Bumping Reservoir Expansion Fish and Wildlife Habitat Impact Report

Report submitted to Department of Ecology's Office of Columbia River by Washington Department of Fish and Wildlife in partial fulfillment of Contract # C1400032

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1.0 Introduction

1.1 Description of proposed project

A proposal for additional water storage under the Yakima Basin Integrated Water Resource Management Plan (Integrated Plan) is to enlarge the existing Bumping Reservoir. The following is a summary of the proposed project, primarily summarized from the final Programmatic Environmental Impact Statement for the Integrated Plan, released in March 2012 (U.S. Bureau of Reclamation (Reclamation) and Washington Department of Ecology (Ecology), 2012).

Bumping Lake Dam is located on the Bumping River, a tributary of the Naches River, approximately 40 miles northwest of Yakima. Bumping Lake Dam was constructed in 1910 and created a reservoir with a capacity of 33,700 acre-feet at elevation 3,425 feet. Enlargement of Bumping Lake Reservoir would include construction of a new dam and fish passage facilities located downstream from the existing Bumping Lake Dam.

The reservoir would be enlarged to an approximate elevation of 3,490 feet under both alternatives. Depending on which dam site is chosen among the two currently under consideration, a total active capacity of approximately 200,000 acre-feet or 214,000 acre-feet would be achieved. The existing dam would be breached following construction to allow full use of the existing pool. The enlarged reservoir would inundate approximately an additional 1,900 acres of land for a total inundation area of approximately 3,200 acres. The reservoir would extend approximately five miles upstream from the dam and create approximately three more miles of shoreline, for a total of 15 miles.

Per communications with Reclamation (Chris Lynch, personal communication, August 2015), the general operation of the enlarged Bumping Reservoir would be to use the same amount of water available in the existing 33,700 acre-feet reservoir in normal and above normal water years. In drought years the additional capacity of the enlarged Bumping Reservoir would be tapped to meet water demands for multiple purposes. Functionally, in normal and above normal water years, only the top 33,700 ac-ft would be used for water demands while the remaining capacity would remain as carry-over storage for the following water year. A capacity table provided by Reclamation estimates the maximum pool of 3490 ft to provide 203,000 ac-ft. Subtracting 33,700 ac-ft from that results in a pool elevation of about 3478 ft.

1.2 Description of what Washington Department of Fish and Wildlife was tasked to provide to Ecology.

Washington Department of Fish and Wildlife (WDFW) was contracted through Ecology's Office of Columbia River (OCR) to investigate a proposed project at Bumping Reservoir where the existing reservoir would be expanded as summarized in Section 1.1. Under that contract, referred to as a fatal flaw analysis, WDFW was to provide the following elements in a report.

A final report will be prepared regarding:

- An inventory of existing and future, potential spotted owl habitat(s) in the area of the proposed Bumping Lake Reservoir.
- Identification of existing habitat and future habitat protection and restoration alternatives for Northern-spotted owls (and other species as applicable).
- Presence and distribution of terrestrial listed species (federal/state/PHS) wildlife presence/absence data for the Bumping project.
- Presence of ESA listed-plants at Bumping Reservoir.
- Identify specific mitigation measures, management recommendations, and applicable Best Management Practices (BMPs) for threatened and endangered species.
- Evidence of all wildlife species of importance will be documented and reported in the WDFW heritage database.
- WDFW will produce an inventory of 'Species of Concern and Priority Habitat Species' by Project Area and will produce GIS data layers consisting of points (e.g. nests, eagle foraging areas), lines (significant migration routes), and polygons (e.g., spotted owl nesting areas, critical habitat). Identify potential impacts of project proposals on other ESA and PHS species.
- Collect existing and additional bull trout information related to raising Bumping Reservoir, and develop management recommendations.
- WDFW will provide recommendations that will allow Reclamation to avoid or significantly reduce potential impacts. These recommendations are presented in section 4.8

1.3 Timeline of work, field and office

A team of biologists and scientific technicians were hired to perform tasks that were outlined in Section 1.2 above. The two biological leads started in late July 2014 and the four scientific technicians started in late August and early September 2014. Fall season was spent collecting both field data and compiling existing data from various sources both with WDFW and from a variety of outside sources, further elaborated in the method sections of this report. Winter season was primarily spent collecting and refining existing data and some research and analysis of issues identified during fall field studies. Due to higher priorities on other aspects of the contracted Integrated Plan work, limited field work was conducted at the project in the spring of 2015. Revisiting spring wildlife studies are among the recommended future studies section of this report (Section 4.9). Implementation of many of those recommendations for future studies will require work beyond June 2015.

2.0 Methods

The following methods described are for specific impacts that we attempted to quantify with existing data and new data collection under this contract. The results for these investigations are in the results section (3.0) and they are discussed further in the discussion section 4.0. Other impacts for which we did not specifically study but can talk about based on hypotheses and knowledge of the area are described in the discussion section.

2.1 Priority Habitats and Species: Habitats

Priority Habitats and Species (PHS) habitat information was obtained in two forms. WDFW databases that include PHS habitats were reviewed for the project area and biological surveys were performed. Potential terrestrial PHS habitats for this area included aspen stands, biodiversity areas and corridors, old-growth-mature forest and riparian areas. Potential aquatic PHS habitats for this area included freshwater wetlands and instream habitat. PHS habitat features were also possible in this area. They included cliffs, caves, snags/logs and talus.

While conducting biological surveys of the project areas, habitats that were not part of the PHS database were mapped when encountered and when feasible to map. Both terrestrial and aquatic (wetland, instream) habitat types were mapped. Terrestrial habitats mapped within the Bumping study area included cliff, talus and aspen. Within the project area, there are some small groves of old-growth/mature forest habitat. Generally the patches were estimated at a couple of acres or less. While these areas were noted, they were not mapped due to their overall small size and the inability to separate these small groves from the surrounding well-developed sub-mature forest habitat. No caves were encountered in the project area. While individual large (>20" dbh) snags and some large logs were encountered throughout the project area, there were no areas where these featured were determined to be abundant though that terminology is somewhat subjective. All habitats that were digitized were submitted to Terry Johnson, WDFW, who manages the PHS habitat layers.

Wetlands

Potential wetland areas were observed while doing habitat and species surveys during the fall of 2014. The National Wetland Inventory (NWI, 2014) was consulted in order in order to ascertain what wetlands were already mapped. Areas that were not accounted for by NWI were visited during the fall of 2014 to determine if they exhibited plant community, soil and hydrology wetland indicators according to the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coasts Region (Version 2.0)* (USACE, 2010).

Wetlands were visited on October 28th and November 14th. During field visits, smaller wetland areas were sketched and waypoints were taken at either end of them. Field notes were considered to estimate the size and shape of wetlands. A larger wetland was delineated by recording a GPS track around its edges. Wetlands were delineated in Arc Map 10.1 (ESRI, 2014), using National Agriculture Imagery Program (NAIP) 1-meter color orthoimagery (USDA, 2013), mapped at a resolution of 1:1000. These wetlands were small palustrine wetlands that are difficult to locate via remote sensing/orthoimagery, as was done through NWI. It is possible/likely that other such wetlands exist within the project area and are not mapped.

Instream Habitats

Instream habitats throughout the project area were delineated in ArcMap using WDFW's 24k hydrology layer, GPS tracks recorded by field personnel, and the

Department of Natural Resources' on-line Forest Practices Application Review System.

Terrestrial Habitats

Arc Map 10.1 was used to delineate polygons for the terrestrial habitats (ESRI, 2014), specifically aspen, cliff and talus. All habitats were mapped using 2013 NAIP 1-meter imagery; they were mapped at a resolution of 1:1000.

Aspen stands were observed during the fall of 2014. PHS manual stipulates that aspen stands can be mixed with other trees and that they must be at least 1 acre in area (WDFW, 2008). With these considerations, waypoints were taken in the field at the bounds of aspen stands and notes were taken about their shape. Waypoints were overlaid on NAIP 1-meter color orthoimagery (USDA, 2013) and polygons were drawn around the aspen stands.

Cliffs and talus were identified through remote mapping on orthoimagery. Additional notes were taken on these habitats when encountered through field visits. Cliff habitat is defined as cliffs that are greater than 25 feet high and below 5000 feet in elevation. Talus is defined as homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. Talus in the Bumping Lake project area was primarily composed of andesite rock.

Riparian habitat occurs in the project areas but is difficult to map, particularly in areas of forest where the floodplain is often not well defined in aerial imagery or on the ground. Riparian habitat is assumed to occur next to streams and lakes. In this document, WDFW and USFS recommendations for riparian habitats were used for recommendations later in the discussion section to minimize impacts to riparian habitat.

2.2 Listed and PHS wildlife species impacted

Listed and PHS wildlife species were surveyed using a combination of field surveys and comprehensive database searches from WDFW databases and outside sources. WDFW databases include querying existing PHS occurrences, and interviewing agency staff who might have knowledge and records for the area. Agency staff were able to provide knowledge if target species have been documented in the area or not. Outside sources for wildlife information in the Bumping Lake area included United States Fish and Wildlife Service (USFWS), United States Forest Service (USFS), and Cascades Carnivore Project. For birds, a citizen science project database, eBird, was also consulted for species occurrences in the project area (eBird, 2015).

Documentation of PHS Occurrences

All vertebrate species identified were recorded and compiled for a comprehensive species list. When target species were encountered and the observation met PHS recording requirements, staff filled out a PHS wildlife observation form and submitted it to WDFW Wildlife Diversity Program. Staff used the PHS manual (WDFW, 2008) as guidance as to what to record.

2.3 Northern Spotted Owl Impacts

2.3.1 Habitat mapping

Northern Spotted Owl (*Strix occidentalis caurina*) (NSPO) habitat was identified and digitized for the proposed enlargement of Bumping Reservoir (i.e. project area) using the following methodology prior to initiation of ground truth of mapping efforts. Habitat polygons were generated using ArcMap 10.1 (ESRI 2014) and 2011 NAIP 1-meter color Orthoimagery (USDA, 2011) in conjunction with Google Maps Aerial imagery (Google Maps, 2015). Using this imagery, habitat was digitized based upon the aerial signatures of the forest which considered canopy cover, stand density, and perceived forest species composition. Relatively homogeneous forest stands were mapped as individual polygons in an attempt to accurately characterize the NSPO habitat. All areas of the project area were mapped and cross-referenced against other previous mapping efforts of the area including NSPO habitat mapping by the Naches District Office of the United States Forest Service (USFS) Okanogan-Wenatchee National Forest (USFS, 1991).

Once this initial phase of approximations and comparisons were concluded, Washington Department of Fish and Wildlife (WDFW) Yakima Basin Integrated Plan (YBIP) biologists familiar with Northern spotted owl habitat qualities made field visits to the project area between late September and early November 2014 to ground truth the NSPO habitat maps and the associated habitat polygons generated from digitizing. Staff preformed walking inspections through the mapped forest polygons to compare digital mapping signatures with collected forest metrics. All visits to polygons were visual inspections and performed by staff familiar with Northern spotted owl habitat, but formal forest plots were not established due to lack of time.

Comparisons were made based on the forest metrics of the individual stands. Metrics that were considered included canopy cover, diameter at breast height (DBH), number of forest layers, stand species composition, snag and large woody debris presence, mistletoe infection (or other indications of decadence and forest disease presence). Within each stand or homogenous polygon, photos of habitat were taken to help supplement the forest metrics, as well as Global Positioning System (GPS) waypoints to give precise information of location. Occasionally the GPS was used to mark edges of homogenous stands to facilitate the delineation of polygon boundaries. Using the forest metrics, stand photos, and GPS information the initial polygons generated were refined to more accurately represent the forest habitat. In refining the data aerial signatures became apparent, large stands of lodgepole pine were readily apparent from aerial imagery, which was confirmed during the ground truth process. Additionally, the location of local infrastructure (e.g. campground, marina, private cabins) was also confirmed during the ground truth process.

When all mapped polygons had been visited, biologists applied the information collected to begin the revision process. Using GPS data, collected photos, and Washington State's 2011 Statewide NAIP 1-meter Color Orthoimagery (USDA, 2011) the habitat polygons were refined until they accurately represented the terrestrial landscape. To help define the character of the terrestrial habitat and its role in Northern Spotted Owl's lifecycle, USFWS definitions of NSPO habitat and use as

defined in the critical habitat rule were applied (USFWS, 2012b). Based on the definitions supplied by the USFWS, four habitat types were determined to be applicable to the project area. The four habitat types applied to the project area include suitable, dispersal, unsuitable, and non-habitat (United States Department of the Interior and USFWS, 2012). Metrics were summarized from the 2012 critical habitat rule. Metrics were also reviewed and clarified with conversations with local USFWS staff (Krupka, 2014). The following is a description of the habitat types and the metrics that define them:

- **Suitable** habitat type is distinguished by a mature characteristic with >40% fir trees, >60% canopy closure, an average DBH >20 inches, a multi layered stand, abundant downed woody debris, and 2-3 snags per acre. Habitat meeting this definition facilitates nesting, roosting, and foraging. These three behaviors are integral to population recovery as well as persistence of the species.
- **Dispersal** habitat type is defined by a mixed conifer species composition, >40% Fir trees, having >40% canopy cover, an average DBH >11 inches, and downed woody debris. Habitat of this character facilitates the foraging of food while offering protection from avian predators.
- **Unsuitable** habitat type is unable to meet spotted owl habitat criteria due to historical or landscape context. Some examples of historical and landscape context limiting the composition of the forest are fire, disease, and management activities such as logging. Unsuitable habitat currently is not classified as meeting habitat criteria but has the ecological suitability to regenerate into habitat barring management, such as development, that could move it from unsuitable to non-habitat. Unsuitable habitat is defined by having <40% Fir trees and of an overall younger age composition.
- **Non-habitat** type represents landscapes that are not capable of becoming Spotted Owl habitat. Some examples of these landscapes are Bumping Lake and its regular high water level, non-forested wetlands or wetlands dominated by hardwood forest, talus, and large forest openings (meadows). These landscapes will never constitute usable NSPO habitat without major changes.

A fifth category was defined in the mapping: those habitats that were borderline dispersal and suitable habitats. These stands exhibited some characteristics of suitable habitat but other aspects such as DBH or snags fell just below the metrics described for suitable based on the walk-throughs conducted by staff. Formal forest assessment plots should be conducted for these borderline areas if there is desire to place them in the correct category.

Mapping these individual polygons helped to delineate changes in stand metrics as well as serving as a baseline for generating further intensive forest metrics if desired. Each homogenous stand or polygon was mapped to a minimum size of one acre, if the stand was smaller than an acre it was included in an adjacent representative polygon. Additionally, areas of development where forest components were still present (forest service roads, forest cabins) were also included in adjacent representative polygons. Within ArcGIS (ESRI, 2014) an attribute table is associated with all the forest polygons, the attribute table is populated with all the forest metrics collected and personal descriptive notes. Finally, the polygons that comprise the project area were clipped to the size of the inundation area (as defined by files received from the Bureau of Reclamation in September 2014) plus 50 yards past the

proposed high water elevation. The additional 50 yards were included to allow changes to the forest that might be above the proposed high water level, but within a riparian and/or littoral zone created by the new reservoir level. The additional buffer was also a response to indications from Bureau of Reclamation staff (Young, 2014) that updates in topography using new LiDar data might result in small shifts to the spatial display of the inundation line. Two proposed dam locations are being considered; refer to Section 1.1 for specifics on locations. Acres impacted were calculated for both proposed inundation areas. The shapefile of mapped habitats is stored in WDFW files and would be available upon request to those parties needing to work on it as further information regarding Bumping Lake project becomes available in the future.

2.3.2 Species occurrence

USFS and WDFW databases were queried for historic activity circles within the project area. In addition to historic activity areas, databases were checked for years of occupancy. These database searches will help to guide what areas should be checked in the future for northern spotted owl occupancy and if there are currently northern spotted owls residing in the project area. For this report, no occupancy surveys were conducted. Only a habitat analysis was completed. The habitat analysis methods are outlined in Section 2.3.1.

2.4 Bull trout Impacts

Impacts to bull trout and their habitat are expected to occur in Deep Creek (their spawning tributary), other fish-bearing tributaries to the lake, and in the inundated portion of the Bumping River below the existing dam. The inundation of these areas will effect spawning, rearing, and prey base. Additional impacts are likely to come from the inundation of terrestrial habitat by the enlarged reservoir and the flow regime changes below the reservoir that will impact the Bumping and Naches Rivers. These changes will result in impacts to lake and stream productivity as well as riparian and ecosystem function.

As water levels in Bumping Reservoir are raised each year to the proposed 3,490-ft elevation, we expect to see stream sediments deposited into the lower end of all tributaries within the expanded inundation area, including Deep Creek. The inundation of Deep Creek and increased distribution of deposited material is expected to be problematic for bull trout passage and rearing. These types of problems are similar to what we see in other areas of the basin where large water storage reservoirs have inundated bull trout spawning streams such as Box Canyon Creek, Gold Creek, and Indian Creek. Other impacts include reduced riparian cover along stream banks within the proposed inundation zone, unconsolidated and extremely permeable streambed sediments, excess fine sediment within the stream channel, and increased channel meandering through the alluvial fan. Existing spawning habitat in Deep Creek through this zone will no longer be suitable for spawning and migration. Specifically, in years when lake levels and/or natural stream flows are low, the bedload composition and distribution resulting from the inundation will likely create conditions that cause streamflow to spread out or go subsurface as Deep Creek passes through the proposed inundation zone. The lack of

confined flow creates a passage barrier for upstream, and possibly downstream, migrating fish. However, upstream passage from the current reservoir into Deep Creek has not been a problem for bull trout. These impacts, categorized into blocking migrations, reducing stream complexity, increasing water temperature, and reduced historic habitat, are all considered threats to bull trout populations (USFWS 2014).

Even if fish are still able to spawn in the proposed inundation reach, the success of the embryos is not expected to be high because the refill of the lake will likely occur during the egg incubation phase. Inundation of salmonid redds can cause them to be covered in sediment and increase mortality of eggs because of reduced oxygen infiltration to the eggs and reduced waste-product removal (Silver et al. 1963).

We investigated several different types of impacts to bull trout that this inundation might cause. The methods for these investigations follow.

2.4.1 Bull trout snorkel surveys

Some tributaries to Bumping Reservoir have the potential to provide rearing habitat for bull trout. However, regular surveys for juvenile or sub-adult bull trout have not been performed in tributaries to Bumping Reservoir. To quantify the potential impacts to rearing bull trout, we wanted to determine what tributaries, if any, are currently providing rearing habitat. We snorkeled several tributaries to the existing Bumping Reservoir as well as some tributaries presently downstream of the Bumping Dam that would be inundated by the proposed Bumping Dam. We snorkeled all tributaries with sufficient flow that had stream temperatures less than or equal to 12°C to support rearing (USFWS 2014). Other sources report 15°C as a barrier to bull trout distribution, but we chose 12°C as a more realistic temperature for bull trout and to focus on streams where they are most likely to occur.

Surveys were conducted at night by snorkeling from the mouth of the tributary and working upstream using underwater dive lights to scan continuously all likely habitat that a bull trout at any life history stage would use. For this assessment, the goal was to survey those portions of the tributaries that would be inundated by the proposed Bumping enlargement. The habitat above the inundation line in certain streams would be surveyed in the future. Streams were intended to be surveyed when very good survey conditions existed, such as low base flows that allow for fewer places to look and sufficient water for rearing; and minimal turbidity that provides the best opportunity to detect fish. Future surveys could be performed at different times of year to maximize the detection of bull trout using streams at different temperatures and flow. Stream temperature was recorded at the beginning of each survey at a location that characterized the stream without any influence of lake water. Significant cascades and culverts encountered were also noted and their location marked.

Two other calculations were performed to assess habitat impacts. The total number of fish-bearing stream miles that would be inundated was calculated to estimate the number of miles of habitat that would eventually be unsuitable for bull trout and other stream-dwelling fish after the proposed Bumping Reservoir expansion.

Specifically, this includes the length of a stream from the point that it intersects the existing maximum pool elevation to the proposed maximum pool elevation. The proposed maximum pool elevation is that which is created by the furthest downstream dam location (larger pool option). The total number of miles of stream above the proposed inundation line was also calculated to estimate the remaining potential habitat available after the proposed Bumping Reservoir expansion. These stream lengths include major side channels that appear on the topographic maps available through Environmental Systems Research Institute ArcGIS online.

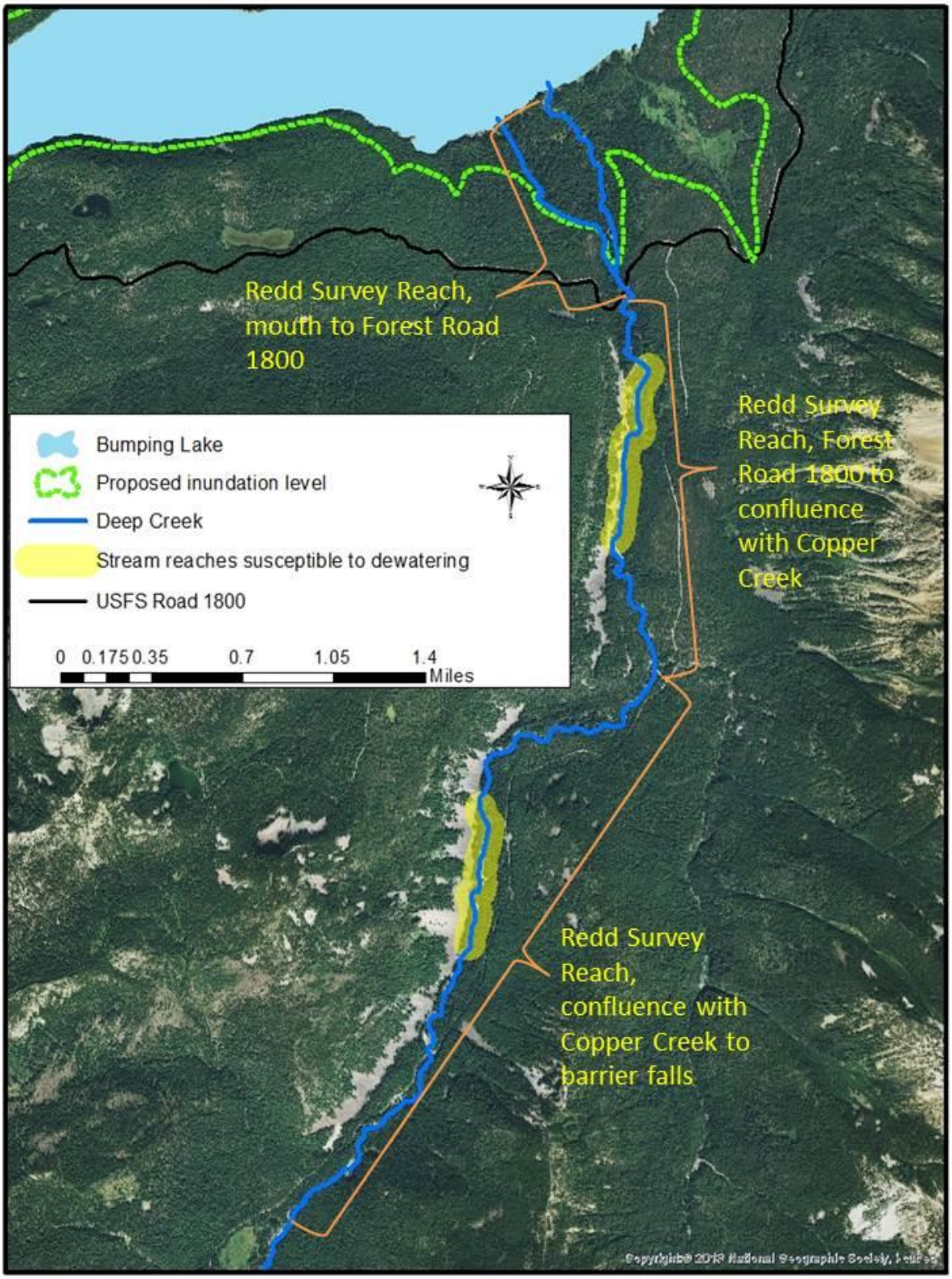
Two exceptions to this method are the natural waterfalls on the Upper Bumping River about 1 stream-mile above the lake and on Deep Creek 5.6 miles above the lake. No stream length upstream of these barriers were considered in this "remaining habitat" calculation because habitat above it is not currently available to fish that inhabit the Bumping Reservoir or the lowest reaches of those streams. The natural ~5-ft cascade on Cedar Creek 0.5 miles (0.8 km) upstream of its mouth (Appendix D, Picture 27) was not considered a year-round fish passage barrier, and the culvert that passes Granite Creek under Forest Road 1800 (Appendix D, Picture 28) was not considered a permanent fish passage barrier because it is possible to correct that barrier. Thus, the habitat above these two features is included in the "remaining habitat" calculation.

Dewatered areas, such as those found on Boulder Creek and Granite Creek were not treated as year-round barriers since fish are able to use those dewatered areas and the stream above them at certain times of the year. It is not known if the passage barrier at the mouth of the unnamed tributary just downstream of the Bumping Dam Spillway is a year-round passage barrier to fish or not. The passage issue there seems to be partially man-made and partially natural due to the presence of an abandoned water wheel and a natural cascade (Appendix D, Pictures 25 and 26) and so it is difficult to apply fish passage assessment guidelines. Until further assessment, this stream is included in the calculation of suitable habitat inundated by the proposed reservoir expansion. To determine if a stream was fish-bearing we used the Department of Natural Resources' on-line Forest Practices Application Review System (FPARS) (Washington State Department of Natural Resources, 2014) in conjunction with field observations of fish from snorkel surveys. When determining stream habitat length within the proposed inundation zone any major side channels or forks in the river (such as those on Deep Creek, and Upper and Lower Bumping River) were included in the stream length calculation.

2.4.2 Bull trout redd inundation prediction

To estimate the percent of redds that could be impacted by the inundation, the bull trout spawning survey notes from 1991 to 2014 were analyzed to enumerate the number of redds found in each of three reaches of Deep Creek. 1991 was the first year that complete redd surveys for bull trout started. The first reach, beginning at the confluence of Deep Creek and the lake and extending upstream to Forest Road 1800 (see Figure 1), is similar to the proposed inundation zone of an expanded Bumping Lake (elevation 3490 ft) and closely represents the number of redds that would be impacted by the inundation. However, because the inundation line is

Figure 1. Deep Creek redd survey reaches relative to the proposed new lake elevation and areas that can de-water.



approximately 150 meters (0.1 miles) downstream of Forest Road (FR) 1800, using the number of redds from this surveyed reach overestimates the true number of inundated redds. We know this because in most years redds are observed in this 150-meter reach between the proposed inundation line and the FR 1800. These redds will not be inundated by the proposed enlargement of the reservoir. Therefore, this estimate is further refined by using locations of bull trout redds marked in 1996, 2009, and 2013 to provide an estimate of the number of redds between the mouth of Deep Creek to the proposed inundation line and between the proposed inundation line to FR 1800. This ArcGIS exercise provided a ratio that could be applied to the true number of redds observed in all years within this most downstream surveyed reach that would allow a more accurate estimate of the number of redds expected to be impacted by the additional inundation. This modeling exercise assumes that 1996, 2009, and 2013 represent a normal distribution of redds throughout the entire 1991 to 2014 study period. This assumption is discussed in the results section (3.0).

Many years of observations of spawning bull trout in Deep Creek have shown that there are two areas of Deep Creek where flow often goes subsurface and a passage barrier for upstream-migrating bull trout results. One of these dewatering areas occurs 2.4 km (1.5 miles) above the mouth of Deep Creek (approximately 0.5 mi above FR 1800) and the other occurs about 1.6 km (1 mile) above the confluence of Copper Creek with Deep Creek (Figure 1). The reach below FR 1800 has never been observed to go dry. We hypothesize that, in years where these de-watering passage barriers form for the majority of the bull trout migration and spawning period, the distribution of redds may be skewed to reaches downstream of these dry areas, including the proposed inundation zone. If this was true, and predictions are correct that lower stream flows caused by climate change could occur in the future, more redds could be inundated than predicted using present-day redd distributions.

To test this hypothesis, the calculated inflow to Bumping Reservoir was used as a surrogate to Deep Creek flow and those flows were compared to the number of redds observed within the proposed new inundation zone. We used the average daily flow over the period August to September because this is the time period when bull trout redds are created. This daily calculated inflow is available from Reclamation's Hydromet system and is a measure of the total flow of all tributaries into Bumping Reservoir on a daily basis. This provides a relative measure of Deep Creek flow that allows comparisons between years, but not a comparison of true discharge in the stream. While this flow is an overestimate of the flow in Deep Creek, it does provide an approximation of the magnitude of Deep Creek flow. This method assumes that streams flowing into Bumping Reservoir rise and fall proportionally to one another. This estimate of relative flow in Deep Creek was compared to the percentage of redds inundated by the proposed Bumping enlargement to determine if there was a relationship between distribution of redds and flow. Though there is a gaging station known as Deep Creek below Copper Creek on Reclamation's Hydromet system, the station records gage height only and frequently data is missing from the period we are studying.

Survey forms for the period 1991 to 2014 were investigated to determine timing, duration, and geographical extent of dewatered areas. These data were analyzed to determine if more bull trout redds occur in the proposed inundation zone in years where dewatered areas persist for longer periods of time. Alternately, the reverse might also be true: in years where dewatering does not occur, more redds might be constructed in the two upper surveyed reaches. Therefore, years where some or all reaches of Deep Creek did not dewater were analyzed to determine if an effect of flow on redd distribution could be quantified. This information would also provide evidence of the validity of the flow versus redd distribution analysis described above.

2.4.3 Lower Bumping River bull trout habitat assessment

The proposed location of the new Bumping Dam will inundate riverine areas presently downstream of the dam and reshape them into a lacustrine environment. These areas currently support a bull trout population. Existing life history knowledge and spatial distribution of bull trout were analyzed to predict impacts to bull trout between the existing and proposed Bumping Dam.

2.5 Steelhead Impact Assessment

The proposed location of the new Bumping Dam will inundate riverine areas presently downstream of the dam and reshape them into a lacustrine environment. These areas currently support steelhead trout. Existing life history knowledge and spatial distribution of steelhead were analyzed to predict impacts to steelhead between the existing and proposed Bumping Dam as well as impacts to steelhead that will be able to move upstream of the new Bumping Dam.

The number of steelhead redds constructed in the Bumping River since 2004 until 2015 (Torretta 2015) were analyzed to determine how many redds on average might not be able to be created once the new Bumping Dam is constructed. The proposed Bumping Dams are both located within the survey reach known as Bumping Dam to Goose Prairie, which is 6 km (3.7 mi) in length. A proportion of the number of redds within that reach, relative to the amount of habitat that would no longer be available post-dam construction, was calculated as an estimate of the amount of spawning habitat that would no longer be available to steelhead (and other species) after the Bumping Reservoir expansion. Approximately 2.4 km (1.5 mi) of the 6-km survey reach would be impacted by the proposed larger pool reservoir and approximately 1.9 km (1.2 mi) of the 6-km survey reach would be impacted by the smaller pool reservoir option (Figure 2).

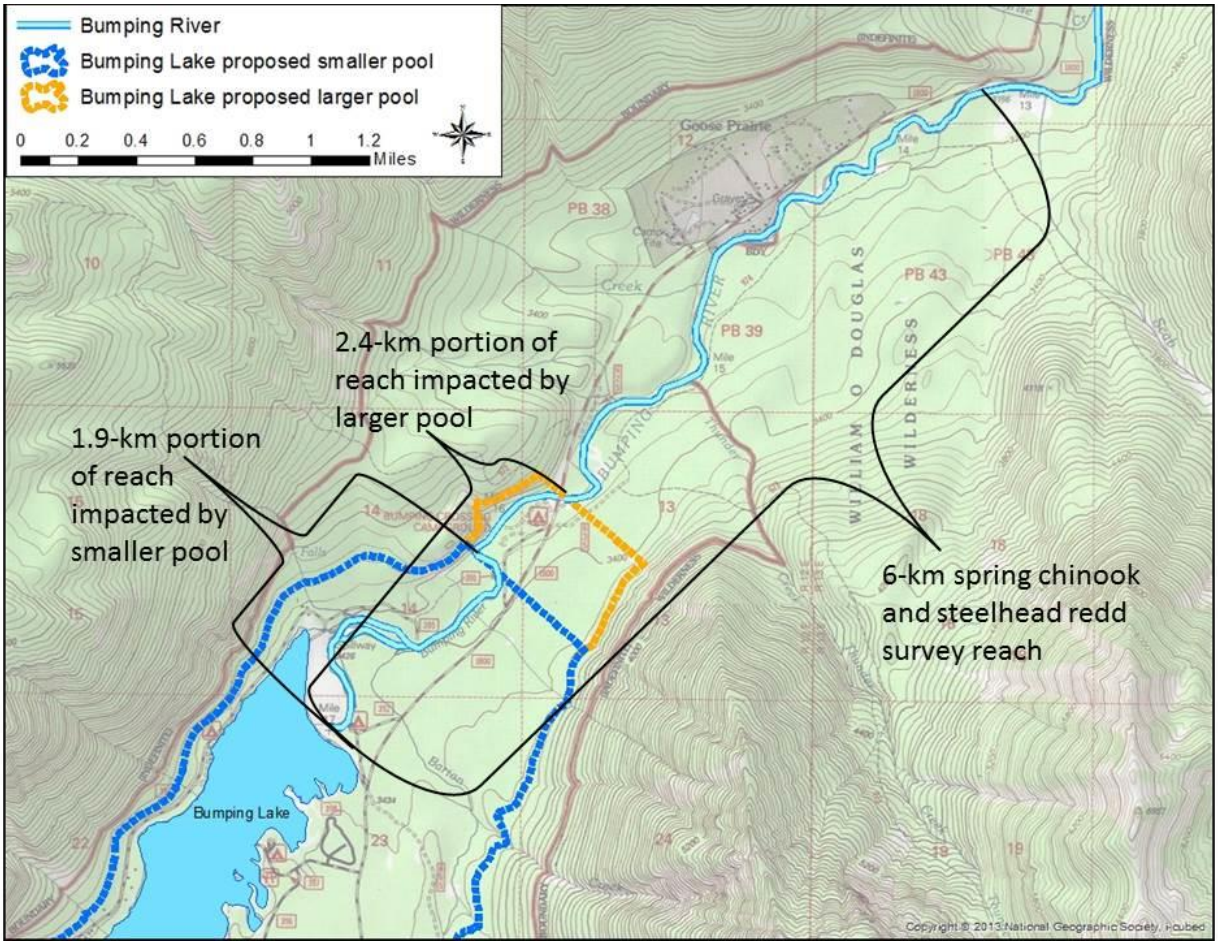
This estimate assumes that the redds observed in the Bumping Dam to Goose Prairie survey reach are evenly distributed. We know that steelhead redd distributions are not typically evenly distributed within a stream as observed by redd distributions in the Bumping River and in other rivers of the Yakima Basin such as the Cle Elum River, Yakima River, and Teanaway River. With that in mind, GPS data from 2004, 2005, and 2006 was used to qualify these results. For this analysis, the length of the stream reaches do not include side channel habitat since the total length of the survey reach was not assessed for side channel habitat.

We also assessed impacts to steelhead that will be able to move upstream of the new Bumping Dam assuming construction of the new dam will include fish passage.

2.6 Chinook Impact Assessment

The proposed location of the new Bumping Dam will inundate riverine areas presently downstream of the dam and transform them into a lacustrine environment. These areas currently support a chinook salmon population. Existing life history knowledge and spatial distribution of chinook salmon redds were analyzed to predict impacts to chinook spawning areas between the existing and proposed Bumping Dams.

Figure 2. Spring chinook and steelhead redd survey reach from Bumping Dam to Goose Prairie and portions of that reach impacted by the proposed enlarged pools.



The number of redds constructed in the Bumping River since 1988 until 2014 were analyzed to determine how many redds on average might not be able to be created once the new Bumping Dam is constructed. The proposed Bumping Dams are both located within the survey reach known as Bumping Dam to Goose Prairie, which is 6 km (3.7 mi). A proportion of the number of redds within that reach, relative to the amount of habitat that would no longer be available post-dam construction, was calculated as an estimate of the amount of spawning habitat that would no longer be

available to steelhead (and other species) after the Bumping Reservoir expansion. Approximately 2.4 km (1.5 mi) of the 6-km survey reach would be impacted by the proposed larger pool reservoir and approximately 1.9 km (1.2 mi) of the 6-km survey reach would be impacted by the smaller pool reservoir option (Figure 2).

This estimate assumes that the redds observed in the Bumping Dam to Goose Prairie survey reach are evenly distributed. We know that spring chinook redd distributions are not typically evenly distributed within a stream as observed by redd distributions in other rivers of the Yakima Basin such as the Cle Elum River, Yakima River, and Teanaway River. However, until spring chinook redds on the Bumping River are mapped over several years, a more detailed analysis of redd impacts will not be possible. With that in mind, the number of redds per kilometer observed on average in this reach was calculated and prorated to the length of the impacted stream reaches for both large and small reservoir pools. For this analysis, the length of the stream reaches do not include side channel habitat since the total length of the survey reach was not assessed for side channel habitat.

We also assessed impacts to spring chinook that will be able to move upstream of the new Bumping Dam assuming construction of the new dam will include fish passage.

2.7 Rare Plants

2.7.1 Oregon Goldenaster Surveys

Oregon goldenaster (Washington Threatened) occurs on sand and gravel bars along rivers and streams. The identification period for the species is June through September. Biologists identified potential habitat for this species occurrence in Bumping River above the reservoir and below the dam within the proposed inundation zone. Suitable habitat was also assessed immediately below the proposed new dams on Bumping River as larger increased flows might have an impact on the species. One small area of potential habitat was identified in Deep Creek just below the inundation zone. Biologists digitized these habitat areas, loaded them into GPS units, and searched for the species presence from August 27-29th, 2014.

2.7.2 WNHP Database Searches

Washington Natural Heritage Program (WNHP) databases and species fact sheets were queried to determine a potential list of federal and Washington State listed plants that might occur within the Bumping project area. Species were included as potential species of occurrence if they were found in the general region and habitat type occurred in the Bumping project area; upper Yakima County or southeastern Kittitas County. Species habitat association was derived from species fact sheets generated by the WNHP (WNHP, 2015).

3.0 Results

3.1 PHS habitats

In the project area, cliff habitat, talus and wetland PHS habitat was identified and mapped. Aspen habitat consisted of two small groves that were mapped by biologists

for this report. These groves still have value to wildlife species, but of size (less than an acre in size) not to be considered a PHS habitat according to guidelines, however this is relatively typical for most aspen groves in central eastern Washington (WDFW, 2008). In addition to the small aspen groves, 18 areas of talus habitat were mapped and one occurrence of cliff habitat was mapped for this report. Terrestrial habitats are shown on Figure 3. Representative photos of impacted habitats are shown in Appendix A.

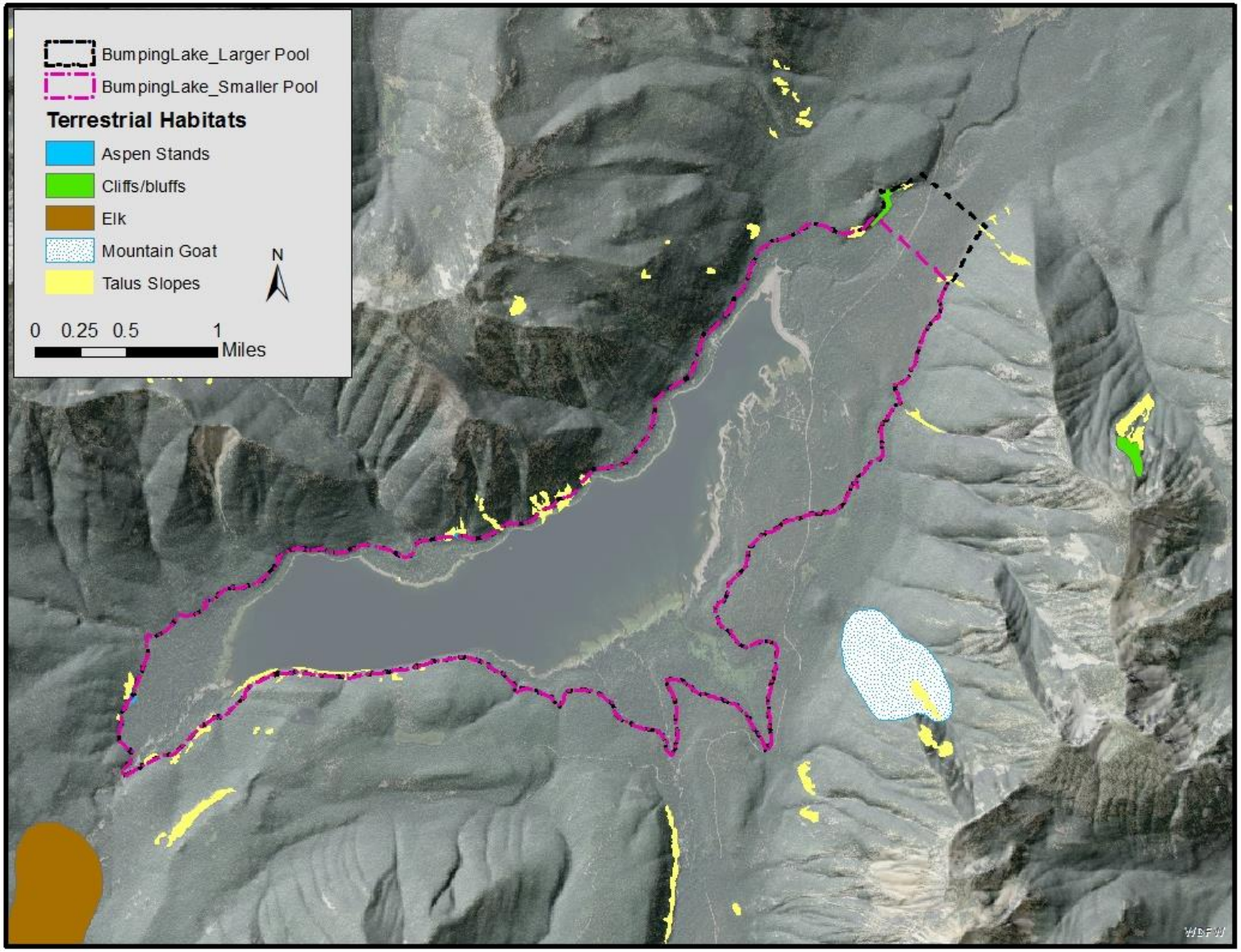
Mature forest areas were identified in the project area, but are generally included in the calculations of suitable habitat for northern spotted owl nesting, roosting and foraging habitat. Refer to Section 3.3.1 for details on that forested habitat. Small groves of what appear to be old-growth habitat (habitat that is generally unaltered by humans and at least 150 years of age) were found within the mature and sub-mature habitat patches. These groves were difficult to separate from the mature and sub-mature surrounding forest and thus their boundaries were not mapped. Two areas were these groves were noted were southeast of the current Bumping Dam near the proposed inundation area and in the northwest corner of Bumping Lake. Some remnant trees showing characteristics of old-growth trees were noted in several areas including the Deep Creek area, downstream from the current dam and in the southwest corner of the lake. However, forests in these areas were clearly altered from human activities in the past and were less than 150 years old with the exception of these remnant trees. These remnant trees were isolated within the stand and did not seem to be clustered such as a grove.

Forest impacts at Bumping Lake are substantial under the proposed reservoir plans. While much of the forest is not mature or old-growth forest, the habitat is generally a mid-elevation wet/cool mixed conifer forest. Due to past forest history such as fire, harvest or disease the forest is in various states of regeneration and much of the forest is not currently at or near climax condition in terms of plant associations. Using the same 50 meter buffer as was applied to the owl mapping effort, there are 2,212 acres of mixed conifer forest habitat that would be inundated or altered under the larger pool option and 2,057 acres that would be inundated or altered under the small pool option.

Forest types consist of a range from young regenerating forest that is currently dominated by small lodgepole pine forest to forests where Douglas fir, western hemlock, western red cedar and Engelmann spruce are the dominant trees. Though the habitat impacts for northern spotted owl are well discussed later in this report, a variety of bird, mammal, herptile and invertebrate species use these forests and it is important to consider impacts that inundation of such a large forested area would do to these species as well. Some are PHS or listed species covered in this report, but many are common species that are not listed or on the WDFW PHS list but still play important roles in the ecosystem of the Bumping Lake area.

Five occurrences of wetlands were mapped for this report, two in the reservoir expansion area and three just outside of the area. They are classified as palustrine (four occurrences) and riverine wetlands (one occurrence). These wetland areas were mapped as they were incidentally discovered while conducting fish and wildlife

Figure 3. PHS terrestrial habitats within the Bumping Reservoir proposed expansion



habitat surveys. They were mapped by a WDFW biologist with training in wetland delineation through the Washington State Department of Ecology. Existing wetlands under NWI were not delineated in the field, but were referenced for this report. Wetland habitats are shown on Figure 4. NWI lists codes for these wetlands based upon the Cowardin system of wetland rating (Cowardin et al., 1979). Most of these NWI wetland areas have not been ground truthed, so some of these classifications could be in error. These newly mapped occurrences were submitted to Terry Johnson (WDFW) for inclusion into WDFW PHS habitat databases.

Table 1 shows acres of different habitat types impacted within the current reservoir expansion area. Acres of impacted habitat are listed for both the larger proposed reservoir option and a small reservoir option. It should be noted that the reservoir expansion areas were based upon files given to WDFW by Bureau of Reclamation in September 2014 and could change slightly based upon new LiDar data acquired in the fall of 2014. Wetlands listed are palustrine and riverine wetlands for impacts. Lacustrine and littoral wetlands are not listed. Lacustrine and littoral wetlands could be impacted by expansion of the reservoir, especially areas currently having aquatic vegetation as the lake level will be raised an estimated 64 feet at full pool (from the current 3426 ft. elevation to 3490 ft. elevation).

In addition to terrestrial habitat types, upper Bumping River is mapped as elk migration area and Nelson Ridge south of Bumping Reservoir are mapped as mountain goat habitat.

3.2 Listed and PHS wildlife species impacted

Database searches and observations collected while conducting fish and wildlife habitat surveys were compiled to assess species use by listed and PHS wildlife species of the project area. Some of the locations, such as northern spotted owl, wolverine and fisher locations are considered sensitive locations and their precise location should not be shown on public figures. WDFW policy 5210 is to project the resolution of these locations to a wider precision, often a township (WDFW 2011). This sensitive data may not be presented on maps at a finer resolution produced by WDFW unless the other party has signed a release agreement, agreeing to the provisions in policy 5210. Department of Ecology does have a signed agreement with GIS staff in Olympia and can access the raw data through that resource or work with WDFW on specific questions regarding locations of sensitive data. This sensitive data will not be shown in this public report. Examples of this sensitive data that may occur in this area include northern spotted owl, gray wolf, wolverine and fisher locations and bat hibernacula.

Figure 5 displays non-sensitive wildlife sightings. Table 2 discusses the documented occurrence or probable occurrence of each listed or PHS species that was believed to have potential to occur in the larger area. Species listed in Table 2 are species believed to have potential for occurrence in the project area. Species that are likely to be impacted by the project are listed in Section 4.2 along with management recommendations. All fish and wildlife species recorded are listed in Appendix E.

Figure 4. Wetland habitats within the Bumping Reservoir proposed expansion area

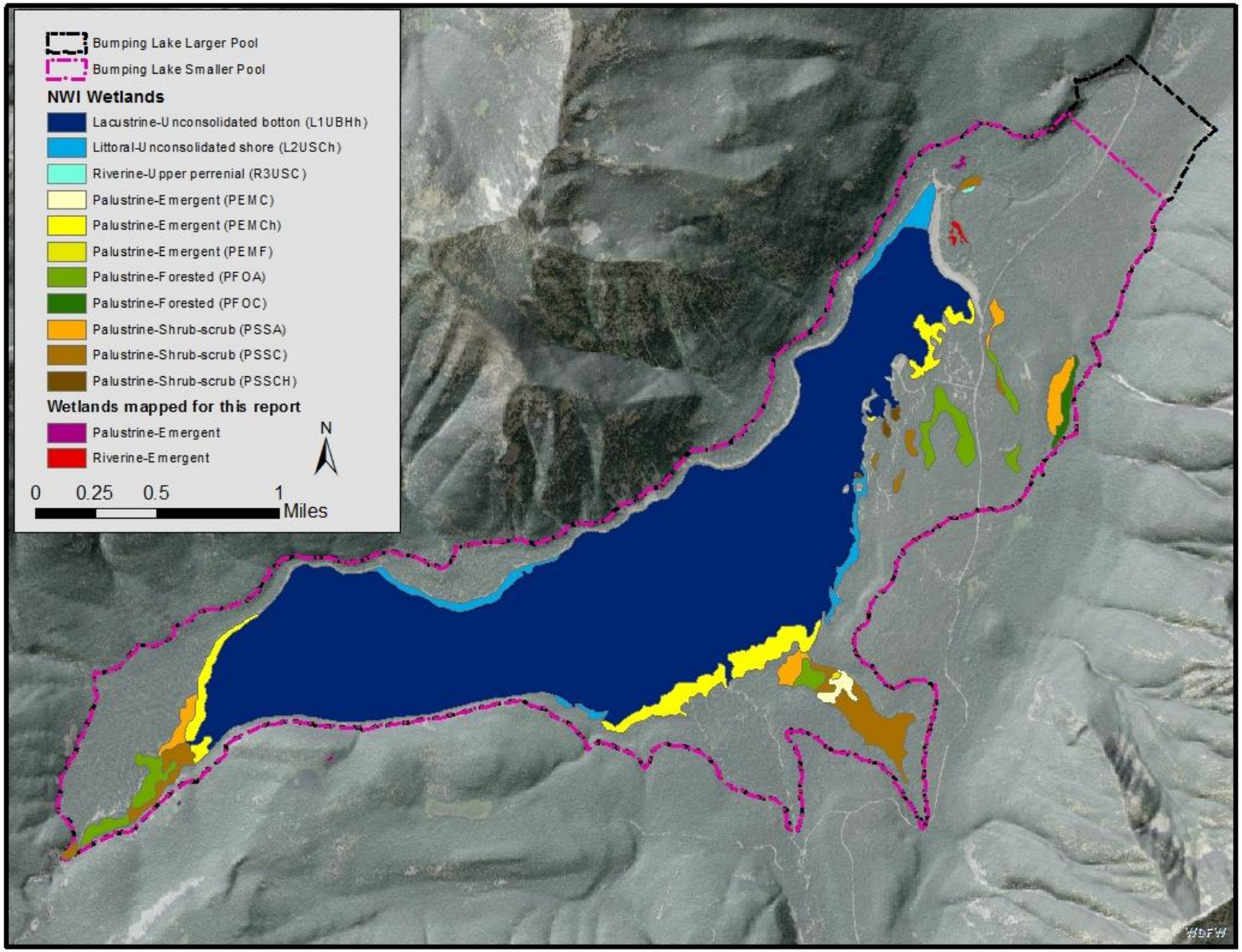


Table 1. Acres and number of habitat features by habitat type within the proposed Bumping Reservoir expansion zone.

Habitat Type	Larger pool option		Smaller pool option	
	Impacted Habitat (Acres)	Number of habitat features impacted	Impacted Habitat (Acres)	Number of habitat features impacted
Wetlands[1]	228.6	38	228.6	38
Talus	31.5	18	28.5	15
Cliffs	6.3	1	0.7	1
Aspen[2]	0.4	2	0.4	2

[1] Includes riverine and palustrine wetlands. Does not include lacustrine and littoral wetlands (lake wetlands).
[2] Not of size to meet PHS guidelines (less than acre in size)

Documentation of PHS Occurrences

Bumping Reservoir area is well traveled by biologists and recreational users, thus the databases for these areas were fairly complete. However, biologists for this report did document several new PHS occurrences during fish and wildlife habitat surveys for this report. New PHS occurrences documented by the team of biologists associated with this report are:

- Multiple reports of western toad breeding on the shores of the reservoir as evidenced by finding large concentrations of juvenile toads in the edges of the reservoir in late summer (August and September) 2014.
- Three occurrences of black-backed woodpecker pairs, mainly around the current dam area, in areas of lodgepole pine.
- One occurrence of sooty grouse hooting, in mature forest below the dam, within the reservoir expansion area.

3.2.1 Larch Mountain Salamander Habitat

The species is known to use forested talus slopes. The species has been documented in Clark, Cowlitz, Skamania, Lewis, King, Pierce, Klickitat, and Kittitas counties, but not Yakima County (Crisafulli et al., 2008). Habitat similar to where they have been found in Kittitas County was found around Bumping Reservoir. Habitat consisted of cool, moss covered talus in forest openings. Habitat locations believed to have the possibility for occupancy were marked with a GPS and are shown on Figure 6. These habitat locations should be surveyed to protocol for this species (Crisafulli, 1999) in the future prior to an Environmental Impact Statement (EIS) being developed. Representative photos of habitat locations are shown in Appendix B.

3.3 Northern Spotted Owl

3.3.1 Habitat mapping

Northern spotted owl habitat was mapped according to USFWS critical habitat categories (USFWS, 2012b). In addition to the four categories outlined by the USFWS (suitable, dispersal, unsuitable and non-habitat) a fifth category was outlined in the methods. These are habitat areas that are borderline in our assessment between dispersal and suitable habitat. Our assessment consisted of ground truth methods of mapped polygons, thus some metrics such as DBH and snags per acre

Figure 5. Locations of non-sensitive PHS wildlife occurrences in or near the Bumping Reservoir expansion

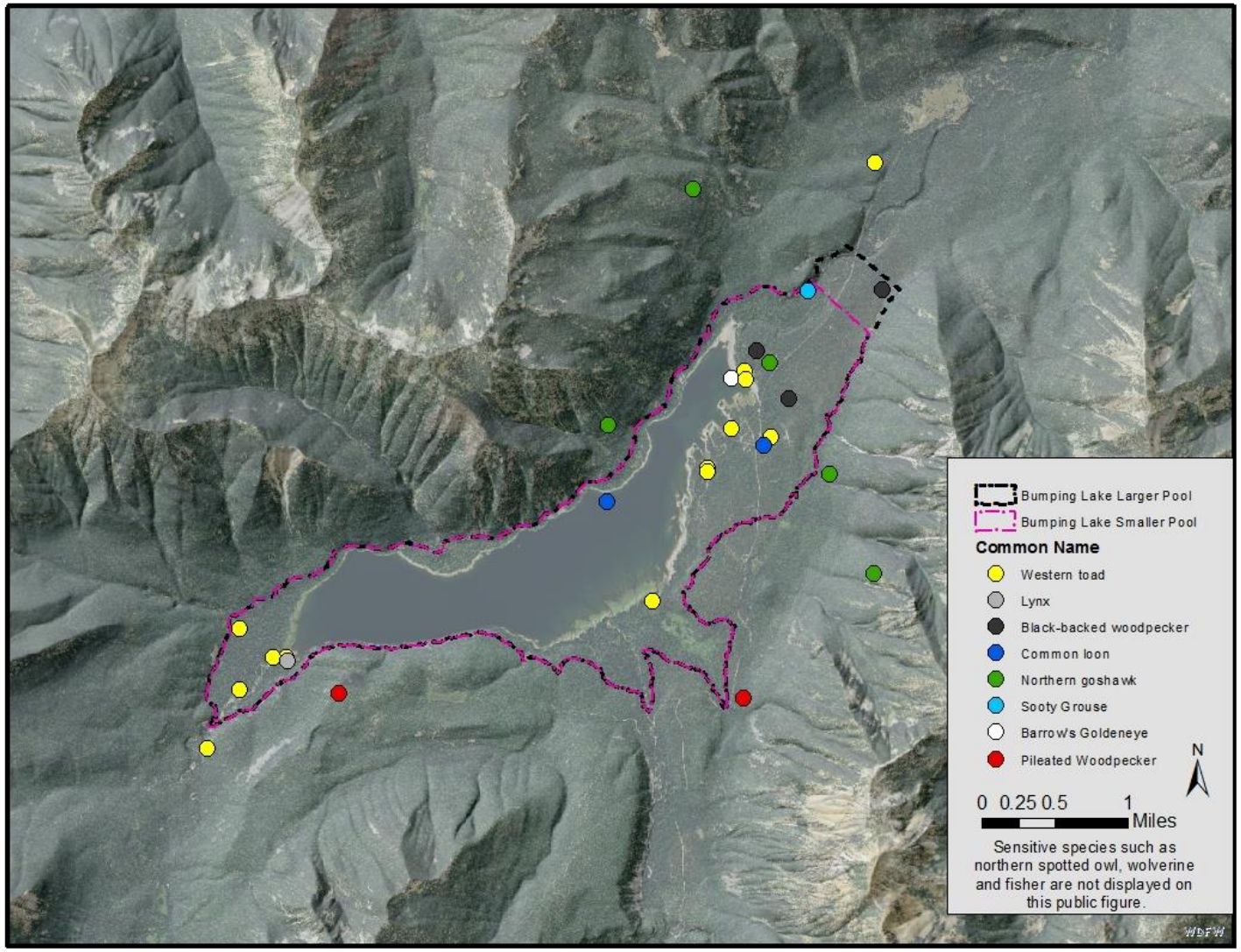


Table 2. Listed and WDFW PHS species of documented or potential occurrence in the Bumping Lake project area.

Common Name	Federal Status [1]	WA State Status [2]	Potential for Occurrence on or near to the Project Areas and Associated Habitat 4 for the Species D=Documented On-site, N=Not Documented On-site, U=Undetermined occupancy in the project area
Butterflies			
Mardon Skipper	FCo	SE	N=Species is not recorded from the Bumping Lake area. Nearest populations are around slopes of Mt. Adams. No suitable habitat was found in the project area. Species prefers dry meadows in forests.
Fish			
Mountain Sucker	None	SC	D- species is documented in the Naches River basin, but not necessarily in the Bumping Reservoir or Bumping River below the dam.
Bull trout	FT	SC	D- species is documented both upstream and downstream of the dam. Negative impacts to this species will take the form of spawning and rearing habitat inundation by the new dam, and possibly changes in lake productivity. Positive impacts assuming upstream fish passage will be incorporated into the new dam are likely for the population presently downstream of the dam as well as the isolated population above the existing dam.
Chinook Salmon	None	SC	D- species is documented downstream of Bumping Dam. Negative impacts to this species will be limited to areas below the dam. Positive impacts assuming upstream fish passage will be incorporated into the new dam are likely.
Steelhead	FT	SC	D- Species is documented downstream of Bumping Dam. Negative impacts to this species will be limited to areas below the dam. Positive impacts assuming upstream fish passage will be incorporated into the new dam are likely.
Amphibians			
Larch Mountain Salamander	S&M	SS	N=Species not documented for Yakima County. Similar habitat was found in the project area to what the species has been documented in Kittitas County. See Section 3.3 for results and recommendations for future surveys to look for presence.
Columbia Spotted Frog	None	SC	N=Species is not recorded in the project area or Bumping River watershed. Habitat is aquatic habitats that have permanent water source. Possible habitat occurs in the emergent wetland near Deep Creek.
Western toad	None	SC	D=Species is documented breeding throughout the reservoir edges. Reservoir expansion could have substantial impacts on this species at this site.
Birds			

Common Name	Federal Status [1]	WA State Status [2]	Potential for Occurrence on or near to the Project Areas and Associated Habitat 4 for the Species D=Documented On-site, N=Not Documented On-site, U=Undetermined occupancy in the project area
Great blue heron	None	PHS	N=No breeding colonies are documented in the project area.
Cavity nesting ducks	None	PHS	D=Barrow's goldeneye is recorded as breeding on the reservoir. It is unknown if other cavity nesting species also breed on the lake.
Harlequin duck	None	PHS	D=Species is recorded breeding on the Bumping River. While it is not recorded in the project area, habitat below the current dam is suitable breeding habitat for the species.
Waterfowl concentrations	None	PHS	N=No waterfowl concentrations are documented in the databases nor were any concentrations observed in the area during fall of 2014. Small groups of Canada goose were observed as were small groups of diving and dabbling ducks.
Bald eagle	FCo, EPA	SS	N=Species is observed in the project area occasionally during non-breeding season, but no concentrations of eagles are documented and no breeding sites are documented on the reservoir.
Northern goshawk	FCo	SC	D=Species documented breeding in forests surrounding the reservoir. Species may be impacted by reservoir expansion.
Peregrine falcon	FCo	SS	N=Species not documented breeding in the project area. There is one small cliff in the expansion area, not of suitable size for peregrine falcon nesting.
Sooty grouse	None	PHS	D=Male documented hooting in forested area below the current dam. Species likely uses other areas of the forest for breeding, particularly in more mature forest elements of the project area.
Band-tailed Pigeon	None	PHS	N=Species not documented in the project area. Its occurrence in Yakima County is localized. Species may move through the forested area occasionally during migration.
Flammulated owl	None	SC	N=Species not documented in the project area. Species tends to be associated with more dry forest types than are found in the project area, though the slopes above the reservoir could contain the species as sub-optimal habitat.
Northern spotted owl	FT	SE	D=Species has been documented breeding in the project area and continues to breed in the project area. See Section 3.4.2 for details on species occurrence.
Vaux's swift	None	SC	D=Species prefers more mature forest and uses snags for roosting. Species was observed in areas below the dam during August 2014.

Common Name	Federal Status [1]	WA State Status [2]	Potential for Occurrence on or near to the Project Areas and Associated Habitat 4 for the Species D=Documented On-site, N=Not Documented On-site, U=Undetermined occupancy in the project area
Black-backed woodpecker	None	SC	D=Species was observed in multiple occurrences in the project area. Species was primarily observed in lodgepole pine forest near the current dam area.
White-headed woodpecker	None	SC	D=A single report from eBird in September 1998, likely post-breeding dispersal. Species typically is found in more dry forest types than the wet forest types that occur around Bumping Reservoir.
Pileated woodpecker	None	SC	D=Species is documented in the project area. More mature forested areas would be more suitable habitat for the species.
Mammals			
Roosting Concentrations of Big Brown Bat, Myotis Bats, Pallid Bat	None	PHS	N=No roosts are documented in the project area. A roost is located down Hwy. 410, but is some distance from the project area.
Townsend's big-eared bat	None	SC	N= No roosts are documented in the project area. A roost is located down Hwy. 410, but is some distance from the project area.
Cascade red fox	None	SC	D=Species uses the project area. Multiple occurrences from Cascade carnivore project data (unpublished). Species tends to use more upland habitats than those directly adjacent to the reservoir, but can be found in lower areas occasionally.
Fisher	FC	SE	D=Historic records from the area, particularly headwaters forest area of the upper Bumping River. Reintroduction efforts around Mount Rainer National Park show Bumping Lake as part of the recovery area and habitat models include habitat in the proposed expansion area (Lewis, 2013).
Gray wolf	FE	SE	U=Several unconfirmed occurrences have been reported in the Bumping River watershed during the 1990's from WDFW biologists. No confirmed packs are in the area. Individual wolves can range wide areas and may be likely to use the project area in the future.
Grizzly Bear	FT	SE	N=No documented occurrences in the area. Species is generally believed to not occur south of I-90 in Washington, but future wildlife connectivity at I-90 Snoqualmie Pass may enable the species to range farther south.
Lynx	FT	ST	U=There is an unconfirmed report from Upper Bumping River near the reservoir. Lynx are not believed to be as far south as Bumping Reservoir generally, but a rare individual could range widely.

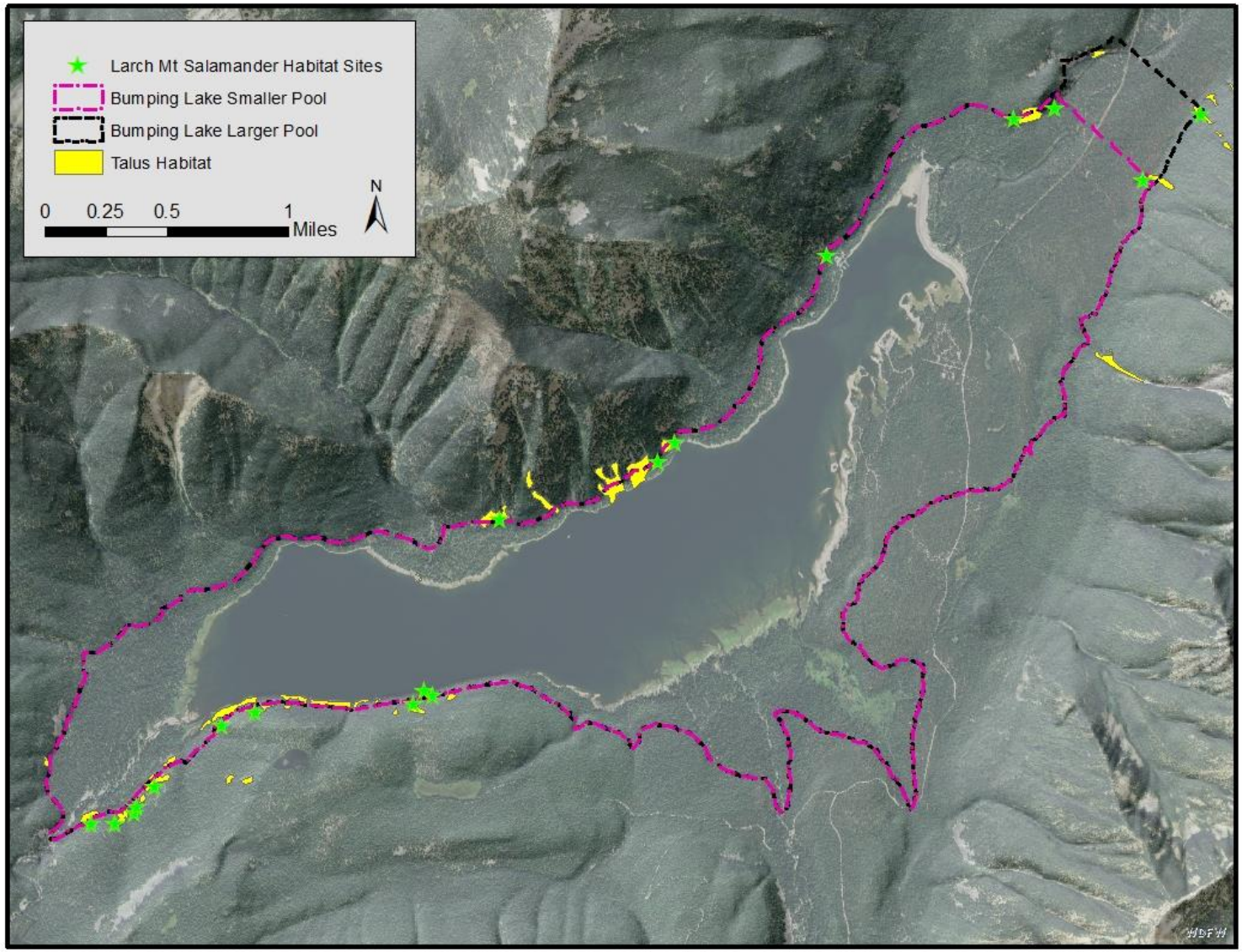
Common Name	Federal Status [1]	WA State Status [2]	Potential for Occurrence on or near to the Project Areas and Associated Habitat 4 for the Species D=Documented On-site, N=Not Documented On-site, U=Undetermined occupancy in the project area
American marten	None	PHS	D=Species is documented using forested area around Bumping Reservoir, both from WDFW data, USFS data and Cascade Carnivore Project data.
Wolverine	FC	SC	D=Historic sightings have been documented in the project area, including one near the northern shore of Bumping Reservoir in the in January 1976. Species generally uses alpine areas, but can range widely and can use forested environments, especially during the winter.
Elk	None	PHS	D=Species regularly uses the area and upper Bumping River is designated as elk migration route.
Rocky Mt mule deer	None	PHS	D=Species is common in the area. No special status habitats are designated in the project area for this species.
Mountain goat	None	PHS	D=Species is mapped as a regular occurrence on Nelson Ridge to the south of the reservoir area.

[1] Federal Status: FE = Federally Endangered; FT = Federally Threatened; FC = Federal Candidate Species; EPA = Bald and Golden Eagle Protection Act; S&M= Northwest Forest Plan Survey and Manage Species; FCo = Federal Species of Concern

[2] Washington State Status: SE = State of Washington Endangered; ST = State of Washington Threatened; SS = State of Washington Sensitive; SC = State of Washington Candidate; PHS=Priority Habitats and Species

Note: All native migratory birds are protected by the federal Migratory Bird Treaty Act (MBTA)

Figure 6. Locations of potential Larch Mountain salamander habitat within the Bumping Reservoir proposed expansion.



are approximations. When our evaluation showed characteristics close to both categories, these habitat polygons were placed in this "borderline" category as more precise measurements are needed to reveal that these areas belong in either the dispersal or suitable category. Acreage listed in Table 3 shows acres of each habitat type in both the larger proposed pool footprint and the smaller proposed pool footprint. As mentioned in methods, these calculations were made using a 50 meter buffer of the known reservoir expansion footprint, due to uncertainty with the existing footprint shapefile and the likelihood that some riparian shore habitat will develop above the high water mark, replacing coniferous forest. Graphical depictions of mapped habitats are shown on Figure 7. Representative photos of habitat types are shown in Appendix C.

Table 3. Number of acres of spotted owl habitat types within the proposed Bumping Reservoir expansion area including a 50 yard buffer of the expanded reservoir area.

Habitat Type	**Larger Pool Option (Acres)**	**Smaller Pool Option (Acres)**
Suitable	76	76
Dispersal/Suitable	228	228
Dispersal	1,310	1,174
Unsuitable	598	579
Non-habitat[1]	92	88
Total	**2,304**	**2,145**

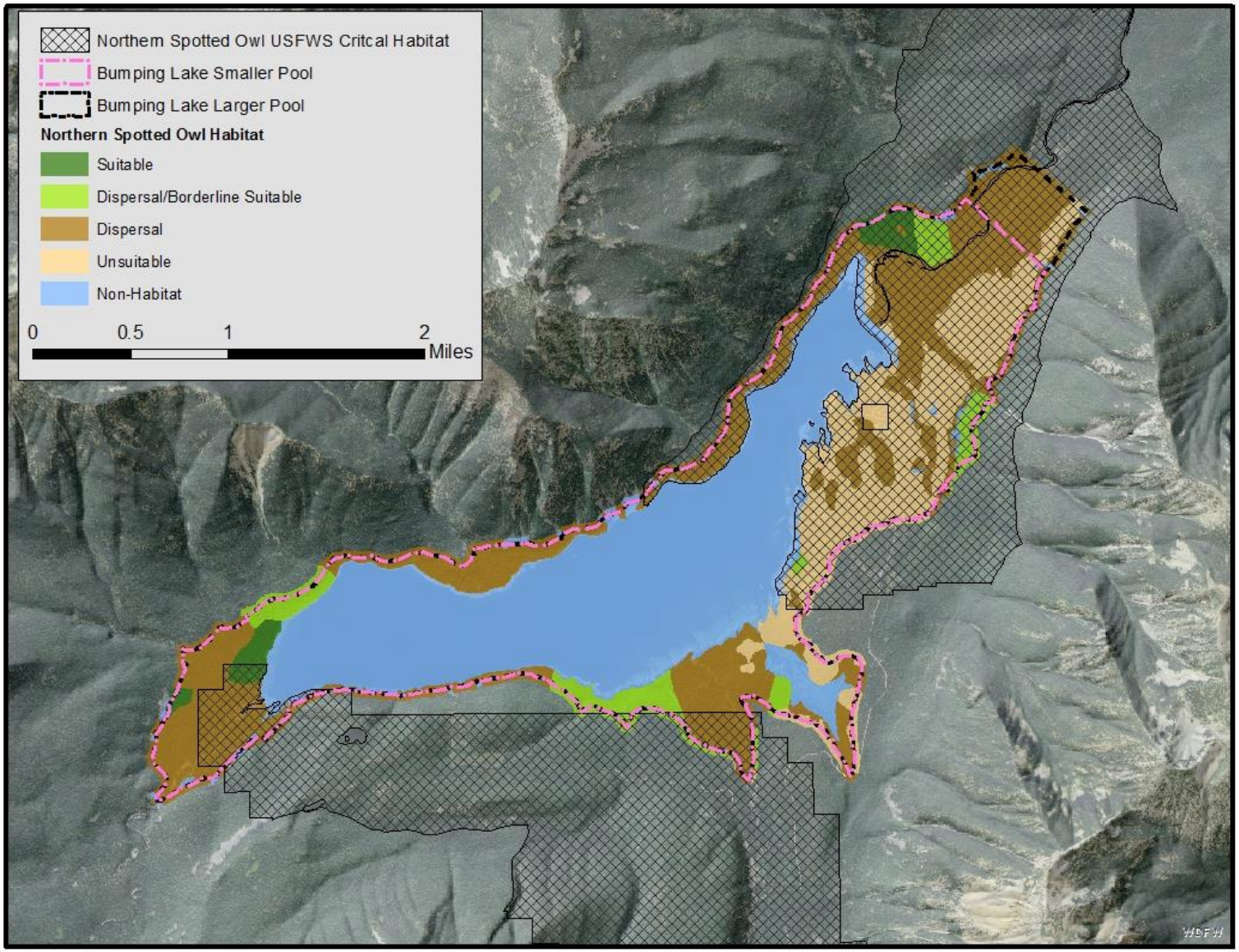
[1] Current reservoir not part of calculations

Two important habitat designations regarding northern spotted owl are also found in the Bumping Reservoir area. Those are areas classified as USFWS critical habitat (USFWS, 2012b) and areas classified as large successional reserves by the USFS Land Management Geodatabase (USFS, 2010). There are 1,195 acres classified as critical habitat under the larger pool option and 1,028 acres classified as habitat under the smaller pool option. All forested habitats are designated as late successional reserve habitat under the 2010 version of the USFS land management geodatabase. Thus, 2,212 acres of forested habitat for the larger pool and for the smaller pool option, 2,057 acres of forested habitat. These calculations used the 50 meter buffer of the proposed pool boundary that the northern spotted owl habitat happing used. The critical habitat areas are meant to designate area on a course scale that the USFWS determined were critical to protect for the northern spotted owl, they are not meant to reflect areas currently in owl habitat or not. Similar for the late successional reserves, this is a land management planning tool rather than reflecting what currently exists on the landscape. Acres of habitat calculated in Table 3 are a reflection of what currently exists on the landscape.

Suitable

Areas that were mapped as suitable had trees that averaged 20-22 inches DBH. These habitat areas typically had three or more layers and were mixed conifer in composition. This composition included Western hemlock, Douglas fir, Western red cedar, and Engelmann spruce. No mistletoe was observed. There were generally

Figure 7. Northern spotted owl habitat map within the Bumping Reservoir proposed expansion.



about two snags per acre over 20" DBH and some had deformities. Downed wood was present and canopy cover ranged from 70-85%. Many of these areas minimally meet the suitable habitat characteristics and should be further investigated using forest plots. One area was found within the suitable habitat polygon adjacent to the Bumping Reservoir on the west shore that could be considered a mature forest grove. The grove was not mapped due to its small size and is not the result of an exhaustive search for old growth stands. Other groves within suitable habitat could exist. For both the larger pool and smaller pool, 76 acres were calculated.

Dispersal/Suitable

These borderline areas had average DBH of 18-20 inches. Were composed of mixed conifer habitat, some were fir dominated (Douglas and true fir), while other stands were dominated by western hemlock. No mistletoe was present, but 1-2 snags greater than 20" DBH per acre with deformities were present. Canopy cover in various areas ranged from 60-90%. There was a small grove of mature forest in the dispersal/borderline habitat forest polygon near the eastern inundation border southeast of the existing Bumping Dam. This grove was smaller than an acre in size and not substantial enough to separate into distinct forest polygons. The dispersal/borderline suitable areas should be investigated using formal forest plots. More precise measurements could classify these forest stands into either suitable or dispersal habitat. For both the larger pool and smaller pool, 228 acres of this borderline dispersal/suitable habitat would be impacted (Table 3).

Dispersal

The majority of habitat in the reservoir expansion area was mapped as dispersal habitat. These areas were mixed conifer in composition, some areas fir dominated either Douglas or true fir while other areas were western hemlock dominated. Western larch and western white pine were interspersed and some areas had percentages of lodgepole pine, though no polygon had more than 40% lodgepole pine. Average DBH for these stands average 12-14" on the lower end to 16-18" on the upper end. Many areas had no snags that were over 20" DBH, some polygons had scattered larger snags. Most areas had some downed wood, though much of the downed wood was of small diameter. Canopy cover was variable for these stands, ranging from 50-90%. Most polygons were composed of two layers, though a few more mature polygons did have three layers and a couple only had one layer. For the larger pool and smaller pool alternatives, 1,310 acres and 1,174 acres of dispersal habitat, respectively, would be impacted (Table 3).

Unsuitable

Habitats mapped as unsuitable habitat have the potential to recruit to future habitat, given a long period of habitat regeneration. Habitats put in this category typically were young lodgepole pine forests, average DBH of 8-12 inches depending on the stand. There were often isolated remnants of Douglas fir in these areas suggesting that the lodgepole pine forest are the younger regeneration stage of a mixed conifer forest. In many stands, mixed conifer species such as Douglas fir or Grand fir were present in the understory. For the larger pool and smaller pool alternatives, 598

acres and 579 acres of unsuitable owl habitat, respectively, would be impacted (Table 3).

Non-habitat

These are non-forested habitats that have no potential of developing into spotted owl habitat without major landscape modifications. The current reservoir is not factored into acreage calculations. This habitat type was mainly comprised of talus, cliff and meadow wetland habitats. For the larger pool, 92 acres of non-owl habitat would be impacted. For the smaller pool 88 acres of non-owl-habitat would be impacted (Table 3).

3.3.2 Species occurrence in the inundation zone

Six historical northern spotted owl territories have been documented around Bumping Reservoir. Three of the six were reproductive pairs, Boulder Creek, American Ridge-Bumping Lake, and Sunrise Creek. Only one of those (Sunrise Creek) is believed to still be active. The other three sites, Cedar Creek, Lily Lake and Nelson Ridge, had single bird detections. Three of the five (Lily Lake, Boulder Creek and Nelson Ridge) have not been active since 1991 according to WDFW databases and the fifth (American Ridge-Bumping Lake) was active through 2000. These territories have not been regularly surveyed in recent years (no surveys from 2005-2015 for Boulder Creek, Cedar Creek, Lily Lake and Nelson Ridge and American Ridge-Bumping Lake has not been surveyed since 2009). Due to survey effort, exact current status of these territories is unknown. The reservoir expansion area overlaps with owl management circles for all six territories.

3.4 Bull trout Impacts

3.4.1 Bull trout snorkel surveys

We did not survey Deep Creek for presence/absence due to consistent presence of bull trout observed each year during redd surveys. The Upper Bumping River from the mouth at Bumping Lake up to the barrier falls has been snorkeled for juvenile bull trout as late as 2010 by a team representing several agencies. However, because of the extended period elapsed since then and the need to perform regular surveys to monitor the population, surveys were conducted again to confirm presence, imply (but not prove) absence, or suggest very low abundance. Table 4 summarizes the snorkeling effort for bull trout in the late summer and fall of 2014. Figure 8 displays the location of these surveys. Bull trout were found in the upper Bumping River below the natural falls, the lower Bumping River above the bridge over the Bumping River, and in the unnamed tributary just east of Deep Creek. All of these sightings were within the proposed inundation area. The juvenile bull trout sighting in the unnamed tributary was the first documentation of bull trout in that stream. In addition to these snorkel surveys, bull trout have been documented by other agencies at other times. Table 5 summarizes those occurrences using data from WDFW Region 3 files, the WDFW on-line database known as Salmonscape, and the Bull Trout Action Plan (Reiss et al., 2012). Other tributaries were not snorkeled because they were either dry at the time of observation in the fall of 2014, or had

Table 4. Bull trout surveys in the Bumping River Basin for the YBIP in 2014.

Stream	Date	Total survey length in meters (miles)	Water temp-erature (°C)	Start time of survey	Water clarity	# of bull trout obs-erved	Length of bull trout (mm)
Barton Creek	9/29/14	1992 (1.24)	12	7 pm	Very clear	0	NA
Unnamed Tributary East of Deep Creek	10/8/14 10/9/14	1752 (1.1)	6.8 7	8 pm 6:30 pm	Very clear Very clear	1 0	150 NA
Granite Creek	9/8/14	782 (0.49)	NA	7 pm	Very clear	0	NA
Upper Bumping River	9/9/14 9/10/14 9/15/14 9/16/14	2233 (1.4) (includ-ing side chan-nels)	10 10 10 10	9 pm 8 pm 8 pm 7 pm	Very clear Very clear Very clear Very clear	2 0 0 0	150 & ~175
Cedar Creek	9/16/14	959 (0.6)	10	7 pm	Very clear	0	NA
Boulder Creek	9/18/14	688 (0.43)	11	7:30 pm	Very clear	0	NA
Unnamed Tributary just downstream of spillway	9/23/14	160 (0.1)	8	7 pm	Very clear	0	NA
Unnamed Tributary 0.2 mi downstream of spillway	10/7/14	1159 (0.72)	9.1	7:20 pm	Very clear	0	NA
Lower Bumping River	9/23/14 9/24/14 9/25/14 9/29/14 9/30/14	3052 (1.9) (includ-ing side channel)	12 14 14 NA 15	8:50 pm ~8 pm NA 7:45 pm 8 pm	Very clear Very clear Very clear Very clear Very clear	0 0 1 1 2	NA NA 270 175 270 & ~225

Figure 8. Bull trout snorkel survey areas.

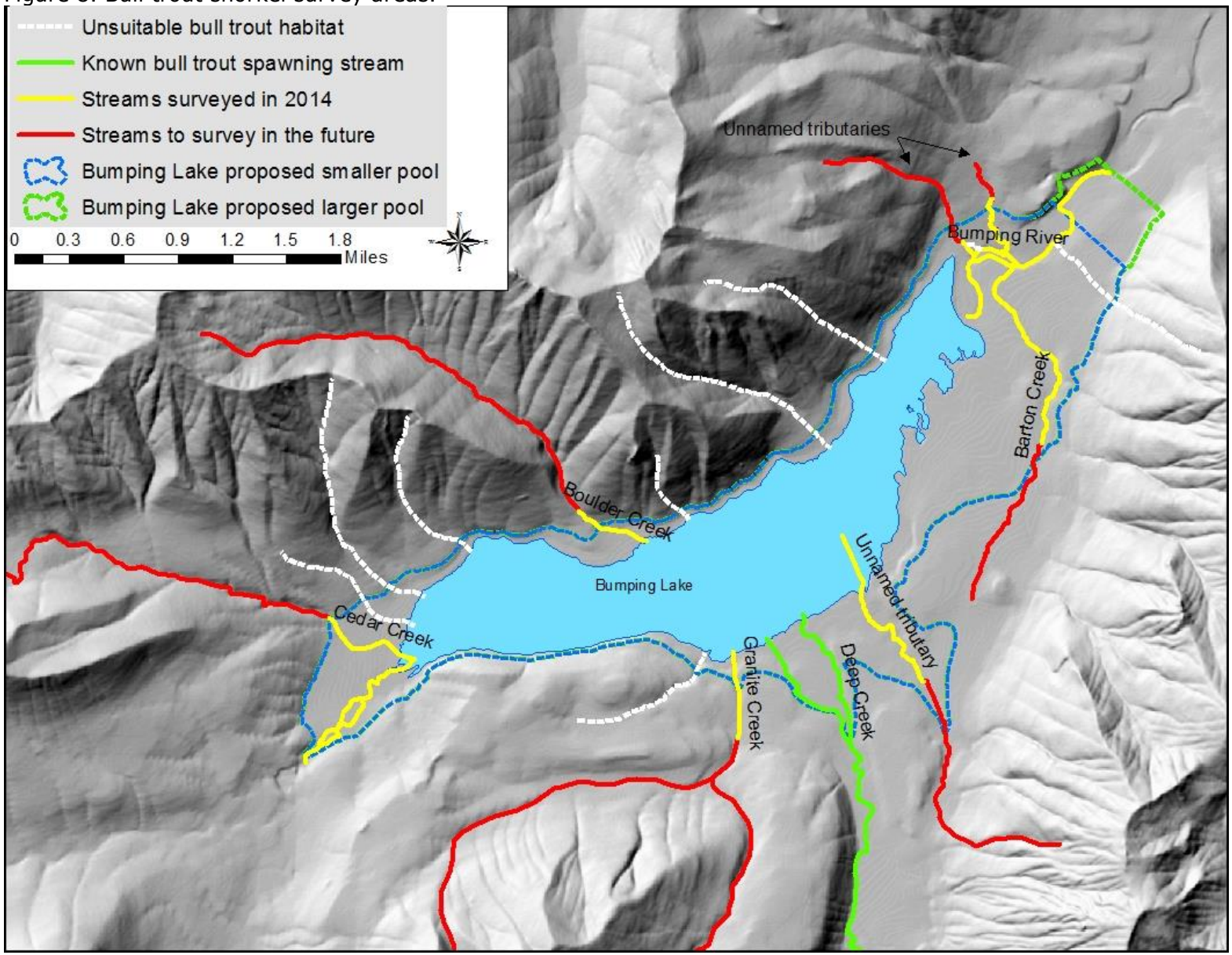


Table 5. Summary of bull trout observations in the Bumping River basin prior to Fall 2014.

Stream	Date	Observer	# of Bull trout	Description
Barton Creek	1990	WDFW	0	Electrofishing 100 m
Boulder Creek	1990	WDFW	0	Electrofishing 250 m
Bumping Lake	1952-1971	WDFW	1952 – 1 1955 – 3 1959 – 1 1960 – 2 1963 – 4 1966 – 14 1968 – 3 1969 – 5 1971 - 1	Archived bull trout catch records based on spot checks of anglers
Bumping Lake	1970	USFS	Unknown	Myrle Wischnofski found rainbow, brook, cutthroat, kokanee, and bull trout in Bumping Lake in 1970 per Naches ranger district files.
Bumping River, upper	1990 1994 2002 2003 2009 2010	WDFW Multiple Multiple Multiple Multiple Multiple	2 sub-adults 1 redd Several juveniles Several Juveniles 2 redds Several juveniles	Electrofishing Snorkel survey Redd survey Snorkel survey Redd survey Snorkel survey
Bumping River, lower	1978 1997 2001 2002 2003-5	WDFW WDFW YBJB WDFW WDFW	Unspecified 1 6 1 4	Electrofishing Just below dam Snorkel Hook and line capture for radio tagging
Cedar Creek	1993 1994	WDFW Colin Leingang	0 1	Electrofishing 265 m Below trail 1278; according to Karen Lindhorst.
Deep Creek	1993 1989-2014	WDFW WDFW, Reclamation, USFS, YBJB, others	7 sub-adults (11 – 24 cm) Several spawning adults and many redds observed every year	Electrofishing for over 5 hours From bull trout redd surveys in fall
Granite Creek	1993 Un-known	WDFW Unknown	0 1 or more	Electrofishing 390 m As documented in http://apps.wdfw.wa.gov/salmonscape/

insufficient water in them to support bull trout on a long-term basis. These are noted as "Unsuitable bull trout habitat" in Figure 8. It is possible that these streams may be suitable at other times of year or at different flow regimes than were observed in the fall of 2014.

A few streams were snorkeled above the inundation line because time allowed for that on the night of a survey. The unnamed tributary east of Deep Creek was not surveyed up to the inundation line because of lack of time in that evening and because we had already determined presence in this stream the previous evening. The unnamed tributary just downstream of the Bumping Dam Spillway was not surveyed up to the inundation line because of the presence of an abandoned water wheel at the mouth that may block bull trout passage. The stream was surveyed up to a shallow pond to determine fish presence since this stream is not shown in Washington State Department of Natural Resources' (DNR) Forest Practice Review System (FPARS). Four brook trout and one cutthroat were found so it is considered a fish-bearing stream in this report.

Presently, there are approximately 27.4 miles (44.1 km) of fish-bearing habitat in the project area. This includes fish habitat above Bumping Dam not blocked by an existing barrier (as described in methods) as well as those streams that enter the Bumping River below the dam that would be partially inundated by the proposed dam in the larger pool option. The length of fish-bearing stream that would be inundated by the proposed expanded inundation zone is approximately 10.2 mi (16.5 km). The length of fish-bearing stream that will still be available to fish above the maximum pool elevation of the proposed expanded reservoir is approximately 17.2 miles (27.7 km). Note that, as described in methods, this number includes stream habitat that currently is blocked by the Granite Creek culvert and partially blocked by the Cedar Creek cascade. The number of stream miles inundated and miles that would remain available for fish in each stream are shown in Table 6.

3.4.2 Bull trout redd inundation prediction estimates

As discussed in methods, the purpose of this analysis is to provide an estimate of the impact of the proposed increased pool elevation on bull trout spawning habitat. We are using the existing redd location data relative to the proposed inundation area to estimate the number of redds that would no longer be viable in an expanded Bumping scenario.

Surveys in all of the analyzed years 1991 to 2014 indicated whether redds were above or below Forest Road 1800. In every survey year the 0.95-mile (1.5 km) lowest reach (Bumping Reservoir to Forest Road 1800), remained flowing and connected by way of either the left or right fork of the stream. In every survey year the 3-mile (4.75 km) upper survey reach (confluence with Copper Creek to the barrier falls 5.6 miles upstream from the mouth) experienced some amount of dewatering. With the exception of 2002, 2011, 2013, and 2014, the middle reach (FR 1800 to the confluence with Copper Creek, 1.7 mi, 2.7 km) experienced some amount of dewatering.

Table 6. Stream habitat below and above the proposed inundation line.

Stream Name	Stream kilometers below inundation line (miles)	Stream kilometers above inundation line (miles)
Bumping River, downstream of dam to proposed larger pool dam location	3.24 (2.01)	NA
Bumping River, downstream of dam to proposed smaller pool dam location	2.41 (1.50)	NA
Barton Creek	2.14 (1.33)	1.83 (1.14)
Unnamed Tributary just downstream of existing dam spillway	0.36 (0.22)	1.46 (0.91)
Unnamed Tributary 0.2 mi downstream of existing dam spillway	0.60 (0.37)	0.50 (0.31)
Unnamed Tributary east of Deep Creek	1.72 (1.07)	0.51 (0.32)
Deep Creek	2.18 (1.36)	7.81 (4.85)
Copper Creek	NA	6.65 (4.13)
Granite Creek	0.32 (0.20)	5.70 (3.54)
Bumping River above the reservoir	2.28 (1.42)	0.06 (0.04)
Cedar Creek	0.8 (0.50)	2.45 (1.52)
Boulder Creek	0.43 (0.27)	0.69 (0.43)
Total Miles	16.5 (10.2)	27.7 (17.2)

Table 7 shows the percentage of redds that are found downstream of the proposed inundation line (data source is adjusted based on GPS data as described in methods) and within the lowest survey reach (data source is raw field data from survey forms) in several different scenarios. Our refined estimate of the percentage of redds inundated by the proposed Bumping Reservoir expansion in the period 1991 to 2014, is 14.3%. The three years of GPS data (1996, 2009, and 2013) used to adjust all the data for a more accurate number of redds impacted by the inundation had August and September flows that were 5, 15, and 25% different than the average August and September flow for the period of record. Considering that the average percent difference of August and September flows from the average is 37%, we consider the flows in these three years within a normal range. It is understood that additional years of GPS data would provide a better representation of the redd distribution in Deep Creek. Once more GPS data is collected, this exercise should be repeated to improve the estimates of the number of redds impacted by the inundation.

Redd distribution is variable from year to year so the additional scenarios in Table 7 are provided to qualify the percentage of redds expected to be inundated by the Bumping Lake expansion. The average percentage of redds below the proposed inundation line in 2002, 2011, 2013, and 2014 is 8.5%. Survey forms in those years

indicated that the middle reach (FR 1800 to the confluence with Copper Creek, 1.7 mi, 2.7 km) remained flowing and connected during surveys in those years. This could represent flow regimes that allow ample spawning opportunity in the upper reaches, and thus one might expect a lower number of redds in the lowest reach (which is proposed to be inundated).

Table 7. Percent of bull trout redds downstream and upstream of the proposed inundation line.

Data source	Subject reaches	Stream miles	1991 – 2014 Period of record	2005 - 2014 Last 10 years	2002, 2011, 2013, 2014 Years when middle reach does not dewater	2004 - 2008 Same period as USFWS analysis
Modeled data	Lake to inundation line	0.75	14.3	13.3	8.5	18.6
	Inundation line to barrier falls	4.85	85.7	86.7	91.5	81.4
Field surveys	Bumping Lake to Road 1800	0.95	19	18	11	24
	Road 1800 to barrier falls	4.65	81	82	89	76

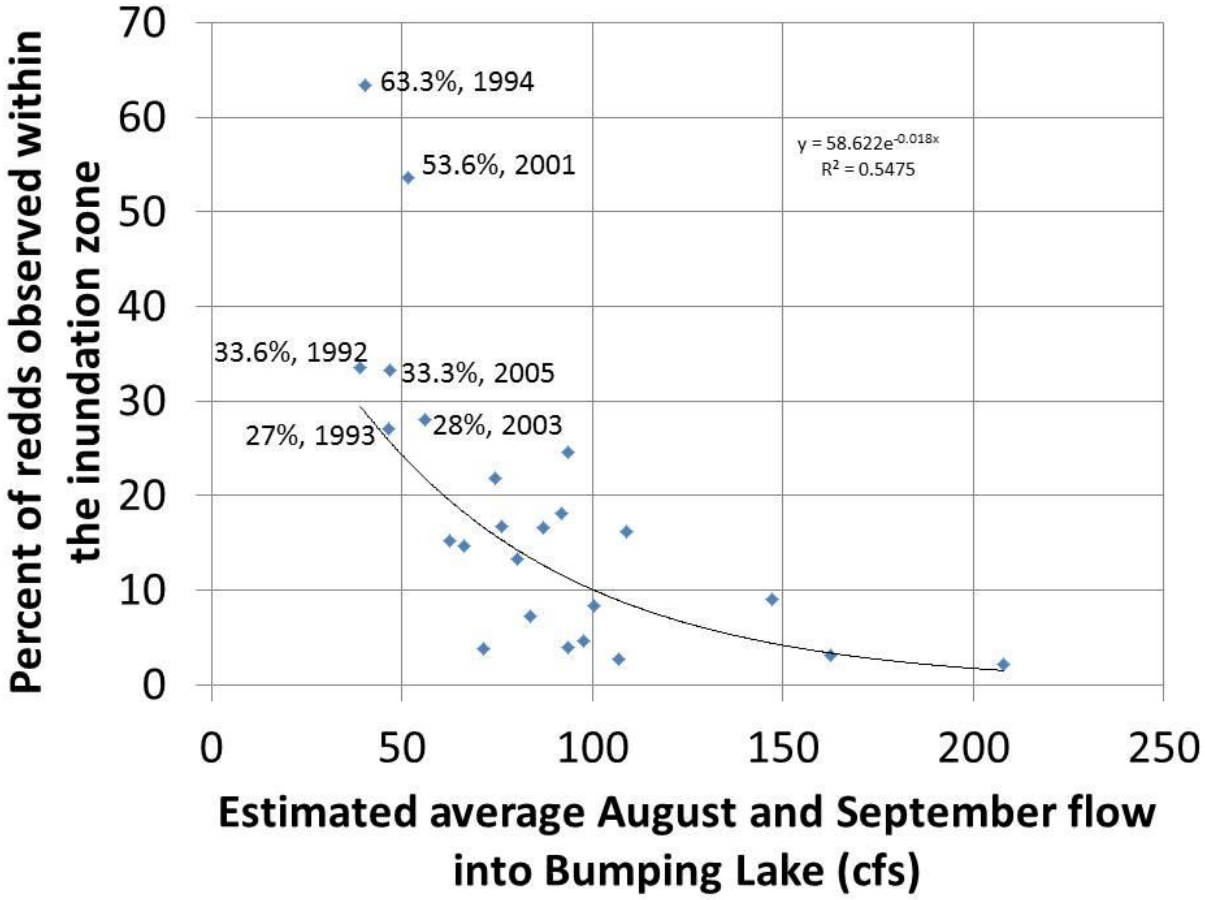
The average percentage of all the redds within the proposed inundation zone of Deep Creek between 2004 and 2008 was 18.6%. This analysis is provided as a comparison to a similar redd inundation prediction analysis by USFWS (unpublished report). WDFW's analysis of this same time period with the raw, unmodeled data resulted in the same finding as the USFWS (24% of all the redds in Deep Creek occur below Road 1800).

The result of the analysis to determine a relationship between flow during bull trout spawning in Deep Creek and the percentage of redds found in the proposed inundation reach is shown in Figure 9. This figure shows a moderate inverse relationship between flow and the percentage of redds found within the inundation zone. That is, the lower the average flow the higher the number of redds observed in the proposed inundation zone. Data from three major droughts in the Yakima Basin (1994, 2001, and 2005) are labeled on Figure 9 and show that, in years where inflows to Bumping are low, a large percentage of redds occur within the inundation zone. Data from three other low-water years are shown to support the relationship between a drought year and this confined redd distribution.

The average percentage of redds within the inundation zone in 1994, 2001, and 2005 is 43.6% and represents a redd distribution in severe drought years. Survey form information indicated that the degree of dewatering in the middle and upper survey reach in those drought years was extensive. The survey form field notes do not contain consistent quantitative information about the extent of dewatering, but in general provides a qualitative assessment of dewatering and no quantitative

capability of determining a relationship between extent of dewatering and location of redds.

Figure 9. Relationship between average August and September flow into Bumping Lake and the percentage of redds observed in the proposed inundation zone.



3.4.3 Lower Bumping River bull trout habitat assessment

Bull trout do occur below the current Bumping Dam. Presently Bumping Dam has no fish passage facilities but fish are capable of passing downstream during certain gate configurations and flow. No bull trout redds have been observed in the reach below Bumping Dam but redd surveys have been sporadic and difficult to accomplish because of the partial overlap with spring chinook spawning and the resulting difficulty in distinguishing small spring chinook redds or "test digs" from bull trout redds. Sub-adult bull trout have been observed in the reach, and adult bull trout have been caught and tagged in the pool at the Bumping Dam spillway (Mizell and Anderson, 2008). While no spawning was documented in the Bumping River below the dam, bull trout do leave the Bumping River, forage elsewhere, and return to the Bumping River below the dam to forage again (Mizell and Anderson, 2008). This suggests these fish are part of the Naches River fluvial populations and not simply a relic population flushed from above the Bumping Dam.

3.5 Steelhead Impact Assessment

Steelhead are known to spawn throughout the Bumping River below the dam, although flow conditions in many years make surveying for redds difficult. Between 2004 and 2015, complete steelhead redd surveys were only performed in 2005, 2006, and 2010. The average annual number of redds observed in the entire Lower Bumping River (Bumping Dam to Forest Road 1709 below the American River confluence) in those three years was 22.3. The average annual number of redds observed in the Bumping Dam to Goose Prairie survey reach in those years is 2, or 9% of the total steelhead redds observed in the entire Lower Bumping River. The true percentage of redds impacted by the new Bumping Dam inundation is lower than this because the survey reach is actually longer than the reach of impacted habitat. As described in methods, these numbers were prorated based on the amount of spawning habitat lost due to the inundation of the lower bumping river by the new large pool and small pool dams. The number of redds created per kilometer in the Bumping Dam to Goose Prairie survey reach (6 km) is 0.3 redds per kilometer. Given that the inundation of the large pool Bumping Reservoir impacts 2.4 km of the spawning habitat and the small pool Bumping Reservoir impacts 1.9 km of the spawning habitat (Figure 2), the number of redds impacted in either case is estimated to be less than one annually, assuming an even distribution of redds in the Bumping Dam to Goose Prairie survey reach. This is equivalent to 3 or 4% of the total number of steelhead redds in the Lower Bumping River annually. Note that the stream lengths reported here do not include side channels.

A quantitative analysis of impacts on rearing fish is not possible without more information about the habitat below the dam to compare to preferred rearing habitat characteristics. However, the creation of a new Bumping Dam will block 2.4 km (1.5 mi) or 1.9 km (1.2 mi) of currently suitable spawning and rearing habitat in the Bumping River.

3.6 Chinook Impact Assessment

The average annual number of redds observed in the entire Lower Bumping River (Bumping Dam to confluence with the Naches River) since 1988 until 2014 is 129. The average annual number of redds observed in the Bumping Dam to Goose Prairie survey reach in that time period is 36, or 28% of the total redds observed. The true percentage of redds impacted by the new Bumping Dam inundation is lower than this because the survey reach is actually longer than the reach of impacted habitat. As described in methods, these numbers were prorated based on the amount of spawning habitat lost due to the inundation of the lower bumping river by the new large pool and small pool dams. The number of redds created in the Bumping Dam to Goose Prairie survey reach (6 km) is 6 redds per kilometer. Given that the inundation of the large pool Bumping Reservoir impacts 2.4 km of the spawning habitat (Figure 2), the number of redds impacted by the large pool reservoir is estimated to be 14.4 annually, assuming an even distribution of redds in the Bumping Dam to Goose Prairie survey reach. Given that the inundation of the small pool reservoir is 1.9 km (Figure 2), the number of redds predicted to be impacted by the small pool reservoir is 11.4 annually. This is equivalent to 11% and 9% of the

total number of spring chinook redds in the Lower Bumping River annually. Note that the lengths reported here do not include side channels.

3.7 Rare Plants

3.7.1 WNHP Database Searches

Three plant species of state or federal listing were determined to have some potential for occurrence in the project area (Table 8). One species, large-awned sedge is very unlikely to occur as it is primarily a coastal species. Two other species, Oregon goldenaster and Sierra onion have some potential to occur. Surveys were conducted for Oregon goldenaster and surveys should be conducted for Sierra onion.

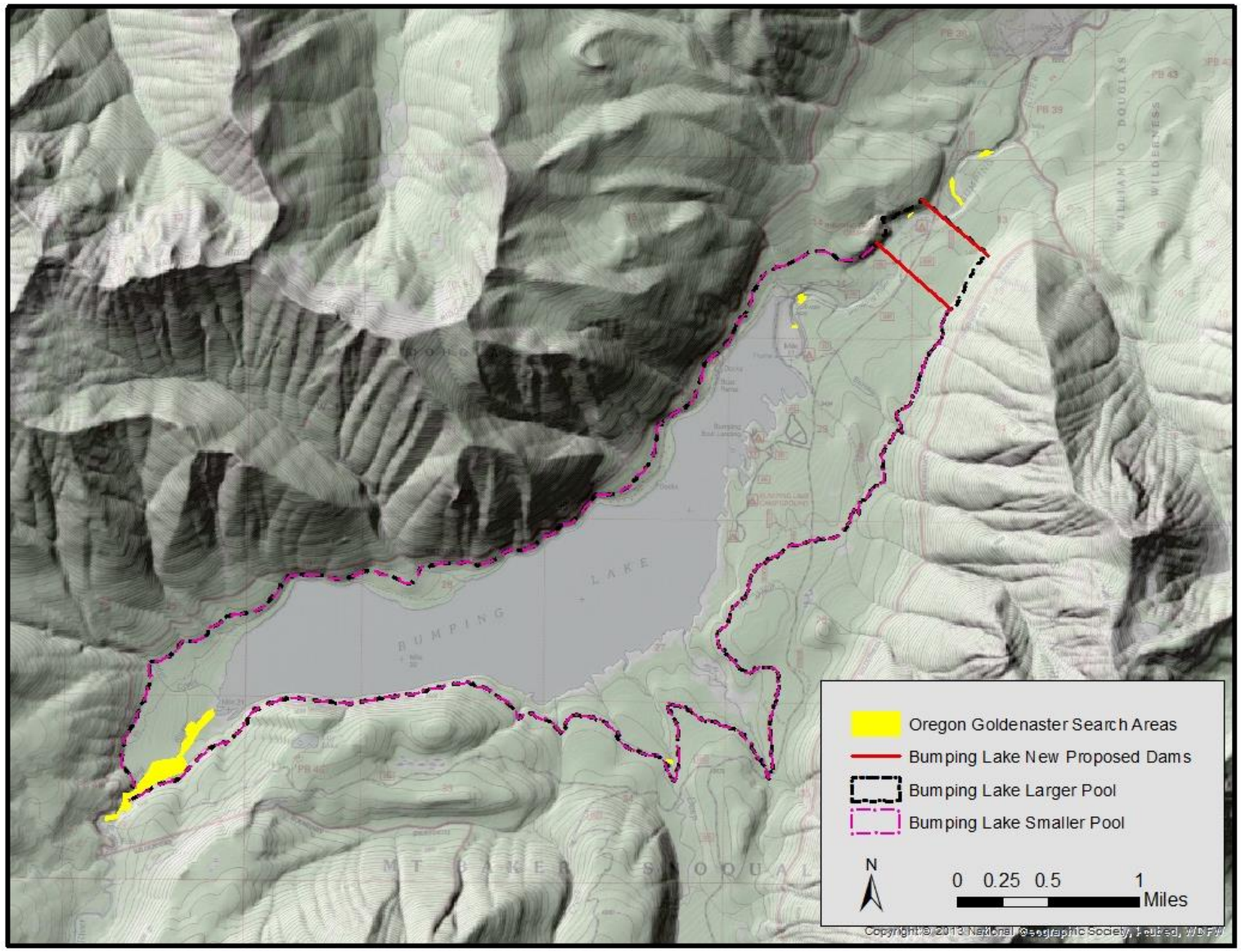
Table 8. Listed plant species of documented or potential occurrence in the Bumping project area.

Common Name	Federal Status	WA State Status [1]	Potential for Occurrence on or near to the Project Areas and Associated Habitat [4] for the Species **D**=Documented On-site, **N**=Not Documented On-site
Sierra Onion	None	ST	N=Species prefers open dry rocky slopes. Populations are found on ridges to the south of the project area in Yakima County. Some limited habitat for this species occurs in the project area.
Large-awned Sedge	None	ST	N=Prefers wet seep areas in coastal environments. Generally a coastal species, one population report in the northwest corner of Yakima County. Likelihood of occurrence for this species in the project area is low.
Oregon goldenaster	None	ST	N=Populations are documented near the confluence of the Bumping and Naches rivers. Project area has suitable habitat, but no occurrences were found during surveys for this species
[1] Washington State Status: ST = State of Washington Threatened			

3.7.2 Oregon Goldenaster Surveys

No populations of Oregon goldenaster were found in the search areas along Bumping River or Deep Creek (Figure 10). None of the other tributaries in the project area are believed to have suitable habitat.

Figure 10. Oregon goldenaster search areas for the Bumping Reservoir proposed expansion.



4.0 Discussion

4.1 Potential impacts to the PHS habitat by the project.

Aspen

Two small aspen groves were located to date, in the inundation area. Both are less than an acre in size. While their size prevents them from officially being labeled as a priority habitat, they are still important to wildlife functions. These forested aspen areas often provide important habitat for a diversity of bird species including sapsuckers.

Cliff

The single cliff area mapped in the inundation area is unlikely to provide much wildlife function. It does not have much complexity in terms of ledges for raptor nests or caves for bat roosting. Some crevices do exist and it is possible that bats use the habitat feature.

Talus

Approximately 30 acres in 18 distinct habitat patches would be lost through inundation, depending on the option of the larger or small pool. Talus in the area is an important habitat to wildlife. In addition to being used by American pika and potentially by Larch Mountain salamander, other species likely use this habitat on a regular basis. Northern alligator lizards were found in this habitat during habitat surveys. Talus is known to be an important habitat to a variety of amphibian and reptile species (Herrington, 1988). Large mammals such as cougar are also known to use talus habitats. There are talus patches in the watershed above the inundation area, likely as much or more acres than would be lost during the project. However, loss of this habitat in the inundation area would increase competition for animals using the remaining talus and would likely lead to some reductions in local populations of animals that rely on talus in the watershed for survival.

Wetlands

Wetland habitats at Bumping Lake are unique in that there are no other large lakes in the area that have well developed shallow wetlands around their perimeter. There are a few smaller ponds such as Lily lake outside of the inundation area that have some similar habitat, but only for some of the emergent wetlands. Lacustrine zones would likely expand at the expanded reservoir and over time, littoral zone will likely recover and expand. Emergent wetlands along the shore will likely recover and given that the new reservoir will have a larger footprint, that habitat type eventually will be larger than present. However, that time period many take a decade or more for wetlands to shift upslope. Recommendations for future study are that full impacts of these changes in wetlands should be studied, including perhaps modeling of how impacts could be lessened if the reservoir was slowly filled over a period of years, say a decade.

Wetland habitats found along Bumping River, have similar habitat outside of the inundation area as do wetlands along other tributaries in the inundation area. Wetland habitats along the river and tributaries will result in a net loss of these habitats in the area as these areas will become part of the lake environment. This

net loss of palustrine and riverine wetlands will mean that animals using this habitat will be forced to compete for the remaining habitat in the area, potentially leading to localized population reductions of some species. Efforts should be made to explore on-site mitigation options or if off-site, mitigation options nearby as movement potential of some animal species is low and will not directly help these populations if mitigation is located outside their range of movement.

Mature Forest

Areas mapped as suitable and borderline suitable habitat should be considered mature forest, consisting of approximately 300 acres of impacted forest types. A multitude of species use these forests, many are listed or candidate species including northern spotted owl, northern goshawk, pileated woodpecker, Vaux's swift and mammal species such as fisher may occupy these areas in the future. In addition to these listed and candidate species, may other common wildlife species use this habitat including various birds, amphibians and mammals. The surrounding landscape above the inundation line has a large proportion of mature forested habitat. Thus, there is habitat but loss of the forested habitat within the inundation area would lead to overall habitat loss and competition for habitat in the remaining mature forest areas.

These mature forests also provide important riparian species cover for streams. Streams in these forests either support bull trout spawning or rearing or may have the potential to support spawning or rearing. Loss of these mature forest areas near creeks and second growth forests that have mature forest elements will have impacts to stream dynamics. Impacts could include increased sediment load, increased water temperature, unconfined channels that reduce surface connectivity and access to headwater habitat, and reduced riparian ecosystem function. All of these are detrimental to both fish and wildlife species.

4.2 Potential impacts to Listed and PHS fish and wildlife species by the project

Species listed here are believed to be impacted by the project, potentially substantially impacted. While other wide ranging species such as wolverine may occasionally use the project area, the impacted habitats are not believed to be vital to their occurrence in the area.

4.2.1 Listed Species

Larch Mountain Salamander (NW Forest Plan Survey and Manage, State Threatened)

The species currently is not documented in the project area, or in Yakima County. Thus impacts to this species are not fully known and would depend if the species occurs around Bumping Reservoir or not. These impacts will focus on impacts to potentially suitable habitat for the species. Habitat assessment was not conducted above the inundation area, so it is unknown how much habitat occurs for the species outside of the impacted area. In the impacted are up to 14 distinct habitat patches are within the inundation area and would be lost through the currently designed reservoir expansion.

Northern spotted owl (Federal Threatened, State Endangered)
There are spotted owl territories that historically have been used around the reservoir, though currently appear to be vacant. One territory is still occupied in the area and these other areas could be reoccupied in the future if habitat remains. Impacts to habitats by the project have the potential to harm the species status in the area. Most of the habitat that would be inundated are not believed to be core habitats for the species management circles, but rather important habitats used for foraging and dispersal.

While only the inundation area was assessed for this project, other facilities have the ability to reduce spotted owl habitat farther in the area. Reservoir expansion as it is currently designed would result in loss of campground, marina, roads and cabins at Bumping Reservoir. It would be possible that some of this entire infrastructure would be rebuilt around the new lake, thus resulting in even more forested habitat loss and likely into more mature habitats that are in upland areas. Also see section 4.3.

Fisher (Federal Candidate, State Endangered)
Fishers may use mature forests in the area and mature forest habitat at Bumping Reservoir was included in the habitat map for the species recovery plan (Hayes and Lewis, 2006). While they don't currently exist in the project area, there are reintroduction efforts nearby at Mount Rainier and the species might disperse to the area. Inundation of these habitats has the potential to impact this species.

Bull Trout (Federally Threatened, State Candidate)

This species is documented spawning and rearing in the project area, both above and below the present Bumping Dam. Deep Creek has the only major spawning population, and Deep Creek, Bumping River, Granite Creek, Cedar Creek, and the unnamed tributary east of Deep Creek all have had rearing bull trout observed in them. Deep Creek is one of the three strongest populations in the Yakima River basin and will be impacted by the proposed Bumping Reservoir Enlargement. See Section 4.4 for more details.

Steelhead (Federally Threatened, State Candidate)

This species is documented spawning and rearing in the project area below the existing Bumping Dam. This species' will likely be impacted by the reservoir enlargement and possibly flow manipulation within the Lower Bumping River. See Section 4.5 for more details.

4.2.2 PHS Species

These PHS species may have impacts to their habitat through either the inundation of the reservoir or construction of the dam. Species outlined below are species that are likely to be impacted by the project. Management recommendations are from the WDFW PHS management recommendations for Washington's priority species (Larsen et al., 2004).

Western toad (State Candidate)
Western toad was documented using the shoreline areas of the reservoir for breeding and breeding was documented in multiple areas around the lake. Thus, Bumping

Reservoir appears to be an important breeding area for the species. Western toads breed in shallow wetland areas and this species is likely to be impacted by a rise in the reservoir. If the reservoir is raised at once, rather than a series of years, current emergent wetlands will be lost under more than 60 feet of water at full pool while new wetlands have not had the time to recruit into the newly inundated areas. It should be noted however that Bumping Reservoir was built in 1910 over an existing natural lake and Western Toads occur abundantly in this area today. Thus, it is unknown if they migrated to this habitat after the reservoir was built or if they historically used the area and adapted to the reservoir inundation area over time.

Harlequin duck (PHS)
Most of Bumping River could and does provide nesting habitat for this species. Harlequin ducks have not been documented nesting in the proposed inundation area, but may use the area. Suitable habitat is still present downstream from the proposed new dams, though inundation of the river would reduce available habitat for the species. Habitat immediately downstream of the current reservoir may be reduced by outflow from the dam reducing habitat complexity along the stream in the form of large woody debris that the species often uses. They likely would also happen from a new dam, resulting in habitat impacts beyond just the proposed new dam location.

Northern goshawk (State Candidate)
Northern goshawk prefers mature and sub-mature forests for nesting. Inundation of mature forest elements would likely result in habitat loss for this species and possibly result in loss of some territories if habitat loss is high enough. Forest inundation may also impact prey availability. Goshawks are known to prey upon a wide variety of forest species including Douglas squirrel, snowshoe hare and forest grouse, which are present or are likely present in forested areas proposed for inundation.

Sooty grouse (PHS)
Sooty grouse use a wide variety of habitats from habitats near streams for nesting to more upland habitats later in the season. They can also use a variety of forest ages from young forests with some larger remnants to older more mature forests. Species is likely to be affected from inundation of forest through the reservoir expansion. It is unknown how much the species would be impacted and if those impacts would lead to population reductions in the area.

Black-backed woodpecker (State Candidate)
Species often inhabits stands of pine and fir that are either burned or infested with insects. Species was found in the lodgepole pine areas near the current dam. This area is not recently burned but did show some signs of insects, though most of the trees were still in relatively good vigor. The species is highly mobile, often only staying in the area while the food source (insects) is available. It is difficult to determine impacts for this species as these areas many not be habitat for this species in the future, while other nearby areas could suffer from fire or insect outbreak and become desired habitat.

Pileated woodpecker (State Candidate)
Pileated woodpeckers occupy both mature forests and second growth forests with large snags. The species has been documented in the project area and suitable

habitat exists in the form of mature forests and some second growth forests with larger remnant snags. The average home range is large, often 1,000 acres or more in size. Species may be able to shift upslope to an extent and utilize forests that are not inundated, but the amount of forested habitats inundated through the reservoir expansion is likely to have impacts on this species.

Vaux's swift (State Candidate)
Species is tied to mature forests, and needs snag components with deformities (broken tops) for nesting and roosting. Suitable habitat occurs in the project area. This species will be impacted through loss of habitat. It is unknown how much suitable habitat exists upslope from the inundation area and if species may have the ability to shift distribution somewhat into new areas. Regardless, the project will result in lost habitat for the species.

American marten (PHS)
Species uses mixed conifer forests of mature age, but also uses forest habitats that have a diversity of age classes for their forage species. Project is within habitats likely to be occupied by the species and Cascades Carnivore unpublished data has shown occurrences in and around the Bumping Reservoir area. Suitable habitat, perhaps better habitat, occurs outside of the inundation area but there would still be impacts to this species habitat through forest inundation loss.

Kokanee (PHS)
This species is known to occur in the Bumping River basin above the dam. Existing spawning habitat may be reduced due to a Bumping Reservoir enlargement because approximately 10.2 mi (16.5 km) of fish-bearing stream would be inundated and eventually become unsuitable for spawning. Stream habitat further upstream that would remain available above the inundation zone in the existing tributaries is less suitable for spawning due to higher gradients, less flow, and larger substrate, though suitable spawning habitat for kokanee and other species has not been quantified. Kokanee may spawn at the existing lake shore, but this has not been documented. Habitat surveys to identify spawning areas and potential spawning areas would need to be completed to help quantify impacts to spawning habitat. Rearing habitat within the lake would likely improve at least temporarily while the reservoir encroaches on an established forested and wetland littoral zone around the reservoir. This would create a nutrient-rich littoral zone that would increase forage for rearing kokanee until the annual cycle of inundation and dewatering of the proposed inundation area creates a littoral zone with reduced complexity and vegetation, similar to what is there now. The length of time required to transition to a less productive rearing area is not known due to many factors influencing that time, including length of time that the proposed inundation area is inundated. However, the transition from the existing forested and wetland habitat to minimally-productive littoral zone habitat is likely to take several decades to nearly a century.

Another aspect of inundation of kokanee redds that needs to be evaluated is the effect of additional inundation on top of kokanee redds. Presently kokanee spawn when the Bumping reservoir is between 7000 and 15000 acre feet. Rearing within the redd occurs while the reservoir is in a similar range of acre-feet on average.

With the expansion of the reservoir it is assumed that operations will change so that more water will be stored in Bumping Reservoir to take advantage of the additional capacity up to a maximum of 214,000 acre feet. Therefore, it is possible that rearing kokanee may experience a much greater depth of water over their redd at a time when they are essentially immobile. While kokanee within redds have likely experienced some amount of dewatering or inundation over the 100+ years that Bumping Reservoir has been operating, the large potential increase in the amount of inundation resulting from the Bumping Reservoir expansion could impact developing embryos detrimentally. The additional water depth could result in less dissolved oxygen and more concentration of waste products as intragravel flow through the redd declines and water velocities at the substrate/stream-water interface approach zero. More information about the potential Bumping Reservoir refill is necessary to evaluate the potential impact of increased reservoir levels on kokanee redd viability.

Positive impacts are expected with the assumed fish passage facilities that would incorporated into the construction of a new Bumping Dam. The ability of the present kokanee population to migrate freely downstream to the ocean and return to the reservoir as sockeye salmon would improve the long-term viability of the population by allowing an anadromous life history to express itself. The potential for existing sockeye salmon to stray or be reintroduced into the Bumping River would also improve genetic connectivity of the population. The influx of marine-derived nutrients to the Bumping River system would also improve habitat for kokanee and other fish and wildlife species.

Rainbow trout (PHS)

This species is known to occur in the Bumping River basin, both above and below Bumping Dam. Because rainbow trout are an obligate stream spawner, and 10.2 mi (16.5 km) of fish-bearing stream would be inundated and eventually become unsuitable for spawning. Similarly, early life-stage rearing habitat will be reduced. The overall impacts to the population because of this loss of spawning and rearing habitat is not known. A more detailed analysis and study of limiting factors for rainbow trout would need to be completed to quantify the overall impact.

Positive impacts for rainbow trout in a similar manner as they are described for kokanee (above) are expected given the rainbow trout/steelhead relationship.

Westslope cutthroat (PHS)

This species is known to occur in the Bumping River basin, both above and below the Bumping Dam. Because cutthroat trout are an obligate stream spawner, and 10.2 mi (16.5 km) of fish-bearing stream would be inundated and eventually become unsuitable for spawning. Similarly, early life-stage rearing habitat will be reduced. The overall impacts to the population because of this loss of spawning and rearing habitat is not known. A more detailed analysis and study of limiting factors for cutthroat trout would need to be completed to quantify the overall impact.

Positive impacts for cutthroat trout are expected given the assumed fish passage improvements incorporated into a new Bumping Dam and the connectivity to other cutthroat populations in the Yakima River Basin that it would provide.

4.3 Northern spotted owl impacts

Much of the lands within the reservoir expansion area either provide habitat to northern spotted owls in the form on nesting, roosting and foraging habitat (suitable habitat) or dispersal habitat. Those lands that are currently listed as unsuitable are in the process of habitat regeneration and may eventually become northern spotted owl habitat if left intact and do not fall to wildfires or disease prior to them maturing into habitat. Only the lands that are listed as non-habitat have no potential for developing into owl habitat. Both dispersal and suitable habitat is important for northern spotted owl occupancy in the area and loss of either type of habitat has an impact on spotted owl populations in the area. Northern spotted owl recovery plan lists habitat availability as one of the limiting features of the species' recovery (USFWS, 2011).

While lands in the expansion area do provide habitat to northern spotted owl, it should be noted that these areas are likely not the best quality of owl habitat within the larger area and specifically within the owl management circles. Habitats upslope from the reservoir expansion areas appear to be more mature in general, especially those habitats in the wilderness areas. None of the site centers for the five management circles are within the reservoir expansion area. Future habitat assessments might look to categorize those habitats, say within a mile of the reservoir expansion to habitats potentially lost within the expansion area.

This report's mapping techniques are based on USFWS habitat guidelines because the area is on federal forest land and the USFWS is likely to be consulted on impacts to this species habitats going forward. However, the Washington State forest practices rules (DNR, 2014) also defines northern spotted owl habitat. Specifically forest practice rules are more defined in the exact metrics that define habitat than the USFWS habitat definitions. Most habitats in the area of reservoir expansion will likely be defined the same under both sets of habitat definitions, however the amount of suitable versus dispersal habitat may change slightly depending on state of federal definitions. Areas investigated further for formal forest plots are recommended that they collect data to ensure determination of habitat type under either definition.

Two previous mapping efforts to determine northern spotted owl habitat impacts under the Bumping Reservoir enlargement have been conducted. One was by the USFWS under a 2009 memorandum (USFWS, 2009) and the other was a 2009 study contracted by the Bureau of Reclamation to ESA Adolfson a consulting group based in Seattle (ESA Adolfson, 2009) Both were desktop exercises, that is it does not appear that either effort conducted ground truth or digitizing of new habitat as was done for this effort. These efforts, both conducted in 2009, appeared to use existing datasets from either the USFWS critical habitat layer as was done by the USFWS memorandum or using the northern spotted owl habitat layer from the NW forest plan was done in the ESA Adolfson memorandum. WDFW believes that the mapping in this report is more refined that either of these two assessments due to the detailed mapping and ground truth methods identified in this report. This mapping

effort is still lacking detailed forest assessments in some areas that are identified in the "recommendation for future study" in Section 4.8.

4.4 Bull trout impacts

On average, a significant number of bull trout redds in Deep Creek will be impacted by the reservoir inundation. The reservoir level at the time of spawning will likely be within the present bull trout spawning reach known as "mouth to FR1800" in normal to above average water years. The reservoir level at the time of spawning in drought years, when Bumping Reservoir will be drafted more to meet downstream water demands, will likely be below the area where redds are currently constructed and spawning in the inundation zone will still be possible at least for some amount of time into the future. However, the development of degraded spawning habitat within the proposed inundation reach will eventually preclude spawning in this area. This is evidenced by the lack of spawning within Deep Creek's existing inundated reach and other inundated reaches for existing bull trout populations such as those found in Box Canyon Creek, Gold Creek, South Fork Tieton, and Indian Creek. How long this degradation takes to develop is dependent upon the frequency of sediment-mobilizing hydrologic events, the pool level at the time of these events, and the numbers of fish spawning in the proposed inundation reach. Even up until the time that spawning habitat has not degraded, the embryos and alevin inside the redds deposited within the proposed inundation reach may be detrimentally impacted by inundation during their incubation period in the gravel as described in methods. This will depend on how quickly the Bumping Reservoir fills to the new inundation level of 3490 ft and for how long individual redds will be inundated.

The time-line for these kinds of impacts to develop depends on many different variables, including rainfall, snowpack, air temperature, water demands, and others. Therefore, we are not able to determine how long it will take for the proposed inundation zone to become inhospitable for spawning and rearing. However, given the proposed operation described in the introduction which involves using only the top 33,700 ac-ft of water in normal and above average water years, we expect the transition to occur more quickly than if the reservoir was drained each year to current low-pool capacities. This is because the potential low-pool elevation might be around elevation 3478 ft in normal to above average water years. Water at this elevation would be inundating some existing spawning habitat year-round. Years when drought occurs would draw the reservoir down further by the late summer, allowing access to existing spawning and rearing habitat.

Presently, most reservoirs in the Yakima River Basin are operated to fill sometime in May depending on snowpack, temperature, rainfall, carry-over storage, and water demands downstream. If the enlarged reservoir were operated to fill in May or later, it is possible that impacts to incubating and rearing bull trout will be limited to forcing them to rear in suboptimal areas (either the lake environment or a smaller rearing area between their birth redd and the lake) since they are mobile by early spring. Bull trout typically rear in streams downstream of their birth redd because of their poor swimming ability when first emerging from the redd, so being forced to rear in a smaller area may be detrimental to their development or increase predation

upon them by larger fish of other species. Incubating bull trout in the lower reaches of the inundation zone would be the first to be impacted because those reaches will be the first to be inundated as the lake refills. If the pool level did rise to levels that inundate redds before February or March, while embryos are still within gravel, incubating juveniles could experience mortality or impaired development from low dissolved oxygen levels and waste accumulation due to a lack of intragravel flow. Further information regarding the expected timing of the refill of an enlarged Bumping Reservoir is needed to be able to quantify impacts to incubating bull trout.

Mastin et al. (2011) report that snow water equivalent in the Naches River basin could reduce by as much as 18.5% by 2030 and 59% by 2090. This suggests that flows in Deep Creek will experience more dewatering in the future. For this reason WDFW is concerned that Deep Creek flows similar to those observed in drought years could become more frequent. In the drought years of 1994, 2001, and 2005, and average of 43.6% (range of 33.3 to 63.3%) of bull trout redds in Deep Creek were estimated to have been created in the proposed inundation reach, likely because dewatering within upstream reaches blocked passage of bull trout adults on their spawning migration. This suggests that many more redds would be impacted by the proposed Bumping Reservoir enlargement than suggested by recent averages of redds within the proposed inundation zone due to climate change. Even in normal and above average water years redds are constructed in this proposed inundation and will experience the potential developmental delay or increased mortality from being inundated or being forced into a smaller rearing area between their birth redd and the lake.

The relationship between flow and the percentage of redds occurring within the proposed inundation reach shows that more redds occur within the proposed inundation reach when flows are low in Deep Creek. This is supported by the observation that portions of spawning reaches within reaches of Deep Creek further upstream go dry, preventing spawning there. If reduced stream flow predictions are true, the more frequent occurrence of dewatered areas in the upper reaches of Deep Creek suggest that bull trout will not simply be able to move upstream above the proposed inundation zone to spawn. The spawning population within Deep Creek is the 2nd largest in the entire Yakima Basin given the last 10 years of redd data. Deep Creek is the only major spawning tributary into Bumping Reservoir. Reduced spawning opportunity in Deep Creek could significantly impact this stronghold for bull trout.

The amount of fish-bearing stream habitat presently accessible by fish in Bumping Reservoir would be reduced by 16.5 km (10.2 mi) or 37.3% due to the inundation. Fish that currently spawn within the proposed inundation area in Deep Creek will potentially move upstream to non-inundated portions, though in drought years we have shown that opportunity for spawning further upstream is not likely because of the significant dewatering there that forces spawning in the lower reach of Deep Creek. Fish that currently rear in Deep Creek, and to a lesser extent other tributaries such as Granite Creek, Upper Bumping River, Cedar Creek, and the unnamed tributary east of Deep Creek, will be forced into a smaller rearing area that could increase intraspecific competition and predation. This reduced rearing area is

will occur because of the loss of habitat due to the inundation and be aggravated by the temporary and permanent barriers further upstream, as well as less-suitable habitat upstream of the inundation line. For some streams, habitat above the proposed inundation zone (above 3490 ft) likely becomes less suitable due to high stream gradients, reduced flows, larger substrate, or dewatered portions. Therefore, it is possible that habitat for bull trout, and other fish, will effectively be reduced by more than 37.3% since the areas that will be available after the proposed Bumping enlargement are less suitable. A more thorough assessment of habitat above the proposed inundation zone should be completed to quantify this reduction in fish habitat and is discussed in section 4.7.

Flow in Deep Creek through the present inundation zone has never been observed to be low enough to cause a passage barrier to upstream-migrating bull trout. However, considering flow reduction predictions by Mastin et al. (2011), and the presence of unconsolidated sediment in the channel through the existing and proposed inundation zones, the possibility that upstream fish passage could be blocked is of concern. The combination of future low discharge and the resulting shallow and unconsolidated flow through a much longer proposed inundation zone could result in upstream fish passage blockages similar to what has been observed in Box Canyon Creek, Upper Kachess River, Indian Creek, and Gold Creek.

The enlarged Bumping Reservoir is expected to significantly alter the hydrologic pattern of surface waters, and potentially groundwaters, in the lower Bumping River. Given operations at other reservoirs in the Yakima River Basin, we expect flows from an enlarged Bumping Reservoir to be consistently low and much less variable between October and ~April and higher between ~May and September to meet downstream irrigation demands. This less-normative hydrograph could result in reduced habitat suitability for fish in the lower Bumping River and Naches River, as well as loss of floodplain functions and reduced large woody material (LWM) in the river. Compounding the loss of LWM due to sustained high flows is the possibility that the altered hydrograph below the enlarged Bumping Dam will likely result in more recreational boating activity. As observed on the Tieton and Upper Yakima Rivers, increases in recreational boating can result in reduced LWM in reaches below dams as downed wood can be a hazard for boaters. We also recognize that the operations of the enlarged Bumping Reservoir may be similar to present operations with the exception of drought years. The potential for changes to the existing hydrologic pattern will depend upon the frequency of drought years in the future. We recommend that further analysis of impacts to floodplain functions downstream of the enlarged Bumping Dam, including the Naches River, be completed to define impacts due to potential additional releases of water from an enlarged Bumping Reservoir. This analysis will be useful when developing a strategy to mitigate for the loss of floodplain functions in the Bumping River.

The impact to spawning and rearing tributaries due to the proposed inundation between elevation 3426.2 ft and 3490 ft has been discussed previously. There are other unnamed tributaries that may not be used for spawning or rearing habitat that will also succumb to the effects of inundation. WDFW has concern that, collectively, the loss of the riparian habitat within the fish-bearing and nonfish-bearing streams

could result in a net loss of productivity in the Bumping River system. Fish-bearing habitat impacted by the inundation is estimated at 16.5 km (10.2 mi). Non-fish-bearing habitat, which still has value as riparian habitat and can contribute to overall productivity of the system, has not been quantified but could significantly increase the effective total miles of riparian habitat impacted. The net impact of this loss of fully functioning riparian habitat needs to be quantified and the impacts mitigated if the Bumping Reservoir expansion moves forward.

4.5 Steelhead impacts

It is not known how much of the habitat that will be available to steelhead above the new proposed Bumping Dam (assuming upstream fish passage facilities will be incorporated into the construction) is suitable for steelhead spawning and rearing. A comparison of steelhead spawning and rearing habitat in other parts of the Naches River Basin to available spawning and rearing habitat in Bumping Reservoir tributaries above the inundation zone should be made to assess whether the loss of spawning and rearing habitat below the present Bumping Reservoir will be equal to, greater than, or less than, the spawning and rearing habitat that is available above the Bumping Reservoir. The potential degradation of rearing habitat in the lower Bumping River due to the expected change in releases from the new Bumping Dam should be taken into account in this comparison. That is, the comparison should be between the rearing habitat in the lower Bumping River available in the future to the rearing habitat available above the proposed Bumping Dam. An analysis of coho and sockeye production potential was performed by Reclamation in 2007 (Reclamation Similar analysis of steelhead production potential to the

4.6 Chinook salmon impacts

The potential loss of 11% or 9% of the total number of redds in the Lower Bumping River due to the proposed inundation would be a significant impact to the spring chinook salmon population. However, given that the new dam would have upstream passage for spring chinook adults on their spawning run, it is important to consider the amount of spawning habitat that will be made accessible to these fish above the dam. With the higher maximum pool elevation proposed, only about 60 meters of the Upper Bumping River will be available for spring chinook spawning. The same spawning habitat in Deep Creek that will remain intact for bull trout above the inundation zone will be available for spring chinook. However, in many years the amount of flow in Deep Creek is less than is typically observed in spring chinook spawning reaches elsewhere in the Naches River Basin, so it is not known how much of the present spawning habitat in Deep Creek would effectively be used by spring chinook. A comparison of spring chinook spawning habitat in other parts of the Naches River Basin to available spawning habitat in Bumping Reservoir tributaries above the inundation zone should be made to assess whether the loss of spawning habitat below the present Bumping Reservoir will be equal to, greater than, or less than, the spawning habitat that is available above the Bumping Reservoir. A similar assessment of spring chinook rearing habitat should be completed to compare the loss of 2.4 km (1.5 mi) or 1.9 km (1.2 mi) of suitable rearing habitat below the Bumping Dam to the new habitat available to chinook passing the new Bumping Dam.

4.7 Fish benefits if Bumping Reservoir is expanded

The Bumping Reservoir expansion is likely to result in several benefits to fish species both directly from the expansion and indirectly due to the assumed fish passage facilities that will be included in the project.

Since 1910 anadromous fish have been unable to spawn and rear in the Bumping River above the dam. There is approximately 37.6 km (23 miles) of fish-bearing habitat that will be available above the proposed inundation level, some of which will be suitable for a variety of species of spawning and rearing salmonids, including steelhead. Besides the potential increase in habitat for these species to use, the very presence of these anadromous fish will bring marine-derived nutrients to the Upper Bumping River system and bring more marine-derived nutrients to the Bumping and Naches River system than previously experienced. This will be beneficial to fish and wildlife throughout this system.

Since 1910, bull trout below Bumping Dam have been unable to genetically connect with bull trout above the dam and limited genetic exchange likely occurs between bull trout from above the dam to populations downstream of the dam via entrainment and occasional passage over the spillway. Assuming fish passage facilities will be incorporated into the proposed Bumping Dam construction, bull trout from other populations will be able to genetically connect with the Bumping Reservoir population and vice-versa, increasing the overall viability of the Yakima River bull trout Ecologically Significant Unit (ESU). These positive benefits are not likely to fully mitigate the negative impacts to bull trout due to an expanded reservoir that causes degraded (inundated) spawning and rearing habitat in Deep Creek. More information is required to determine how much on site/in kind or offsite/in kind mitigation can be formulated and incorporated into this process to keep bull trout populations in the Yakima River Basin unimpaired or improved by the Bumping Reservoir expansion. In particular, the feasibility of a supplementation hatchery for bull trout in the Yakima Basin should be determined.

Presently Granite Creek, Boulder Creek, and several other smaller streams have reaches that go dry in the summer and fall depending on snowpack, temperature, and rainfall. This results in reduced rearing habitat for bull trout and other resident species of fish. The higher maximum pool elevation will likely reduce the magnitude and duration of these areas that dewater, allowing for increased opportunity for rearing for bull trout and other species, including those that have been blocked by the Bumping Dam since 1910. Further assessment of rearing habitat in these creeks is required to determine the value of this habitat before the impact of new fish passage can be quantified.

Presently there is a natural 5-foot cascade on Cedar Creek that is a passage barrier at lower flows. The proposed inundation level is expected to reach the approximate elevation of this passage barrier and may allow fish passage at this barrier for more portions of the year. More information regarding the timing of the proposed maximum pool, as well as an assessment of rearing habitat in Cedar Creek, is necessary to quantify this potential habitat benefit. In addition, the lower portion of Cedar Creek does dewater and more information regarding the extent of that

dewatering relative to the timing of the proposed inundation is necessary to fully evaluate this idea that passage would benefit fish in Cedar Creek.

4.8 Discussion on recommendations for future studies

Studies should be completed prior to writing of an EIS, so that an EIS can fully determine impacts to fish and wildlife habitat.

1. *Rare Plants Surveys*
   Surveys were conducted for Oregon goldenaster, State Threatened species. Rare plant surveys should be conducted for all State listed species in the area (there are no possible federally listed species in the area). In addition to Oregon goldenaster, Sierra Onion is also believed to have some limited potential. The Suksdorfia chapter of Washington Native Plant society (WNPS) is conducting an native plant inventory of the inundation area July 16-19, 2015. Copies of that inventory should be obtained once completed as they will be useful for impacts to plant species for this project.
2. *Larch Mt Salamander Surveys*

   Habitat was identified for this report. Species protocol surveys need to be conducted at each area for presence. The species is not recorded for Yakima County, but they were not recorded until recently for Kittitas County when populations were discovered. Habitat similar to areas in Kittitas County exists around Bumping Reservoir. Protocol surveys must be conducted during certain environmental conditions which occur in the spring and fall.
3. *PHS Species*

   PHS species were recorded incidentally during fish and wildlife habitat surveys for this report. As Bumping Reservoir area is covered well by biologists and recreational users, existing databases are useful for documenting species presence. This report surveyed the area repeatedly during the fall of 2014, but not other times of the year beyond limited visits in March and April 2015. Some limited wildlife surveys are recommended for the area prior to the writing of an EIS to assess wildlife information, particularly birds, during the spring breeding season. If a substantial time period exists between this report date and writing of an EIS, databases should be searched again for updated fish and wildlife information.
4. *Northern Goshawk Surveys*

   The Bumping Reservoir area has several historical northern goshawk territories near the reservoir expansion area. These areas should be surveyed according to USFS protocol (Woodbridge and Hargis, 2006) to determine occupancy of those territories and how their habitats will be impacted by the new dams and reservoir expansion.
5. *Northern Spotted Owl Habitat*
   Some areas of spotted owl habitat should be further refined. Areas listed as suitable and borderline dispersal/suitable in this report had metrics that were marginal for those categories based upon spot checking forest measurements

used for this report. To understand metrics in these stands, formal forest plots should be conducted to determine if these areas qualify as suitable habitat (nesting, roosting and foraging habitat).

6. *Northern Spotted Owl Presence Surveys*
   The areas surrounding Bumping Reservoir have been historically occupied by up to six northern spotted owl territories, though currently only one is known to be active. Some of these territories are not surveyed on a regular basis by USFS, due to staff resources. The area around Bumping Reservoir should be surveyed according to USFWS protocol (USFWS, 2012a) prior to an EIS being written to understand northern spotted owl occupancy of the area.

7. *Wetland Impacts*

   Assess impacts of the reservoir expansion on wetland habitats including loss of fish and wildlife habitat. Report should also examine potential for wetlands to move upslope gradually if reservoir is raised slowly over a decade or more. Report impacts would guide mitigation discussions for this habitat loss.

8. *Bull Trout Rearing Habitat Surveys*
   Complete habitat surveys on streams upstream of the proposed inundation area and below the proposed inundation. It is not known if fish currently rearing in stream reaches proposed for inundation would use the reaches upstream of the inundation for rearing. Habitat surveys would include quantification of pool frequency, pool depth, large woody material counts, streambank cover, stream gradient, estimates of stream flow at periodic times of year, salmonid spawning habitat availability, temperature, etc. WDFW's Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual (WDFW 2009) could be used as a guideline for metrics to measure for these surveys.
   This information is vital for accurate determination of impacts of the proposed dam. Particular attention should be paid to the unnamed tributary just downstream of the Bumping Dam Spillway. This creek was not surveyed completely due to insufficient time in the fall season of 2014, but the 160 m (0.1 mi) that was surveyed had what appeared to be suitable bull trout habitat (Appendix D, Picture 24). If this stream did have suitable habitat above the inundation line, removal of the man-made passage barrier and regrading of the stream at the mouth of this creek could be a potential mitigation activity to compensate for the loss of rearing habitat for bull trout and other species that use Bumping Reservoir tributaries.

9. *Bull Trout presence surveys*
   Complete bull trout presence/absence surveys in the reaches that were surveyed in 2014 by the YBIP team as well as above the inundation zone line. Include surveys at different times of year to determine temporal use of tributary streams by all species of fish including bull trout. This information will be necessary to quantify impacts to bull trout relative to the expected pool elevation at different times of year.

10. *Salmonid spawning habitat assessment*
    As described in section 4.6, it is not known whether there is an equivalent or greater amount of spring chinook spawning habitat in Bumping Reservoir tributaries above the inundation zone than in the inundated area below the Bumping Dam where significant spring chinook spawning takes place. Kilometers of impacted spawning habitat below the dam are 2.0 and 1.5 km depending upon the location of the proposed dam. There will be little spawning habitat available in the Upper Bumping River after the reservoir enlargement due to the impassable falls approximately 1 river mile (1.6 km) upstream of the reservoir. The portions of the remaining 4.6 river miles (7.4 km) of Deep Creek above the proposed inundation zone of the enlarged Bumping Reservoir need to be assessed to determine their capacity to support spring chinook spawning. If the amount of Spring chinook spawning habitat in Deep Creek is equal to or greater than that lost by the inundation below the Bumping Dam, overall impacts to Spring chinook spawning would be neutral or positive. If the habitat in Deep Creek is less than that lost below Bumping Dam, overall impacts to spring chinook would be negative and avoidance of those impacts, or mitigation for that loss of habitat, should be pursued.

    This same type of analysis should be performed on other species that are likely to use fish passage facilities assumed to be incorporated in a new Bumping Dam. These species include bull trout, all chinook races, steelhead, coho, sockeye, and cutthroat trout. Though this analysis was completed for coho and sockeye in 2007 (Reclamation, 2007a; Reclamation 2007b), that analysis did not consider the loss of habitat due to the inundation.

11. *Inundation impact on salmonid embryos*
    As discussed in section 4.4, a complete analysis of the effects of the new proposed inundation level(s) on salmonid habitat is not possible because the timing of refill of the proposed enlarged reservoir and frequency of full inundation and dewatering of present spawning habitat is not known. Presently the impact is limited to bull trout, rainbow trout, and cutthroat trout juveniles, but the analysis should include impacts to juveniles of all species that would potentially spawn in Bumping Reservoir tributaries after a new dam was constructed with fish passage facilities. The impacts to bull trout, spring chinook, steelhead, coho, sockeye, and cutthroat trout should be analyzed with respect to timing of inundation and egg/alevin incubation.

12. *Develop monitoring plan for Deep Creek sediment deposition.*
    The increase in reservoir elevation during winter and spring runoff may increase the likelihood of sediment depositing in the existing and proposed inundation zone through which Deep Creek flows. Sustained high flows in Deep Creek in the winter and spring when the reservoir may be full or at least filling within the inundation zone have the potential for sediment mobilization during this time. This problem could be further aggravated by lower base flows predicted by climate change. Thus there is the potential for fish passage impediments. The Bumping Reservoir elevation reached full pool in

February 2015 and that year has been considered a representation of future water years as climate change changes our snow-dominated water supply to a rain-dominated supply. WDFW would like this issue to be recognized and have it included in a long term adaptive management program for Deep Creek. This could take the form of regular passage condition observations after the new Bumping Dam is constructed during the bull trout, steelhead, chinook, coho, and sockeye spawning periods, with some kind of plan to take action to improve fish passage if necessary. In addition, development of a discharge/gage height relationship at the Deep Creek below Copper Creek gage is necessary to develop a more precise relationship between discharge and spawning distribution.

13. *Evaluate riparian stream habitat impacts*
    As discussed in section 4.4, the loss of riparian habitat as a result of the expanded inundation zone proposed could impact the overall productivity of the Bumping River basin, especially above the proposed Bumping Dam. An assessment to quantify the riparian functions that will be impaired or lost by the inundation should be completed so that mitigation for this loss can be attempted.

4.9 Recommendations for avoidance of impacts to species and habitats (BMPs)

1. The dam site for the smaller pool option 1.8 km (1.1 mi) below the current dam will result in less impacts to stream and terrestrial impacts than the dam site 2.6 km (2 mi) downstream of the dam. Habitats in this area are part of an occupied northern spotted owl management circle (Sunrise Creek) and though habitat in this area was mapped as dispersal, less habitat loss would likely lessen impacts for owls in this territory. The area below the dam and downstream to the bridge over the Bumping River (2.6 km below Bumping Dam and containing 3.2 km of stream habitat) is currently used as spring chinook and steelhead spawning and rearing, as well as bull trout rearing and possibly spawning, and this habitat will be reduced by 3.2 km of stream habitat (large pool option) or 2.4 km (small pool option) after the construction of the proposed dam and the pool created by this dam.
2. Consider building the dam with a lower maximum pool elevation that will reduce the amount of habitat acres and stream miles impacted. This would provide a more reasonable range of alternatives for the EIS and prompt an analysis that would provide a graduated scale of impacts to terrestrial and aquatic systems based on different reservoir levels. For instance, the acres of forest inundated, miles of stream impacted, or percent of bull trout redds inundated at a particular reservoir level could be evaluated for cost benefit between impacts and water conserved.
3. Construction of the dam should occur outside of the nesting season for birds, specifically northern goshawk and northern spotted owls; which is generally defined as March-August.
4. If possible, the reservoir level should be raised gradually (over a period of years) to allow some shift in wetlands upslope. If this is not conducted, there will be a dramatic loss of emergent and littoral wetlands at Bumping

Reservoir. These wetlands support both fish and wildlife habitats and support western toad breeding areas.

5. Avoid or reduce cutting forests in the inundation area. Upland forests that die through reservoir inundation will create snag habitat for wildlife and shoaling habitat for fish around the roots. These snags will eventually fall into the lake, creating shoreline habitat. WDFW understands that logs coming near the dam may need to be collected and would expect those to be stored for future restoration projects, or anchor a portion of them in place for habitat in the lake. Co-develop a plan for management of the wood with WDFW, Yakama Nation, USFS, USFWS and other stakeholders.
6. Once a more accurate design of the proposed dam and its inundation area is available, consult with biologists from WDFW and USFS to more accurately assess impacts to species and help develop ways to further minimize risk.
7. Conduct an analysis of habitat impact and downstream floodplain functions in the Bumping River, and Naches River, due to additional releases of water from an enlarged Bumping Reservoir. Develop a strategy to mitigate for the loss of functions that might include purchase of floodplain properties, restoration of floodplain functions to downstream reaches, and installation of LWM or other structures to improve floodplain functions in downstream reaches.
8. Prohibit recreational boating activity in key reaches of the Bumping and Naches Rivers to discourage the need for removal of LWM by boaters. In other reaches where recreational boating is allowed, increase educational outreach opportunities to educate the public about the value of LWM for fish and wildlife habitat and proper floodplain function. Increase enforcement patrols as necessary to reduce unauthorized LWM removal.

4.10 Mitigation Definition

WDFW policy 5002 (WDFW, 1999) requires that mitigation sequencing be used to identify mitigation scenarios. "Mitigation" means actions that shall be required or recommended to avoid or compensate for impacts to fish, wildlife, or habitat from the proposed project activity. The type(s) of mitigation required shall be considered and implemented, where feasible, in the following sequential order of preference:

1. Avoiding the impact altogether by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
5. Compensating for the impact by replacing or providing substitute resources or environments.

6. Monitoring the impact and taking appropriate corrective measures to achieve the identified goal.

The spirit of the first priority, avoiding the impact altogether, is beginning to be addressed in section 4.8, Recommendations for avoidance of impacts to species and habitats. Further ideas for avoiding the impacts can be explored as the preferred alternatives are selected and developed. WDFW priorities for mitigation location and type are listed below in decreasing order of preference:

1. On-site, in-kind. This refers to an activity that is adjacent to the project impact site and affects the same species or habitat that was impacted.
2. Off-site, in-kind. This refers to an activity that is not adjacent to the project impact site but still within the same Water Resource Inventory Area, and affects the same species or habitat that was impacted. For off-site mitigation to be accepted, the project proponent must demonstrate to WDFW's satisfaction that greater habitat function and value can be achieved off-site than on-site.
3. On-site, out-of-kind. This refers to an activity that is adjacent to the project impact site and does not affect the same species or habitat that was impacted.
4. Off-site, out-of-kind. This refers to an activity that is neither adjacent to the project impact site nor does it affect the same species or habitat that was impacted.

Out-of-kind mitigation is not acceptable for impacts to priority habitats and species, with two exceptions: (1) priority habitats and species that are at greater risk can be substituted for impacted priority habitats and species; and (2) for hydraulic projects, WDFW shall consider off-site and/or out-of-kind mitigation where equal or better biological functions and values are provided. Priority habitats, and habitats of priority species, may be replaced at a level greater than the impacts of the project on those habitats and species (WDFW, 1999). For example, if a project impacts 10 acres of priority habitats and species, the mitigation site must impact greater than 10 acres of priority species habitat.

Further as part of WDFW mitigation three key concepts are important to note:

- Proven mitigation techniques must be used.
  Experimental mitigation techniques are allowable only if advance mitigation is being performed and will be fully functional prior to the project impacts.
- Mitigation shall proceed along with project construction.
  Mitigation measures are an integral part of a construction project and shall be completed before or during project construction, except projects with impacts that have no proven mitigation techniques. Those projects require advance mitigation.
- Delayed mitigation shall include replacement that is greater than losses.
  Mitigation that is implemented after project construction, or that requires a long time to reach replacement value, shall include additional habitat value (over and above replacement value) equal to the loss through time.

4.11 Suggestions for Mitigation

Out of kind mitigation is not being suggested here, in part given the longer timeline of this project and that time has not been given to fully explore opportunities for in-kind mitigation first.

On-site, In-kind:

1. For forest impacts to northern spotted owl habitat, work with USFS to improve habitat through forest treatments elsewhere in the Bumping River drainage, preferably within these spotted owl management circles if possible. Areas surrounding Bumping Reservoir are in a mixture of national forest lands and wilderness areas. Forest treatments would not be possible in the wilderness areas so some off-site mitigation is likely needed in addition to on-site.
2. Wetland impacts are expected to be substantial for this project as existing wetlands on the shore of Bumping Reservoir may be inundated by up to 60 feet of new water during periods when the reservoir is at full pool. Some on-site mitigation may be possible by slowly raising the pool allowing for some shift in wetlands upslope. This would need to happen over many years, perhaps a decade to have the potential for wetland shift. If this idea is possible, wetland scientists should be consulted on periods of inundation and how much wetland habitat could be reduced by raising the reservoir slowly. This on-site option is preferred as species who rely on these wetland areas such as western toad may not be found in other off-site mitigation areas.
3. For talus impacts, acquisition on-site is unlikely as all of the area that might contain talus habitats surrounding Bumping Reservoir is federally owned. The forest around these talus areas is important for species such as Larch Mountain Salamander and American pika that use the talus habitat. Mitigation could include working with the USFS to establish areas around these talus slopes that would be protected from future harvest.
4. Remove the abandoned infrastructure of the water wheel from the mouth of the unnamed tributary just downstream of the Bumping Dam Spillway. See pictures 25 and 26 that show this feature. This is dependent upon the results of the investigation recommended in section 4.8.
5. Install LWM and complete other floodplain restoration activities in the lower Bumping River and Naches River to mitigate for the loss of spawning and rearing habitat below the existing Bumping Dam.
6. The loss of more than 37% of existing rearing and spawning habitat for bull trout and fish species that will expand into the Upper Bumping River system should be mitigated. Potential activities to accomplish this could be providing passage over existing barriers on Deep Creek (barrier falls), the Upper Bumping River (barrier falls), Granite Creek (culvert), and Cedar Creek (natural cascade). Activities on Deep Creek would mitigate losses for bull trout spawning and rearing. Activities on the Upper Bumping, Cedar Creek, and Granite Creek would mitigate for bull trout rearing but also open up spawning and rearing habitat for species that will

expand there after the proposed Bumping Dam is constructed and help limit competition for spawning and rearing habitat between bull trout and these other species.

Off-site, In-kind:

1. Inundation of this many acres of forested habitat is not likely to be able to mitigated for completely on-site. Mitigation should be targeted through a combination of acquisition of spotted owl habitat to protect from development and improving existing forest through forest management techniques. If not on-site, mitigation habitat should be targeted within the same demographic area where owls impacted from the Bumping Lake area might be able to disperse to new habitat protection areas.
2. Wetlands impacts are unlikely to be fully mitigated for on-site. Mitigation options should look for opportunities to recruit or acquire lands that contain wetlands of a similar type to those that have been lost. Consideration should be given for species most impacted such as western toad. Large lake wetland complexes are unlikely in the Bumping River watershed due to lack of similar habitat. Other places to explore might include other lake wetland areas in the Naches and Tieton basins and the Teanaway Community forest as an option, or elsewhere in the Yakima River Basin.
3. Impacts to talus habitats may need to be mitigated off-site. Some impacts could be mitigated on-site through protection from harvest as identified in On-site, In-kind above. As it is not possible to enhance these talus areas, acquisition and protection of talus areas in high mountain areas where species such as American pika and potentially Larch Mountain salamander may use them is the goal of mitigation for these impacts.
4. If the results of the spawning and rearing habitat analyses recommended in section 4.8 suggest that significant spawning habitat in tributaries to the Bumping Reservoir will be lost due to the inundation, implement habitat restoration activities in bull trout streams elsewhere in the basin including Box Canyon Creek, Indian Creek, Gold Creek, Cold Creek, Upper Kachess River, Teanaway River, and the American River to mitigate for the loss of spawning and rearing habitat.
5. Depending upon the result of the recommendation in section 4.8 (13) to evaluate the impact of the reduced riparian habitat on the overall productivity of the Bumping River Basin, implement riparian habitat restoration to address the loss due to the proposed inundation.
6. Other off-site/in-kind projects that would support bull trout populations and mitigate for lost bull trout habitat due to the Bumping Reservoir expansion are found in the Bull Trout Enhancement document (Reclamation and Ecology, 2014). Projects listed there could provide off-site/in-kind mitigation if that have not already been implemented and used as mitigation for other projects. They include:
    a. Box Canyon passage improvement for the section of stream as it passes through the inundation zone.

b. Gold Creek passage and habitat improvements.
c. Continuation of the Bull Trout Task Force to educate the public about bull trout needs and monitor bull trout passage.
d. Kachess River and Box Canyon assessment to limit channel dewatering.
e. South Fork Tieton River assessment to repair the
f. Bull trout population enhancement
g. Improve productivity and food resources for bull trout.

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6.0 Appendices

Appendix A. Pictures of PHS habitats impacted by the proposed projects.

Picture 1. Palustrine forested wetland. This wetland was one of the wetlands mapped by biologists for this report.

Picture 2. Palustrine emergent wetland. Wetland located along unnamed tributary adjacent to Deep Creek.

Picture 3. Emergent wetlands. Photo taken near the dam at full pool in April 2015.

Picture 4. Talus habitat along southeastern shore of Bumping Reservoir.

Picture 5. Talus slopes of large rock size. Supports American pika.

Picture 6. Cliff habitat along Bumping River that would be inundated by the proposed new dam.

Appendix B. Pictures of Larch Mountain salamander habitat locations within proposed Bumping Reservoir expansion area.

Picture 7. Northeast area near the proposed inundated line.

Picture 8. Southeast area near the proposed inundation line.

Picture 9. Talus near southwest shore of Bumping Reservoir.

Picture 10. Talus near north shore of Bumping Reservoir. This area would be partially inundated by the proposed inundation.

Appendix C. Pictures of representative northern spotted owl habitat types within the proposed expansion area of Bumping Reservoir.

Picture 11. Suitable northern spotted owl habitat in northwest corner of project area.

Picture 12. Borderline suitable northern spotted owl habitat for nesting, roosting and foraging habitat in northeastern project area. This is an example of an area that should be ground-truthed in more detail.

Picture 13. Borderline suitable northern spotted owl nesting, roosting and foraging habitat. This is an example of mixed conifer forest type that should be investigated further.

Picture 14. Dispersal habitat for northern spotted owls, mixed conifer forest.

Picture 15. Dispersal habitat for northern spotted owl. This area consists of mixed conifer forest.

Picture 16. Unsuitable habitat for northern spotted owl area dominated by lodgepole pine.

Appendix D. Pictures of bull trout habitat in the Bumping River Basin that would be inundated by the proposed Bumping Reservoir expansion.

Picture 17. Barton Creek with suitable rearing habitat for bull trout.

Picture 18. Lower Bumping River just below Bumping Dam where a bull trout was observed.

Picture 19. Lower Bumping River between Bumping Dam and Bumping Dam Spillway where a bull trout was observed.

Picture 20. Cedar Creek suitable bull trout rearing habitat.

Picture 21. Granite Creek suitable bull trout rearing habitat.

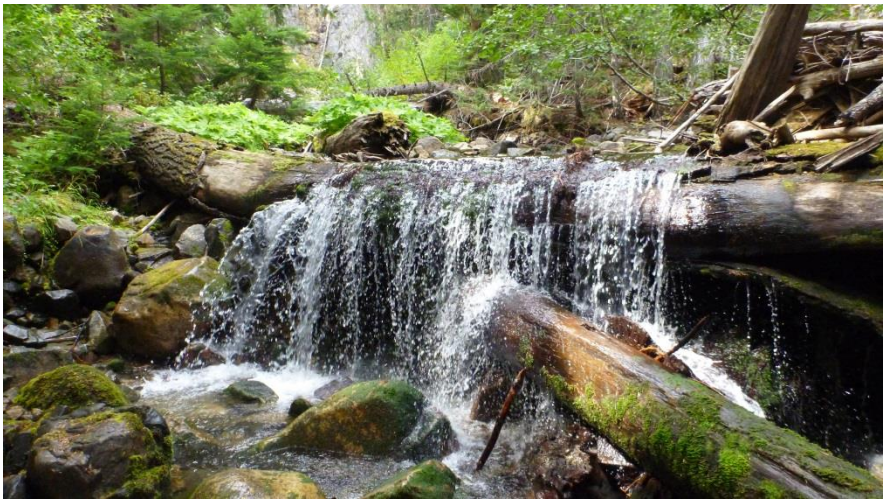
Picture 22. Beaver dam on Unnamed tributary east of Deep Creek. A bull trout was observed in the pool of this beaver dam.

Picture 23. Unnamed tributary east of Deep Creek that has suitable bull trout rearing habitat.

Picture 24. Unnamed tributary entering left bank downstream of Bumping Dam Spillway that has suitable bull trout rearing habitat.

Picture 25. Unnamed tributary entering left bank downstream of Bumping Dam Spillway and the passage barrier at its mouth. There is no pool associated with the 2-foot tall cascade shown here. This barrier is considered repairable so the habitat upstream of it was included in calculations of stream habitat available to fish coming from Bumping Reservoir. See Picture 26 for more information on this passage barrier.

Picture 26. Unnamed tributary downstream of Bumping Dam Spillway and the passage barrier just upstream of its mouth. The infrastructure related to the old water wheel prevents passage as well as the cascade just downstream of this point (Picture 25). This barrier is considered repairable so the habitat upstream of it was included in calculations of stream habitat available to fish coming from Bumping Reservoir.



Picture 27. Five–foot cascade on Cedar Creek caused by large woody material. This is a passage barrier at the flows shown here but may be passable at higher flows or with rearrangements of large woody material that can occur naturally. Thus, habitat upstream of it was included in calculations of stream habitat available to fish coming from Bumping Reservoir.

Picture 28. Impassable barrier at Granite Creek caused by culvert under FR1800. This barrier is considered repairable so the habitat upstream of it was included in calculations of stream habitat available to fish coming from Bumping Reservoir.

Appendix E. List of all fish and wildlife species found during field studies performed under this contract. Species on this list were observed between August 22, 2014 and April 13, 2015.

Amphibians
Cascades Frog
Pacific Tree Frog
Tailed Frog
Western Toad

Reptiles
Northern Alligator Lizard

Mammals
Black Bear
Cascades Golden-mantled Ground Squirrel
Douglas Squirrel
Elk
Mule Deer
Pika
Yellow-pine Chipmunk

Birds
American Dipper
American Pipit
American Robin
American Three-toed Woodpecker
Belted Kingfisher
Black-backed Woodpecker
Cackling Goose
Canada Goose
Chestnut-backed Chickadee
Common Merganser
Common Raven
Dark-eyed Junco
Evening Grosbeak

Birds Cont.
Golden-crowned Kinglet
Gray Jay
Great Blue Heron
Hairy Woodpecker
Hermit Thrush
Mountain Chickadee
Northern Flicker
Osprey
Pacific Wren
Pileated Woodpecker
Pine Siskin
Red Crossbill
Spotted Sandpiper
Steller's Jay
Townsend's Solitaire
Townsend's Warbler
Varied Thrush
Vaux's Swift
Western Wood-pewee
White-crowned Sparrow
Williamson's Sapsucker
Yellow-rumped Warbler

Fish
Brook Trout
Bull Trout
Cutthroat Trout
Mountain Whitefish
Rainbow Trout
Sculpin
Chinook Salmon