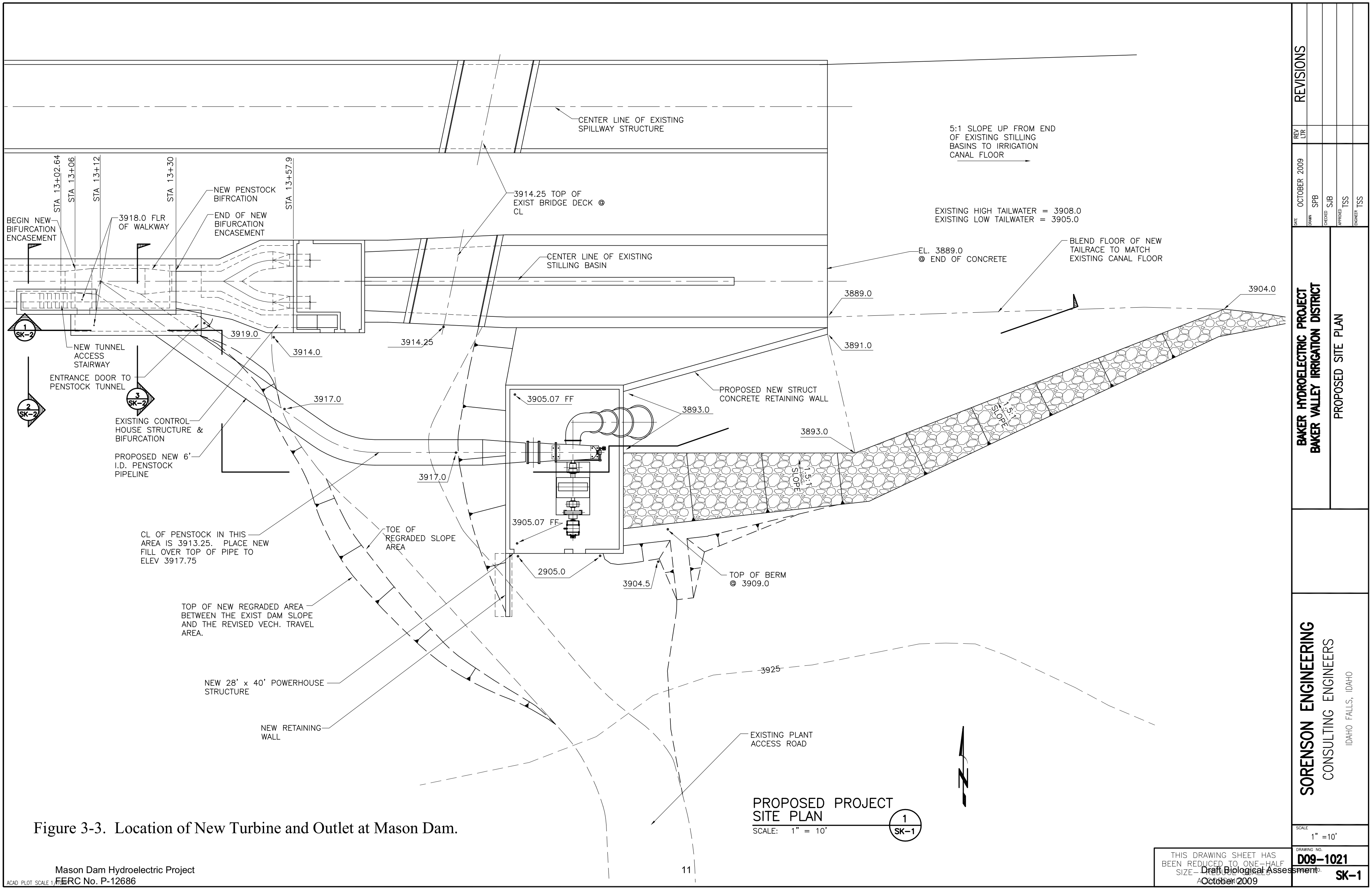


Figure 3-3. Location of New Turbine and Outlet at Mason Dam.

Construction of all project components is expected to occur during portions of a 1 to 2-year construction period. The County would prefer to schedule work within the Powder River between October and March when both the Mason Dam releases (average of 10 to 50 cfs) and recreational use are at a minimum. However, according to the *Oregon Guidelines for Timing of In-water Work*, any in-stream work would need to occur between August 1 and October 31, unless an exemption is granted. Other construction could occur at any time during the year, with some restrictions on noise levels during key bald eagle mating periods.

A mix of equipment, such as bulldozers, loaders, graders, compactors and cement trucks, would be used during construction. This equipment typically produces noise in the range of 70 to 96 decibels, with a nominal noise level between 80 to 85 decibels at a distance of 50 feet from the source (EPA 1974 and 1981). There is no anticipated blasting or helicopter use. Following construction, the hydroelectric turbines would typically produce noise between 60 to 62 decibels directly outside of the turbine enclosure.

3.4.2 Proposed Project Operation

Baker County will not have control of the releases of water from Phillips Lake. Through automated controls the hydroelectric project will run off of the flows releases by BVID for irrigation and flood control. As a result, the Mason Dam hydroelectric project would generate power from releases made by the Irrigation District but will not change the timing or manner in which the Irrigation District releases water from Mason Dam to the Powder River. Nor would the project include any construction within Phillips Lake or change any aspect of the Phillips Lake physical or biological characteristics.

The Mason Dam hydroelectric project will be operated depending upon flows released by BVID. During this time period, DO levels in the Power River will be maintained to meet the cool water fish standard of 6.5 ppm at a point to be determined with consultation from ODEQ downstream of Mason Dam.

3.4.3 Proposed Resource Protection, Mitigation and Enhancement Measures

Changes in the manner in which flows are released may affect dissolved oxygen (DO) levels in the Powder River downstream of Mason Dam. To meet State water quality standards the project has been developed with the centerline of the turbine shaft being 1 meter above tail water and an extended draft tube with aeration fittings would be used to allow aspiration of air to increase the dissolved oxygen. The project will develop a tiered mitigation plan in which the water quality will be monitored on a permanent basis with adjustments made to operating criteria if DO levels fall below State water quality standards.

4.0 ESA Consultation

Baker County filed its request to be designated as FERC's nonfederal representative for purposes of Endangered Species Act (ESA) Section 7 consultation related to the project on August 24, 2006. FERC responded in the affirmative on September 8, 2006. Baker County has since worked with the resource agencies to comply with ESA Section 7 requirements.

During agency coordination meetings on March 20, 2008, the FWS stated that the current lists of Endangered, Threatened and Sensitive (TES) Species for Baker County as posted on their website should be used in all subsequent analyses of federally-listed species (Baker County 2008). This list was reviewed during March and July 2008, and subsequently reviewed on September 20, 2008, with the September 20, 2008 list included within the final TES Study Plan report (EcoWest 2009). Baker County reviewed the lists again on October 19, 2009 in preparation for completing this BA. The current FWS listing was last revised on October 19, 2009. As noted on the associated letter dated October 19, 2009, the species list(s) downloaded from the website fulfill the requirement of the FWS under section 7(c) of the ESA. Copies of the species lists are provided in Appendix A of this BA.

The Biological Assessment for the Bureau of Reclamation Operations and Maintenance in the Snake River Basin Above Brownlee Reservoir dated August 2007 addressed the operations of the existing Mason Dam (also known as the Baker Project). The 2007 BA and subsequent Biological Opinion identified no anadromous fish issues in the vicinity of the Baker project (FWS 2008a). Although the Powder River subbasin historically supported anadromous fish, all anadromous fish species have been extirpated from the area and the Powder River Basin does not contain any "evolutionary significant units" (ESUs) of salmon and steelhead (Nowak 2004). As a result, consultation with the National Marine Fisheries Service was not conducted.

Review of the current FWS list indicated that three ESA-listed or candidate species may occur in Baker County. These include the bull trout (*Salvelinus confluentus*), Howell's spectacular thelypody (*Thelypodium howelli* spp. *spectabilis*) and the Columbia spotted frog (*Rana luteiventris*). The FWS designated critical habitat for the bulltrout in 2005 (FWS 2005). Critical habitat was originally proposed for the Powder River upstream from Brownlee Reservoir to the junction with Cracker and McCulley Creeks (above Mason Dam)(FWS 2002). However, the FWS determined that the protection afforded the bull trout on federal lands along the Powder River by INFISH, the Interior Columbia Basin Ecosystem Management Project strategy, the Northwest Forest Plan and the Aquatic Conservation Strategy provided a level of conservation comparable to or greater than that achieved by designating critical habitat. As a result, there is no critical habitat designated within the Mason Dam project vicinity.

Site specific information on the spotted frog and spectacular thelypody was obtained from a combination of existing data review and detailed field surveys during 2007 and 2008 (see EcoWest 2009a). Data sources included:

- Review of the federal government on-line TES database, which includes data from the Oregon Natural Heritage Program, as updated February 6, 2009

- Review of data collected as part of the Interior Columbia Basin Ecosystem Management Plan (ICBEMP) and the Powder River Subbasin Plan
- Published literature on species habitat requirements and limiting factors
- Information from the FS regarding the TES species updates being developed for the Blue Mountain Area Forest Plan revision

Existing data only was used for the bulltrout, using information provided in the bull trout listing package (FWS 1998), recovery plan (FWS 2002), critical habitat designation (FWS 2005), 5-Year Review (FWS 2008b), Powder River Subbasin Plan (Nowak 2004, US Forest Service documents (FS 1999, 2009) and FS file data, and other information provided by the Oregon Department of Fish and Wildlife (ODFW).

Table 4-1 identifies the federally listed species that occur or potentially occur in Baker County and indicates which species have been documented within either (1) the Mason Dam project vicinity or (2) within the Mason Dam Study area as defined in section 3.0 of this BA.

Table 4-1. Federally Listed Threatened, Endangered or Candidate Species that May Occur in Baker County.

Scientific Name	Federal Status	Documented in Mason Dam Study Area/Vicinity		Critical Habitat Status
		Vicinity	Study Area	
Fish Species				
Salvelinus confluentus (Bull trout [Columbia River Basin])	Threatened	Yes	No	Designated in FWS (2005). Powder River not designated as critical habitat due to protection under other federal guidelines
Amphibians and Reptiles				
Rana luteiventris (Columbia spotted frog)	Candidate	Yes	No	Not designated
Plant Species				
Thelypodium howelli spp. *spectabilis* (Spectacular thelypody)	Threatened	No	No	Not designated

Two species known to occur or with the potential to occur within the project area, the bald eagle and the gray wolf, were recently delisted. The bald eagle was listed as a federally threatened species but a notice of delisting was placed in the federal register on July 9, 2007, with the delisting effective

August 8, 2007. The species is still listed by Oregon as threatened. It is managed by the FS as a Region 6 Regional Forester's sensitive species and continues to be protected under the Bald and Golden Eagle Protection Act (Eagle Act) and the Migratory Bird Treaty Act. The bald eagle status will also be monitored under section 4(g)(1) of the Endangered Species Act for at least 5 years. The gray wolf Rocky Mountain DPS was federally delisted on April 2, 2009, effective as of May 4,2009. The wolf is still listed by Oregon as threatened. Both the gray wolf and the bald eagle are addressed in the Preliminary License Application, along with all other state-listed species, federal species of concern and FS sensitive species.

5.0 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

5.1 Listed Fish Species and Critical Habitat

Background and Status

The Columbia and Klamath River populations of the bull trout are listed by both the federal government and the State of Oregon as threatened. The portions of the Columbia River bull trout population within the Powder River watershed are part of the Hells Canyon Complex Recovery Unit which includes the Snake River and its Oregon and Washington tributaries that drain into the river within the Hells Canyon Hydrolectric Project (Hells Canyon, Oxbow and Brownlee Dams and associated reservoirs). The Powder River watershed bull trout populations are currently known from the Powder River upstream of Mason Dam (Silver, Little Cracker and Lake Creeks), Powder River tributaries between Mason Dam and the North Powder River (Salmon Creek, Pine Creek, Rock Creek, Big Muddy Creek) and the North Powder River and some of its tributaries. Each of these populations are isolated from each other by a number of physical and water quality barriers (e.g., dams, diversions, channel characteristics, temperature)(FWS 2002 and 2005a). The occupied Powder and North Powder River tributaries on private land are designated as critical habitat, with the occupied tributaries on federal land managed under other federal programs (FWS 2005a).

Life History

Bull trout spawn in the late summer or fall, generally between mid September to October. The eggs hatch during the winter, with fry emerging from the gravel in April or May. Sexual maturity is not reached until at least four years of age, with an estimated longevity of 5 to 7 years, and up to 12 years (FWS 1998). Adults may spawn either every year or in alternate years.

The bull trout can exhibit either migratory or resident life history strategies. Resident fish complete their life history cycle in the same stream in which they spawn. Migratory bull trout hatch and rear in tributary streams and then migrate to larger streams or lakes to mature, returning to the smaller streams only to spawn. Both forms can co-occur and resident fish can produce migratory forms. According to the FWS (2002), bull trout in the Powder River basin are thought to be resident fish, as there have been no documented observations of migratory bull trout in the reservoirs, including Phillips Lake (FWS 2002). However, ODFW suspects that bull trout could currently occur in Phillips Lake (Fagan 2008), and the FWS (2002) identifies that bull trout could expand their distribution into Phillips Lake during recovery.

Biological Requirements

Bull trout require a combination of the following habitat elements, although not all occupied habitats contain all of these elements, and the importance of these elements varies with life history stage and strategy (resident or migratory) (FWS 2002).

- Relatively cool water temperatures: overall, 0 to 22 ° C, with 2 to 15 ° C preferred, but with different temperature ranges necessary in different life history stages (e.g., optimal temperatures of 5-9° C for spawning, 2-4 ° C for incubation, and 7-8 ° C for growth). Although bull trout have been observed in water greater than 20 ° C, temperatures greater than 16 ° C are generally considered unsuitable for long term survival (Hemmingson et al. 2001). Cool water temperatures (10 to 12° C) are also preferred for migration, but migration can occur through streams with higher water temperatures.

- Complex channels/cover including large woody debris, pools, undercut banks, side channels that can provide a variety of water depths and velocities.

- Loosely sorted gravel with a minimum of fine material (less than 0.25" or 0.63 cm in diameter).

- A natural hydrograph with minimal daily or day-to-day fluctuations and minimal departures from a natural cycle of seasonal flow variation.

- Cold water sources to contribute to surface flow.

- An abundant food base including terrestrial invertebrates from riparian vegetation, aquatic macroinvertebrates and forage fish, with the food habits varying according to life history stage (i.e., juveniles are insectivores and adults are piscivores).

- Cool, clear permanent water.

- Migratory corridors with minimal physical, biological or water quality barriers between spawning, rearing, overwintering and foraging habitats. Barriers can include physical structures as well as barriers caused by water quality (temperature too high, dissolved oxygen too low) or low flows.

Habitats used by migratory bull trout include bottoms of deep pools in streams and also large coldwater lakes and reservoirs. Within lakes and reservoirs, bull trout inhabit the cold, deeper sections and primarily occur within the upper hypolimnion (Goetz 1989, Fraley and Shepard 1989, McPhail and Baxter 1996, Flatter 2000, Petersen et al. 2002). Bull trout also forage in cool, shallow, littoral zones which tend to occur in the upper reservoir arms where tributaries enter the reservoir. However, bull trout location within a given lake or reservoir varies by season and type of lake.
Within oligotrophic lakes (i.e., low nutrient, well oxygenated lakes), bull trout tend to migrate seasonally between the littoral zone (spring and fall) to just below the thermocline in summer (see for example,Fraley and Shepard 1989, McPhail and Baxter 1996) . In meso and eutrophic lakes,

oxygen levels tend to be depleted during the summer. In these types of lakes, bull trout migrate out of the lake between April and May, returning in the fall and using the water body primarily as overwintering habitat (see for example, Flatter 2000, Stoval 2001, Petersen et al. 2002 and 2003).

Distribution

The historic distribution of the bull trout within the Powder River subbasin is unclear. Nowak (2004) identified that the species was thought to be widespread within the Powder River basin, with at least seasonal connections to the Snake River prior to 1960. Passage above RM 70 on the Powder River was blocked in 1932 by construction of Thief Valley Dam, which has no upstream passage. Mason Dam, constructed in 1968, isolated bull trout in the upper Powder River from bull trout in the North Powder River and other Powder Valley tributaries. Within the Powder River basin, bull trout are currently known from three subpopulations, with isolated local populations within each subpopulation:

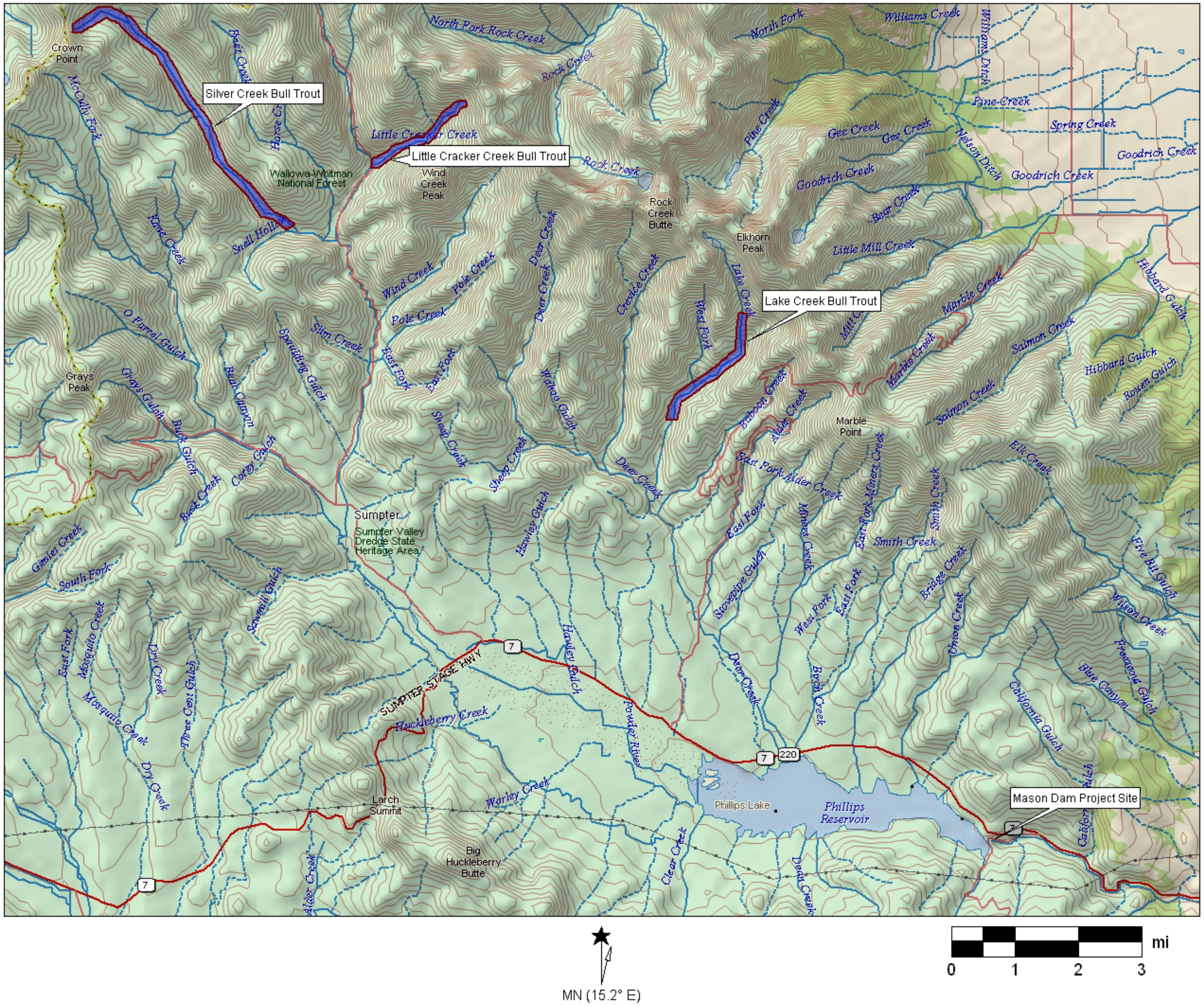
- The Powder River upstream of Mason Dam (Silver and Little Cracker Creeks; Lake Creek),
- Powder River tributaries between Mason Dam and the North Powder River (Salmon Creek, Pine Creek, Rock Creek, Big Muddy Creek), and
- the North Powder River and some of its tributaries.

The FWS (2008) estimated a total of 250 to 1000 individuals within all three Powder River subpopulations, with the majority of the bull trout within Silver Creek.

Fish species in Phillips Lake include rainbow trout (*Oncorhynchus mykiss*), crappie (*Pomoxis spp*), smallmouth and largemouth bass (*Micropterus dolomieui, M. salmoides*), yellow perch (*Perca flavescens)* and walleye (*Sander vitreus*) (FS 1997). The latter two species were introduced in the 1980's and yellow perch have subsequently dominated the lake fishery. There have been several attempts to rid the lake of yellow perch, with the most recent attempt in 2009. Lake-wide netting resulted in the collection of 46,500 yellow perch and 1,047 other fish species. No bull trout were captured during the 2009 lake-wide netting.

As noted above, it is possible that the bull trout occurs within Phillips Lake or that it could enter into the lake during recovery. However, to-date, it has not been documented in Phillips Lake. There have been no documented occurrences of bull trout immediately downstream of Mason Dam or between the dam and Baker City (see figure 5-1)

Figure 5-1. Location of the Known Upper Powder River Bull Trout Populations in Relation to the Mason Dam Project.



Bull Trout Populations and Habitats in the Project Vicinity

Upper Tributaries-Silver Creek/Cracker Creek Local Population

The Silver Creek subwatershed extends from the Silver Creek headwaters to the junction of Silver and Little Cracker Creeks. Silver Creek is a perennial stream with several tributaries. Fruit Creek and an unnamed spring-fed perennial stream enter Silver Creek from the north side. There are an additional three intermittent tributuries entering Silver Creek from the north. Erin Creek and Snell Hollow enter Silver Creek from the south side. It is unknown if these channels have perennial flow.

Most of the watershed (86%) is located on land managed by the US Forest Service (FS), with the lower portion of Silver Creek traversing private land. The watershed historically has been mined, with some ongoing mining. Mine tailings and roads within the Silver Creek floodplain have been suggested as factors that adversely affect the bull trout population through sediment inputs and reduction of channel complexity (FWS 2002).

The Silver Creek bull trout population extends from the headwaters to a point approximately 1.25 miles from the junction with Little Cracker Creek. Between 1996-1999, a variable number of redds were observed in Silver Creek from a low of 7 in 1996 to a high of 36 in 1999. It is unknown how much of the year to year variability can be attributed to natural variation vs. differences in survey protocols (FS 1999). Up to 885 adult bull trout have been estimated to occur within Silver Creek.

Between 1996 to 1999, seven-day maximum temperatures between 12.5 to 18.4 ° C were recorded at the Silver Creek temperature gage, with 7-day maximums generally between 15 to 16 ° C (FS 2002). This gage is located 1 mile downstream of the known bull trout population and field surveys have documented cooler temperatures in the areas occupied by bull trout.

Fruit Creek is a perennial stream that is hydrologically connected to Silver Creek. Bull trout historically occurred in Fruit Creek (FS 1999, FWS 2005). There is currently a fish passage barrier (improperly sized/located culvert) between Silver and Fruit Creeks (FS 2001). There is also a crossing on Fruit Creek approximately 3 miles upstream that is resulting in a substantial amount of sediment input to the creek (FS unpublished file data).

Little Cracker Creek is known to contain bull trout, with the known occurrences 1 ½ miles upstream of the junction with Silver Creek.

The bull trout within Little Cracker Creek and Silver Creeks are thought to form one local bull trout population, although the degree of movement between these areas may be limited by both physical and thermal barriers. There is currently no possibility of bull trout re-entering Fruit Creek where it was historically observed by ODFW because of a physical barrier and potential habitat has been adversely affected by unmanaged stream crossings through the creek (FS 2001, FS file data).

Cracker Creek below the junctions of Little Cracker and Silver Creeks is confined by historic mine tailings and temperatures often exceed 18 ° C. No bull trout have been found in Cracker Creek.

Upper Tributaries-Lake Creek Local Population

Lake Creek is a tributary to Deer Creek. Deer Creek ultimately enters Phillips Reservoir approximately 5 miles downstream of the junction between Lake and Deer Creeks. Bull trout are known to occur in Lake Creek approximately 1 ½ miles upstream from the junction with Deer Creek (or approximately 6.5 miles upstream of Phillips Reservoir). Seven-day maximum temperatures exceeding 18 ° C have been recorded at the Deer Creek temperature gage (FS 1999). The gage is located at the confluence between Deer and Lake Creeks, downstream of the areas occupied by bull trout.

Baboon and Crevice Creeks have been identified as potential bull trout habitat (S. Fouty, FS, pers. comm). These creeks are hydrologically connected to Lake Creek, but fish passage among the creeks is restricted by a number of improperly placed culverts. Passage between Lake and Deer Creeks is also affected by a number of physical barriers. Approximately 80% of the Deer Creek flow is removed near the FS boundary, upstream of the junction with Philips Lake. It is unknown if this diversion is screened.

Phillips Lake

Mason Dam is apparently well aerated throughout the water column during the winter (late November to mid April/early May) with DO values greater than 8 ppm (e.g., 9.2 to 9.9 ppm in May, see Table 5-1). Winter temperatures are unknown but exceed 0 ° C in the upper layers as portions of the lake freeze. Only minimal amounts of water are released from the dam during this time period.

Beginning in May, the lake starts to stratify with increasing temperatures near the surface and relatively constant temperatures near the bottom of the reservoir. These differences increase to 10 ° C by July, as the surface layer warms to more than 20 ° C (above bull trout tolerances), while the temperatures near the bottom of the reservoir remain relatively constant between 10.4 to 11.2 ° C (preferred bull trout temperatures).

Dissolved oxygen concentrations change as both the temperature changes and the reservoir starts to stratify according to temperature and water density. The surface layers (epilimnion) maintain DO concentrations suitable for the bull trout through July. However, temperatures exceed the preferred temperature range beginning in June and neither temperatures nor DO levels are suitable for the bull trout in August. The problem is exacerbated in the lower layers (mesolimnion and hypolimnion) where DO levels drop below 7 ppm beginning in June. Although the temperatures in these two layers remain suitable for the bull trout, the DO levels quickly drop below bull trout tolerances.

In general, the intake is located within the mesoliminion between mid-May to mid June and within the hypolimnion between mid June and September. Intake conditions are anoxic near the intake between mid July and the end of August. This situation represents a “best case” scenario, as the water quality data was collected during a “dry year” in which there was a low reservoir pool. In years with a higher pool elevation, the intake conditions would likely remain anoxic for a longer period of time near the intake.

Figures 5-2 and 5-3 depict the elevations of the intake in relation to the temperature and DO data collected between May and October 2007. Table 5-2 provides a summary of this data identifying the months in which DO levels and/or temperatures exceed adult bull trout preferences (defined as temperatures between 2-15 ° C and DO levels > 8ppm) or adult bull trout tolerances (defined as temperatures between 0-22 ° C and DO levels between 6- 8ppm; tolerable conditions are not suitable for long term survival, just short periods).

Conditions are not within the bull trout's preferred range at any depth within the reservoir between June and October, regardless of the intake depth. Conditions exceed bull trout tolerances (less than 6 ppm and/or maximum month temperatures exceeding 22 ° C) at the intake depths during June, July and August.

Bull trout are known to occupy the upper hypolimnion in oligotrophic lakes, but migrate out of more nutrient rich lakes during the summer. Bull trout may enter Philips Lake during recovery. However, Phillips Lake is not an oligotrophic lake and any bull trout using the lake would most likely migrate out of it during the late spring and summer.

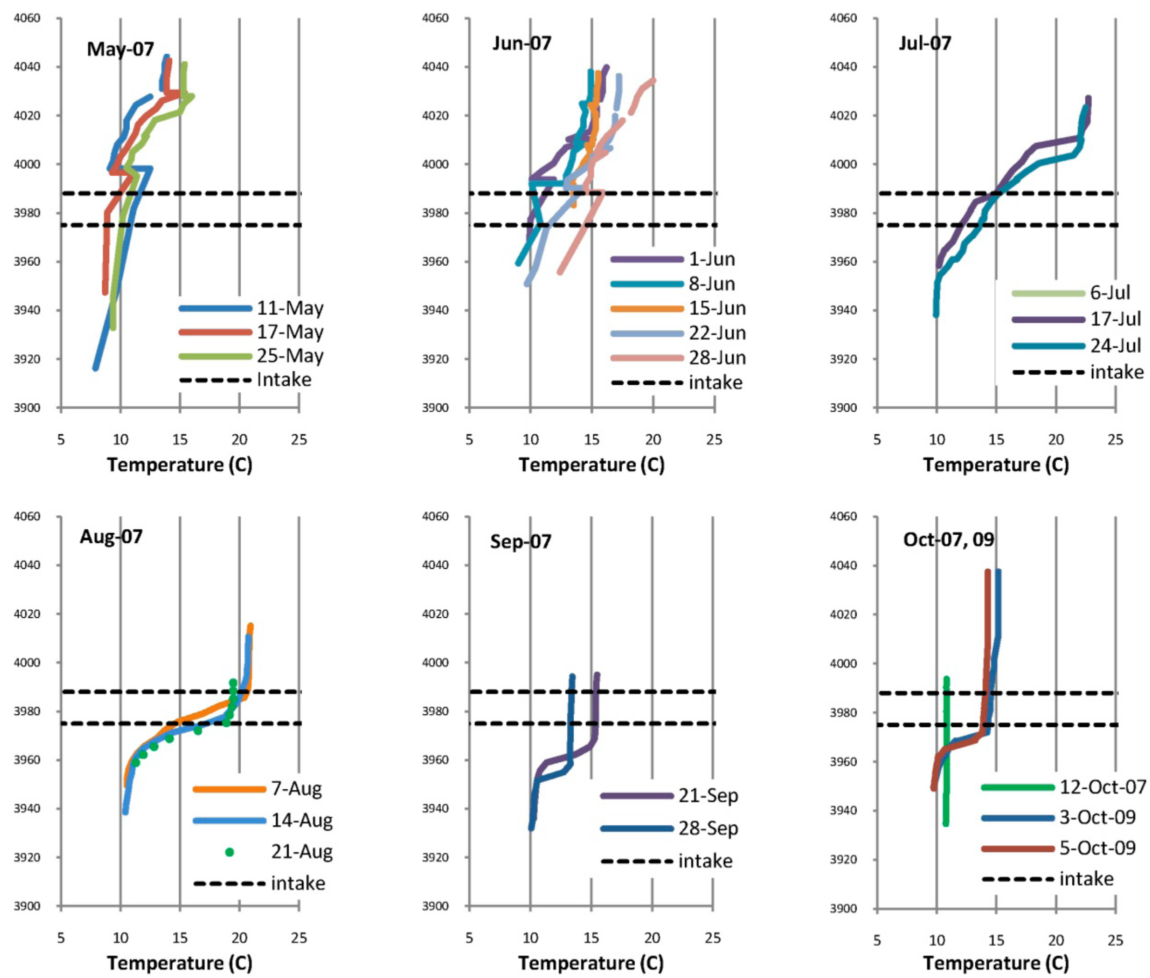


Figure 5-2 Phillips Lake Temperature Profiles Based on Data Collected Between May and October 2007 and October 2009

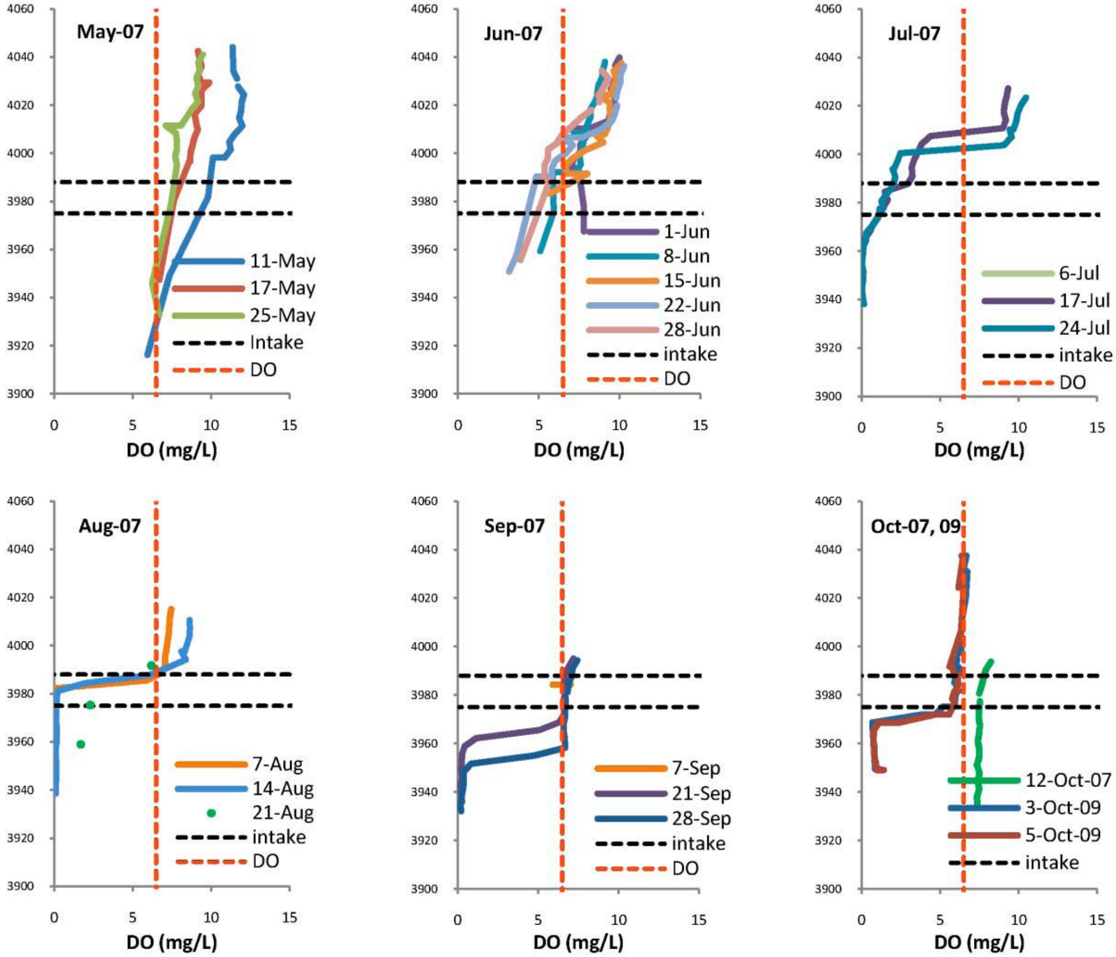


Figure 5-3 Phillips Lake Dissolved Oxygen Profiles Based on Data Collected Between May and October 2007 and October 2009

Table 5-1. Monthly Summary of Phillips Lake Stratification Characteristics and Associated Dissolved Oxygen (DO) and Temperature Measurements. Based on data collected in 2007.

Month	Degree of Stratification	Thermocline Depth	Mean Temperature (◦C, top value) and DO (Mg/L, lower value)		
			Epilimnion	Mesolimnion	Hypolimnion
May	Stratification starting to develop, Still some mixing among layers	Gradual change between 7-15 m, no sharp thermocline	14.4 ±0.38 9.9 ±0.52 n=16	11.2 ±0.51 9.7 ±0.55 n=29	9.3±0.61 7.0 ±0.58 n=9
June		Depth varies during month between 5-15 m with a 5 - 8 m zone	16.0 ±0.42 9.3 ±0.16 n=43	14.0 ±0.59 6.9 ±0.28 n=30	11.5±1.21 4.8 ±0.58 n=11
July	Strongly stratified into 3 distinct layers; anoxic below 20 m by end of month	Sharp change between 7-15 m; 8 m zone	21.8 ±0.35 8.6 ±0.29 n=18	15.8 ±0.77 3.3 ±0.84 n=27	11.2±0.51 0.3 ±0.16 n=19
August	Strongly stratified into 3 distinct layers; anoxic at or below 10 m	Sharp change between 10-15 m; 5 m zone	20.2 ±0.24 5.7 ±0.98 n=38	14.2 ±1.16 0.1 ±0.02 n=19	10.7±0.12 0.1 ±0.02 n=16
September	Strongly stratified, but starting to change; anoxic at or below 13-15 m	Varies during month from 9-13 m (9/13) to 12-14 m (9/25) ; 2 m zone at month end	15.1 ±0.59 6.5 ±0.54 n=31	12.2 ±1.00 1.1 ±0.78 n= 9	10.4±0.07 0.3 ±0.04 n=19
October	None	No significant vertical change in temperature	10.8 ±0.008 6.5 ±0.08 n=19		

Table 5-2. Comparison of Phillips Lake 2007 Dissolved Oxygen (DO) and Temperature Measurements to Bull Trout Water Quality Preferences and Tolerances for Adult Fish.

Month	Mean Temperature (◦C, top value) and DO (Mg/L, lower value)			Temperature and DO meets preferred conditions (OPT) or Short Term Tolerable Conditions (TOL)					
	Epilimnion	Mesolimnion	Hypolimnion	Epilimnion		Mesolimnion		Hypolimnion	
				OPT	TOL	OPT	TOL	OPT	TOL
May	14.4 ±0.38 9.9 ±0.52 n=16	11.2 ±0.51 9.7 ±0.55 n=29	9.3±0.61 7.0 ±0.58 n=9	Yes	Yes	Yes	Yes	No	Yes
June	16.0 ±0.42 9.3 ±0.16 n=43	14.0 ±0.59 6.9 ±0.28 n=30	11.5±1.21 4.8 ±0.58 n=11	No	Yes	No	Yes	No	No
July	21.8 ±0.35 8.6 ±0.29 n=18	15.8 ±0.77 3.3 ±0.84 n=27	11.2±0.51 0.3 ±0.16 n=19	No	No	No	No	No	No
August	20.2 ±0.24 5.7 ±0.98 n=38	14.2 ±1.16 0.1 ±0.02 n=19	10.7±0.12 0.1 ±0.02 n=16	No	No	No	No	No	No
September	15.1 ±0.59 6.5 ±0.54 n=31	12.2 ±1.00 1.1 ±0.78 n= 9	10.4±0.07 0.3 ±0.04 n=19	No	Yes	No	No	No	No
October	10.8 ±0.008 6.5 ±0.08 n=19			OPT: No, TOL: Yes					

Adult bull trout preferred conditions are defined as temperatures between 2-15 ◦C, and DO levels > 8ppm
Adult bull trout tolerable conditions are defined as temperatures between 0-22 ◦C, and DO levels between 6- 8ppm; tolerable conditions are not suitable for long term survival, just short periods

Powder River below Mason Dam

There are approximately 850 feet of the Powder River included in the immediate project study area, which include 0.78 acres of open water habitat. During the fall, the wetted channel averages 30 feet in width, bordered by 10 to 15 feet of bare cobble on each side of the channel. This zone of fluctuation is bordered on the upslope side by a narrow vegetated riparian zone that averages 10 feet in width. The wetted channel width increases to 50 to 60 feet, with portions of the vegetated riparian zone under water. Between midsummer and fall, water surface level decreases by approximately 3.5 feet (1.53 at the gage which is at a wider, shallower river section). In contrast, the water level in the Powder River above Phillips Lake changes 0.13 feet during the same time period.

The stream bed substrate is large cobble with scattered boulders. There is little to no sediment accumulation within the active channel. Exceptions occur along the downstream sides of boulders where up to an inch of sediment deposition (mostly sand) can be found. There are aquatic vascular plant/algal beds within the portion of the channel containing permanent pools. These beds are dominated by water buttercup (*Ranunculus aquatilis*) along with green algae, blue green algae and aquatic mosses.

There is no habitat complexity (e.g., large woody debris, undercut banks, side channels) within this portion of the river. Caddisfly and mollusk surveys in this reach identified a distinct lack of aquatic macroinvertebrates (EcoWest 2009a). Habitat complexity and macroinvertebrate abundance begin to increase just below the end of the study area, between 0.5 to 1 mile downstream of Mason Dam.

The average monthly Powder River temperatures between the current stilling basin and the end of the water quality study area (2.8 river miles downstream of the dam) do not exceed the maximum bull trout tolerance of 22 ° C (Table 5-3), but the temperatures exceed the preferred bull trout upper temperature range of 15 ° C in August throughout this reach. Overall, temperatures would be suitable for bull trout spawning in some areas of the study reach, but not suitable for rearing. Adults bull trout could survive in this reach.

Table 5-3. Comparison of optimal temperatures for different bull trout life history stages to the measured temperatures in the Powder River between Mason Dam and a point 2.3 river miles downstream.				
Key Life History Stage	**General Timing**	**Optimal Temperatures (˚C)**	**Powder River Temperatures (˚C)**	**Temperatures Suitable**
Spawning	Mid September to October	5-9	Up to 13 in Sept, but 7.7 to 10 October	Yes in some areas
Egg incubation/ Fry emergence	October to April/May	2-4	Mostly unknown, temperatures above 7 in May	Unknown
Rearing	Year round until maturity	7-8	Range between 7.6 and 18.1	No
Adult growth	Year round	2-15	Range between 7.6 and 18.1	Yes, except for August
Migration	Unknown, but if it occurs, likely April-May and Sept-Oct	10-12	May temperatures 7.6-8.7 Up to 13 in Sept, but 7.7 to 10 October	Yes

Dissolved oxygen concentrations in the stilling basin range from 10.1 ppm in May to a low of 7.7 in October, remaining above 8 ppm between May and September. Downstream of the stilling basin, average DO concentrations range between 8.0 and 9.6 ppm in all months except August, when they dip to 7.5-7.8 ppm.

There are no bull trout in the Mason Dam water quality study reach. Although temperatures may be suitable for the species to survive, there is no suitable spawning, rearing or foraging habitat between Mason Dam and the gaging station. Habitat complexity increases at a point approximately 0.5 miles downstream.

Critical Habitat

The FWS designated critical habitat for the bulltrout in 2005 (FWS 2005). Critical habitat was originally proposed for the Powder River upstream from Brownlee Reservoir to the junction with Cracker and McCulley Creeks (above Mason Dam)(FWS 2002). However, the FWS determined that the protection afforded the bulltrout on federal lands along the Powder River by INFISH, the Interior Columbia Basin Ecosystem Management Project strategy, the Northwest Forest Plan and the Aquatic Conservation Strategy provided a level of conservation comparable to or greater than that achieved by designating critical habitat.

Factors for Decline

The FWS (1998, 2008b) identified the primary factors for the bull trout decline as:

- Habitat fragmentation through dams, other physical impediments to passage such as roads, water withdrawals/diversions, and thermal or flow barriers to movements, noting that "improperly constructed stream crossings may act as barriers to bull trout movement either constantly or under certain conditions, which prevents bull trout access to suitable habitats and increases isolation of bull trout populations" (FWS 2005, p.22). Habitat fragmentation has occurred at both a large scale within the Hells Canyon complex isolating local populations from each other and at a smaller scale within local populations.

- Non-native fish species introductions, such as lake and brook trout which can compete with or hybridize with bull trout, and predatory fish such as yellow perch and brown trout.

- Habitat degradation through increased water temperature, sedimentation and loss of stream and floodplain complexity.

Other factors such as illegal harvest, past fish management practices or disease either have been addressed or are not factors currently affecting the Powder River bull trout population.

In general, both historic and current population data is low to nonexistent across much of the species range so that the degree of decline can only be qualitatively estimated. The 5-year bull trout status review (FWS 2008b) identified that the Powder River population was a population at substantial risk because of the geographical isolation of watershed subpopulations from each other, the low overall estimated population size, the limited amount of suitable habitat and the presence of a single primary life history strategy (i.e., resident). It is generally thought that at least 50 spawners are required within a local population to prevent inbreeding depression and 500 to 1000 adults to prevent population loss through genetic drift (Rieman and McIntyre 1993) and that the presence of the migratory life history strategy provides a mechanism for the species to avoid catastrophic loss through adverse changes in any one habitat.

5.2 Listed Wildlife Species and Critical Habitat

Background and Status

The Columbia spotted frog is a candidate for federal listing as threatened or endangered. The range of the species has declined substantially in the past 50 years, with the decline thought to be associated with wetland loss and introduction of nonnative predators, such as bullfrogs and bass. Populations in eastern Oregon are part of the Great Basin subpopulation of the Columbia spotted frog, which is one of four recognized subpopulations of the species (FWS 2005b).

Biological Requirements and Life History

The spotted frog is an aquatic species that is associated with open, non-turbid, slack or ponded water. It is often found in association with seeps and springs, open water with floating vegetation, and larger bodies of ponded water such as lakes and stream backwaters. Habitats tend to have relatively constant water levels and temperatures (Bull 2005). Breeding occurs in these open water areas with egg masses being laid in shallow water fringes (generally 6 to 12 inches or less) where they can float freely.

The spotted frog tends to forage in adjacent wet meadows (i.e., wetland areas containing sedges, grasses and rushes), but can also be found hiding under decaying vegetation or upland habitats near water with dense cover to allow protection from predators and ultraviolet radiation. The frog is relatively inactive during winter, generally hibernating or aestivating in deep silt or muck substrates, spring heads, or undercut perennial streambanks with overhanging vegetation. The key feature of overwintering habitat is a microhabitat that is protected from freezing. The frogs can use different wetlands for breeding, foraging and overwintering and are sensitive to fragmentation of their travel routes among different wetland habitats.

Breeding occurs in late winter or early spring, generally between late March to April in mid-elevation areas of the Blue Mountains (Bull 2005). Adults arrive at the breeding sites from 1 to 12 days prior to egg deposition. The specific timing of egg-laying is closely related to water temperature, with adult movement to the oviposition sites thought to be affected by photoperiod or overwintering site water temperatures. Hatching occurs between 12-21 days following egg deposition. Larvae metamorphose into frogs between July and September. Adults move to overwintering sites between August and mid-October. Spotted frogs mature sexually between 2 and 6 years of age.

Spotted frogs can migrate substantial distances from their breeding ponds and will traverse uplands, especially if necessary to reach overwintering sites. However, the frogs often remain within 1 km or less (0.6 miles) of the breeding pond and frogs within isolated ponds may never leave the pond.

Distribution

The overall distribution of the Columbia spotted frog is from extreme southeast Alaska south to northeast Oregon and east to western Montana and Wyoming, with a few scattered populations in northern Utah, southeast Oregon and southwestern Idaho.

There are a number of known breeding sites in northeastern Oregon in Union, Baker, Wallowa, Grant and Umatilla counties (Bull 2005). One of the known sites occurs immediately upstream of Phillips Lake in the series of ponds that have developed in the Sumpter mine tailings (Bull 2005). These ponds are not connected to the river and have no fish or bullfrogs as predators. The spotted frog also occurs in wetlands adjacent to the campgrounds on the south shore of Phillips Lake (A Kuehl, BLM [former FS], pers. comm.). There have been no spotted frog surveys below Mason Dam, although there is likely potential habitat near the Powder River trails between 0.5 to 1 mile downstream of Mason Dam (B. Mason, FS, pers. comm) (see also figure 5-4).

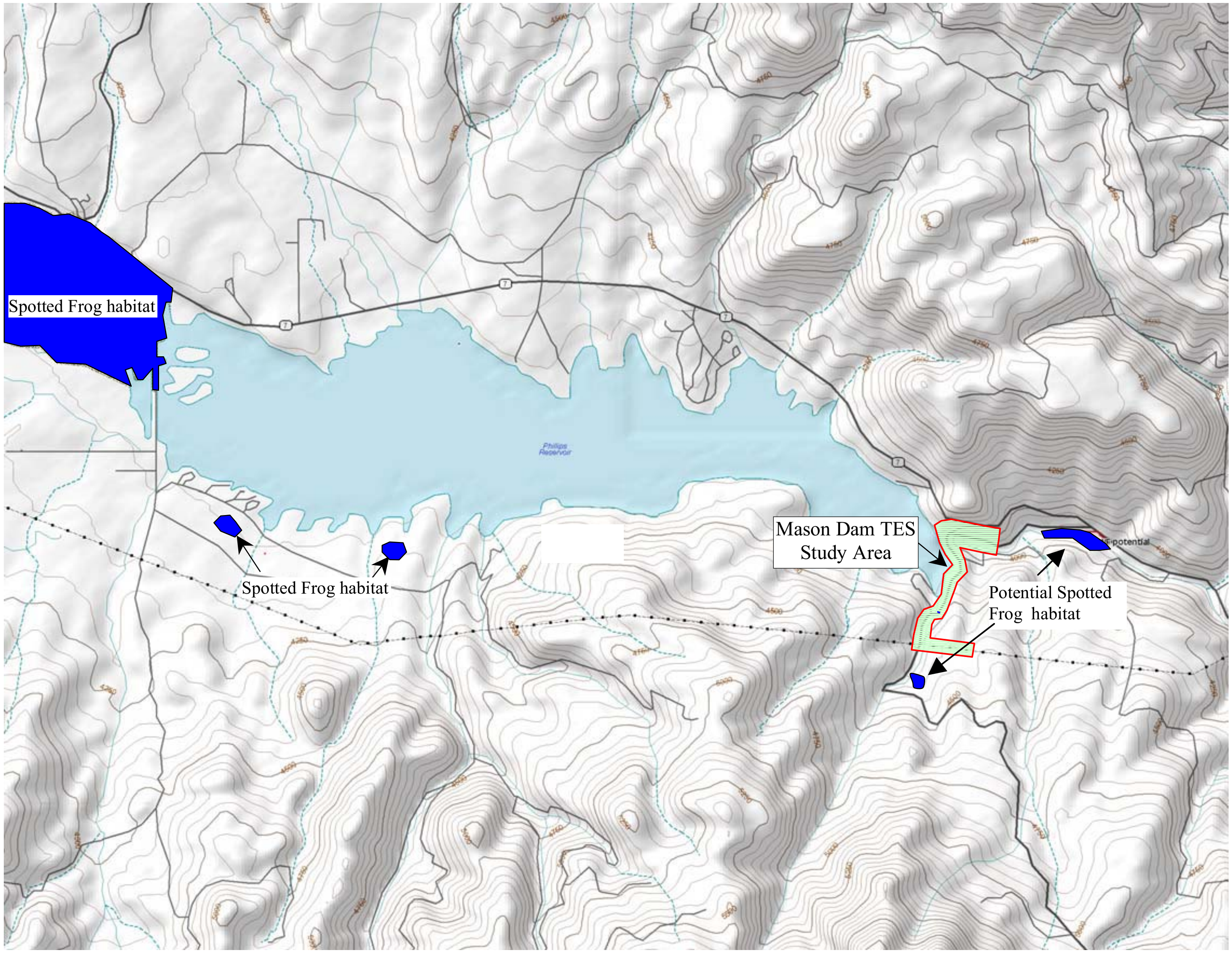


Figure 5-4. Known and Potential Spotted Frog Habitat in the Vicinity of the Mason Dam Project. Potential TES habitat outside of the Study Area was not evaluated for occupancy in this report.

No spotted frogs were observed in the 2007 and 2008 field surveys of the Mason Dam project area. Narrow wetlands border the Powder River within the study area and along an unnamed tributary that enters Phillips Lake above Mason Dam. These wetlands were evaluated for the potential as spotted frog habitat based on the criteria listed below.

- Provides semi-permanent or permanent shallow water with a relatively constant water level
- Known to lack, or likely lack frog or fish predators
- Provides cover (wetland or upland, or dense litter)

OR

- Within a potential travel route to or from the above habitat

OR

- Able to provide hibernating habitat (deep silt or muck substrate, undercut streambank, or spring head)

None of the riparian wetlands along the Powder River within the study area meet any of the above criteria. The wetlands directly border the Powder River, which does have fish predators. The wetlands also are subject to substantial water level fluctuation during the frog's active season. Herbaceous or other low-to-the ground cover (such as litter) necessary for thermal and other protection is minimal. There are no adjacent wetlands meeting the above criteria, so the riparian corridor does not function as a regular travel corridor. There is no hibernating habitat as there is no deep substrate, or cut streambanks with overhanging cover to provide protection from freezing.

The wetlands along the unnamed tributary lack fish predators, and provide much greater cover than the Powder River wetlands. The tributary is spring-fed, but also subject to seasonal water level fluctuations of 6 to 12 inches. As a result of the seasonal flooding, there is little to no litter accumulation and not much sediment deposition. Riparian soils are shallow to cobble.

According to Bull (2005), spotted frog use of streams and creeks is rare (less than 2% of the breeding sites) and restricted to slow moving creeks. The relatively high water level fluctuations limit the tributary as potential breeding habitat with hibernating habitat limited by lack of deep soils or other substrate to protect against freezing. A spring approximately 350 feet upstream of the project area has deep, mucky soils suitable for hibernation, but heavy recreation and horse use limit the wetland's ability to support spotted frog. As a result, there are no known suitable habitats within at least 0.2 miles limiting the stream's value as a regular travel corridor.

Critical Habitat

There is no critical habitat designated for the spotted frog. Critical habitat is not designated for candidate species.

5.3 Listed Plant Species and Critical Habitat

Background, Status and Biological Requirements
Spectacular thelypody is listed as endangered by the State of Oregon and as threatened by the federal government. It is known only from 11 sites (five populations) in Baker and Union Counties, Oregon. Occupied habitats include alkaline wet to mesic meadows within valley bottoms between elevations of 3,000 to 3,500 feet. Common associates include great basin wild rye (*Leymus cinereus*), with greasewood (*Sarcobatus vermiculatus*) typically occurring along the habitat fringes. The FWS considers that all moist, alkaline meadows dominated by greasewood, great basin wild rye or saltgrass between 3,000 to 3,500 feet in elevation within Baker, Union and Malheur Counties represent potential suitable habitat for the species (FWS 1999).

Life History
The spectacular thelypody is a biennial plant that can act as a facultative annual. It establishes solely by seed. In general, annual growth starts during April, with flowering in late May and into July (EcoWest 2009c and 2009d, Currin and Meinke 2008).

Distribution.
The spectacular thelypody was historically known to occur in the Baker-Powder River Valley in Baker and Union Counties and the Willow Creek Valley in Malheur County. The species was thought to have been extirpated until it was rediscovered in 1980 in the Powder River Valley. The historic locations in Malheur County have not been relocated. Currently, the spectacular thelypody is known only from 11 sites (five populations) in Baker and Union Counties, Oregon. All of the known sites are located within a 15-mile radius of Haines in Baker County, within the Baker-Powder River valley.

More than 200 vascular plant species were observed during the 2007 and 2008 surveys of the Mason Dam project area (EcoWest 2009a). The spectacular thelypody was not observed. There is no suitable habitat for the thelypody in the Mason Dam project area.

Critical Habitat
There is no critical habitat designated for the spectacular thelypody.

Factors for Decline
The FWS (2005b) identified that the main factor for the species decline had been the historic conversion of valley meadows to agricultural use. Other factors included road construction and maintenance, competition with non-native, invasive species and changes in suitable hydrologic support.

6.0 EFFECTS OF THE ACTION ON LISTED SPECIES

6.1 Fish

Impacts to the bull trout could occur if the Mason Dam project affected :

- Current populations,
- Current potential or future habitat or migratory corridors, or
- Resulted in a change in existing entrainment risk or mortality as a result of passage through the dam.

Bull trout within the vicinity of the Mason Dam project comprise one of three Powder River Basin subpopulations. Within this subpopulation, there are two distinct local populations: the Silver/ Little Cracker Creek local population, more than 13 river miles upstream of the project, and the Lake Creek population approximately 6.5 miles upstream of Mason Dam and more than 20 miles from the Silver/Little Cracker Creek population. The two local populations are disjunct from each other and blocked from migration into and out of Philips Lake by a number of physical and thermal barriers. The Mason Dam project will neither affect the Powder River tributary populations nor make any changes in their access to Philips Lake. As a result, the known upper Powder River bulltrout populations are not discussed further.

The bull trout is not known to occur in Phillips Lake or downstream of Mason Dam. Published documents (e.g., FWS 2002, FS 1999, FS 2009) identify that the bull trout within the Powder River west of Baker are restricted to the upper tributaries and that the conditions of the upper tributaries make it impossible for the bull trout to migrate into Phillips Lake. However, ODFW suspects that bull trout could currently occur in Phillips Lake (Fagan 2008) and therefore could be at risk of entrainment through the proposed hydroelectric turbine. The FWS suggests that bull trout could expand their distribution into Phillips Lake during recovery (FWS 2002), and therefore, while not initially at risk, bull trout could be entrained in the future during the 30 to 50-year life of the project. As a result, the impact analysis addresses bull trout as if the species may occur/could occur in the future within Philips Lake.

The analysis below is separated below according to impacts on (1) current or potential habitat within Philips Lake and the Powder River downstream of Mason Dam and (2) changes in entrainment or mortality risk.

6.1.1 Current/Potential Future Habitat

Philips Lake

Philips Lake is a meso to eutrophic lake that stratifies during the summer and early fall (June to mid October). The stratification results in an aerated epilimnion with temperatures above bull trout tolerances and a colder hypolimnion with very low oxygen levels. Conditions are not within the bull trout's preferred range (temperatures between 2-15 BC, and DO levels > 8ppm) at any depth between June and October. Conditions within the hypolimnion exceeds the bull trout preferences between May to October, and exceed tolerance levels (less than 6 ppm and/or maximum month temperatures exceeding 22 ° C) between June and September.

Bull tout typically occupy the upper hypolimnion within lakes and reservoirs. In meso to eutrophic lakes, such as Phillips Lake, bull trout typically migrate out of the reservoir when conditions in the hypolimnion become unsuitable, returning to the lake to overwinter.

The project will not change the Philips Lake stratification pattern or associated temperature and DO levels. As a result, any bull trout that do migrate into the lake would likely migrate out of it during the summer regardless of the project operation. The project would have no impact on Phillips Lake or its current/future potential to support bull trout.

Powder River Downstream of Mason Dam

There are no known bull trout between Mason Dam and Baker City. Potential habitat is limited by large fluctuations in reservoir releases over the growing season and the lack of habitat complexity. These factors are most limiting between Mason Dam and the USGS gaging station (850 feet downstream of the dam), although the stilling basin itself does provide some potential habitat. Habitat complexity increases between 0.5 to 1 mile downstream of the dam (between the stilling basin and water quality sampling site #3). There is a potential food base in terms of prey fish for adults, but juvenile habitat is limited between the dam and the more complex habitat reach. Temperatures and DO levels are generally suitable for adult bull trout.

The project would not change the releases from Mason Dam and the large river level fluctuations during the growing season would continue. The project would also not change existing habitat complexity, as there would be no net change in turbidity or erosive power of the released water, or temperatures. Potential habitats would remain marginal between Mason Dam and the gaging station, with improved habitat conditions downstream.

Dissolved oxygen levels would change in the Powder River downsteam of Mason Dam from the stilling basin to a point down stream unknown at this time. Through tiered mitigation and natural aeration DO levels will meet state standards at this point. Table 6-1 shows what could possible happen if the water is released from the turbine without any additional aeration that will be part of the project.

Because there are no bull trout in this area of the Powder River, there would be no direct effect. There could be a loss of potential, future habitat with habitat rendered unsuitable for bull trout between Mason Dam and a point downstream as a result of the potentially low DO levels and the associated impacts on the bull trout food base.

Table 6-1. Comparison of Average Monthly DO Concentrations (mg/L) in the Powder River With Distance From Stilling Basin between Baseline and Project Conditions.						
Sample Site	**Month**					
	May	**June**	**July**	**August**	**Sept**	**Oct**
Dissolved Oxygen-Baseline Conditions						
Stilling Basin RM 131.2	10.1	9.3	9.2	8.4	8.9	7.7
#3 RM 130	10.3	9.0	8.8	7.8	8.3	8.5
#2 RM 129.5	9.3	9.6	8.6	7.7	8.4	9.0
#1 RM 128.4	11.3	9.6	8.7	7.7	8.9	9.5
Dissolved Oxygen-Project Conditions						
Stilling Basin RM 131.2	7.8	5.5	1.8	0.8	6.7	6.4
#3 RM 130	7.8	6.5	6.5	6.5	6.5	6.5
#2 RM 129.5	9.3	9.6	8.6	7.7	8.4	9.0
#1 RM 128.4	11.3	9.6	8.7	7.7	8.9	9.5

6.1.2 Changes in Entrainment or Mortality Risk

It is highly likely that any bull trout entering Philips Lake would migrate out of it during the summer, as documented within other meso to eutrophic lakes. The primary period of use would likely be during the fall and winter, with the lake being used as overwintering habitat. As a result, the risk of entrainment, if bull trout do enter Philips Lake, would be unchanged.

Under current conditions, any bull trout entrained, would be lost to the local population whether killed or not. Adult fishes could survive in the Powder River but conditions would not be suitable for reproduction. River DO could result in the subsequent mortality of any bull trout surviving the entrainment if the state standards are not met but through tiered mitigation DO levels will be met.

Impacts to bull trout could occur if the species entered Phillips Reservoir, were entrained through Mason Dam, and survived passage through the outlet works into the Powder River. Currently, fish entrained through Mason Dam are ejected through two 2’ 9” jet flow valves into the tailrace below the dam. The Mason Dam outlet works are similar to the facilities at Tieton Dam in Washington. The FWS issued a Biological Opinion concerning bull trout entrainment through Tieton as part of consultation for a proposed hydroelectric facility (US Fish and Wildlife Service, 2005). Table 6-2 shows these similarities.

Table 6-2 Comparison of Outlet Works at Mason Dam and Tieton Dam

Item	Mason Dam	Tieton Dam
Hydraulic head	100 -- 160 ft	92 -- 218 ft
Outlet works type	Gate with trashracks	Tower structure
Penstocks	1 @ 56-inch	2 @ 72-inch
Valve type	2 @ 33-inch hollow jet valves	2 @ 60-inch hollow jet valves
Normal discharge range	10 -- 895 cfs	80 -- 2000 cfs
Proposed turbines	1 @ 300 cfs Francis	2 @ 600 cfs Francis

Mortality is likely caused by a combination of physical stresses and sudden pressure differences. Like Tieton, Mason Dam is a high head facility and water exiting the jet valves is expelled with great force. It is evident that passing through the jet valve causes physical stress to fish, which may strike hard surfaces at considerable speed. Entrained fish also experience a great pressure differential as they pass the outlet works because they experience the full head pressure of the reservoir just before they are suddenly ejected from the jet valve into the air. The Biological Opinion for Tieton indicated that a conservative estimate of fish mortality through jet valves is in the range of 60% to 80%. These numbers would probably be slightly lower at Mason Dam due to lower average head (Table 6-2).

Studies have shown that mortality rates for fish entrained into Francis turbines are potentially lower than for fish passing through jet valves. Hardin examined mortality rates of fish entrained into Francis turbines of the type proposed to be used at Mason Dam (Hardin, 2001). He found that fish mortality in turbines is related to the following variables:

- Head
- Turbine speed (rpm)
- Peripheral runner velocity
- Runner diameter
- Runner elevation above tailwater

Table 6-3 shows the turbine variables for the proposed project in comparison to other existing projects where entrainment studies have been performed. The relationship of these variables to each other and to mortality is a complex one. However, fish strike by the turbine blades is presumed to be the major cause of injury and mortality in turbines such as the ones proposed in this project.

Electric Power Research Institute reviewed 64 studies of turbine mortality and concluded that, of the variables listed above, peripheral runner velocity was the most crucial factor contributing to turbine mortality rates, particularly for Francis turbines (Eicher Associates, 1987). Hardin regressed estimates of fish mortality against peripheral runner velocity from 14 studies and found a significant relationship ($p = 0.014$). Runner velocity explains 58% of the variability in estimated mortality. The simple regression equation predicts that turbine mortality at the proposed Mason Dam project potentially could be 28%. The mortality analysis suggests that hydropower operations could reduce fish mortality compared with existing conditions at Mason Dam. The potential therefore exists that if bull trout become established in Phillips Reservoir and are entrained through the dam, potentially a greater number will survive passage through the turbine into the Powder River than would be the case with passage through the jet valves.

Table 6-3 Available Data from existing projects and the proposed project on factors influencing turbine mortality form Hardin (2001) as adapted from Electric Power Research Institute (1987)

Plant	Head (ft)	RPM	Peripheral Runner Velocity (fps)	Runner Diameter (ft)	Runner Elevation Above Tailwater (ft)	Average Estimated mortality (%)
Cushman	450	300	108	6.9	11	41
Elwha	104	300	59	4.9	14	10
Faraday	120	360	62	3.3	10	4
Leaburg	89	225	88	7.5	11.9	17
North Fork	136	139	82	9.7	5	26
Publishers	42	300	47	3	23	13
Puntledge	340	277	103	7.1	2	33
Ruskin	124	120	78	12.4	10	10
Seton	142	120	95	12	16	9
Creek						
Shasta	410	138	111	1	1	39
Sullivan	42	240	64	6.2	23	20
Baker	250	300	80	5	-5	31
Glines	194	225	86	7.7	7	36
Lequille	387	519	121	4.5	6.5	48
Mason	140	514	92	3.44	3.3	28

6.2 Wildlife

There is no spotted frog habitat between Mason Dam and the gauging station, but there is potential habitat, that meets two of the five criteria, beginning at a point 0.5 mile downstream. The project would not affect the potential habitat through changes in flow or turbidity, as described in section 6.1, but could change the river DO levels. Through tiered mitigation and natural re-aeration the expectation of the DO levels will meet state standards in the potential habitat reach and during overwintering. DO requirements are unknown for the spotted frog. Oxygen levels during breeding and egg incubation (if it occurs) would remain the same. Spotted frogs have an ability to aestivate during low oxygen conditions (Bull and Hayes 2002, Engle and Munger 2003). If state DO standards are not met the low DO levels could adversely effect this potential spotted frog habitat.

6.3 Plants

The Mason Dam Project would have no effect on the spectacular thelypody as it does not occur in the project area and there is no potential habitat in the Mason Dam project area.

7.0 Determination of Effects

This Biological Assessment determines the effects that the Proposed Action would have on federally-listed fish, wildlife and plant species and their habitat. The BA will subsequently be used by the FWS to determine whether or not the Proposed Action is likely to jeopardize the continued existence of the listed species or adversely modify their critical habitat. The FWS uses the following terms in their determinations of effects on listed species:

No effect:

This determination is only appropriate if the Proposed Action would literally have no effect whatsoever on the species and/or critical habitat, not a small effect or an effect that is unlikely to occur. Furthermore, actions that result in a "beneficial effect" do not qualify as a no-effect determination.

May affect:

– the appropriate conclusion when a Proposed Action may pose any effects on listed species or designated critical habitat. When the Federal agency proposing the action determines that a "may affect" situation exists, then they must either initiate formal consultation or seek written concurrence from the Services that the action "is not likely to adversely affect" listed species. There are two possible determinations if a project may affect a listed species:

- **Is not likely to adversely affect** – the appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

- **Is likely to adversely affect** – the appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect").In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made. An "is likely to adversely affect"determination requires the initiation of formal section 7 consultation.

7.1 Fish

The upper Powder River bull trout population is a population at risk because of population fragmentation, the low numbers of breeding adults, and lack of a migratory life history strategy that would allow movement among habitats to survive stochastic events. If the local bull trout population were able to migrate in and out of Philips Lake, it would substantially lower the overall population risk of extirpation. However, any loss of breeding individuals, particularly those able to develop an adfluvial life history strategy, would be significant until the local population is stable at 1,000 adults.

The risk of bull trout entrainment by the project is relatively low, as the fish would likely migrate out of the reservoir during the peak summer generation periods when the risk of entrainment is at its highest. DO conditions will need to meet state standards for potential habitat downstream.

The degree to which bull trout would be affected by the project would vary over the life of the project. Under current bull trout distribution conditions, the project would not likely adversely affect the bull trout. However, there is the potential for the project to effect the bull trout over the licensing period if DO standards are not met below Mason Dam in the Powder River.

7.2 Wildlife

The spotted frog does not occur within the direct impact area, but there is potential, unsurveyed habitat, 0.5 miles downstream. If DO standards are not met this would affect this habitat as stated 6.2 and potentially affect the spotted frog.

7.3 Plants

The spectacular thelypody is the only federally listed species that may occur in Baker County. This species was not observed in the Mason Dam project area during the 2007 and 2008 rare plant surveys (EcoWest 2009a). The spectacular thelypody requires low elevation, moist, alkaline meadows. This specialized habitat does not occur in the project area. We conclude that the project would have no effect on the spectacular thelypody.

Table 7-1. Effects Determination for Listed Species Addressed in this BA and Finding of Effects on Critical Habitat.

Scientific Name	Species Finding	Critical Habitat Finding
Fish Species		
Salvelinus confluentus (Bull trout [Columbia River Basin])	Not likely to adversely affect in the short term Likely to adversely affect over the long term	Designated in FWS (2005) Powder River not designated due to protection under other federal guidelines
Amphibians and Reptiles		
Rana luteiventris (Columbia spotted frog)	Likely to adversely affect	None designated
Plant Species		
Thelypodium howelli spp. *spectabilis* (Spectacular thelypody)	No effect	None designated

8.0 CONCLUSIONS

The upper Powder River bull trout population is a population at risk because of population fragmentation, the low numbers of breeding adults, and lack of a migratory life history strategy that would allow movement among habitats to survive stochastic events. If the local bull trout population were able to migrate in and out of Philips Lake, it would substantially lower the overall population risk of extirpation. However, any loss of breeding individuals, particularly those able to develop an adfluvial life history strategy, would be significant until the local population is stable at 1,000 adults.

The risk of bull trout entrainment by the project is relatively low, as the fish would likely migrate out of the reservoir during the peak summer generation periods when the risk of entrainment is at its highest. DO state standards must be met in the Powder River below Mason Dam.

The degree to which bull trout would be affected by the project would vary over the life of the project. Under current bull trout distribution conditions, the project would not likely adversely affect the bull trout. However, there is the potential for the project to effect the bull trout over the licensing period if DO standards are not met making unsuitable habitat downstream of Mason Dam.

The project could affect the spotted frog if DO standards are not met.

There would be no effect on the spectacular thelypody.

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APPENDIX A

Federally Listed Species in Baker County

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN BAKER COUNTY, OREGON

LISTED SPECIES

Fish
Inland:

Bull trout	*Salvelinus confluentus*	CH T

Plants

Howell's spectacular thelypody	*Thelypodium howellii ssp. spectabilis*	T

PROPOSED SPECIES

None

No Proposed Endangered Species		PE
No Proposed Threatened Species		PT

CANDIDATE SPECIES

Reptiles and Amphibians
Inland:

Columbia spotted frog	*Rana luteiventris*

SPECIES OF CONCERN

Mammals
Terrestrial:

Pygmy rabbit	*Brachylagus idahoensis*
Pallid bat	*Antrozous pallidus pacificus*
Pale western big-eared bat	*Corynorhinus townsendii pallescens*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
California wolverine	*Gulo gulo luteus*
Silver-haired bat	*Lasionycteris noctivagans*
Small-footed myotis bat	*Myotis ciliolabrum*
Long-eared myotis bat	*Myotis evotis*
Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Preble's shrew	*Sorex preblei*

Birds

Northern goshawk	*Accipiter gentilis*
Western burrowing owl	*Athene cunicularia hypugaea*
Ferruginous hawk	*Buteo regalis*
Greater sage-grouse	*Centrocercus urophasianus*
Olive-sided flycatcher	*Contopus cooperi*
Willow flycatcher	*Empidonax traillii adastus*
Yellow-breasted chat	*Icteria virens*

Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
White-headed woodpecker	*PIcoides albolarvatus*

Reptiles and Amphibians

Rocky Mountain tailed frog	*Ascaphus montanus*
Northern sagebrush lizard	*Sceloporus graciosus graciosus*

Fish

Pacific lamprey	*Lampetra tridentata*

Invertebrates

Insects:

Blue Mountains cryptochian caddisfly	*Cryptochia neosa*

Plants

Wallowa ricegrass	*Achnatherum wallowaensis*
Upward-lobed moonwort	*Botrychium ascendens*
Crenulate grape fern	*Botrychium crenulatum*
Mountain grape fern	*Botrychium montanum*
Twin-spike moonwort	*Botrychium paradoxum*
Stalked moonwort	*Botrychium pedunculosum*
Clustered lady's-slipper	*Cypripedium fasciculatum*
Cronquist's stickseed	*Hackelia cronquistii*
Red-fruited desert parsley	*Lomatium erythrocarpum*
Cusick's lupine	*Lupinus cusickii*
Snake River goldenweed	*Pyrrocoma radiata*
Biennial stanleya	*Stanleya confertiflora*

DELISTED SPECIES

Mammals

Terrestrial:

Gray wolf	*Canis lupus*

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

Definitions:

Listed Species: An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future.

Proposed Species: Taxa for which the Fish and Wildlife Service or National Marine Fisheries Service has published a proposal to list as endangered or threatened in the Federal Register.

Candidate Species: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN BAKER COUNTY, OREGON

Species of Concern: Taxa whose conservation status is of concern to the U.S. Fish and Wildlife Service (many previously known as Category 2 candidates), but for which further information is still needed. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing.

Delisted Species: A species that has been removed from the Federal list of endangered and threatened wildlife and plants.

Key:

E	Endangered
T	Threatened
CH	Critical Habitat has been designated for this species
PE	Proposed Endangered
PT	Proposed Threatened
PCH	Critical Habitat has been proposed for this species

Notes:

Marine & Anadromous Species: Please consult the National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/pr/species/) for marine and anadromous species. The National Marine Fisheries Service (NMFS) manages mostly marine and anadromous species, while the U.S. Fish and Wildlife Service manages the remainder of the listed species, mostly terrestrial and freshwater species.