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Reintroduction of Bull Trout to the Clackamas River, Oregon

FINDING OF NO SIGNIFICANT IMPACT

We, the U.S. Fish and Wildlife Service (Service), jointly with the State of Oregon (ODFW), and in cooperation with the U.S. Forest Service, Mt. Hood National Forest (USFS), National Marine Fisheries Service (NMFS) and Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), will reintroduce a nonessential experimental population (NEP) of bull trout (*Salvelinus confluentus*) in the Clackamas River and its tributaries in Clackamas and Multnomah Counties, Oregon, under section 10(j) of the Endangered Species Act of 1973, as amended (Act). The geographic boundaries of the NEP include the entire Clackamas River subbasin as well as the mainstem Willamette River, from Willamette Falls to its points of confluence with the Columbia River, including Multnomah Channel. The best available science indicates that reintroduction of bull trout to the Clackamas River subbasin is biologically feasible and will promote the recovery of the species. The accompanying environmental assessment (EA) supports our Finding of No Significant Impact (FONSI).

The EA and FONSI will be made available to the public concurrent with publication in the *Federal Register* of the final rule to reintroduce bull trout to the Clackamas River as a nonessential experimental population under 10(j) of Act.

You may view or download the EA, final rule, and supporting documents from the internet at the following links:
http://www.fws.gov/oregonfwo/Species/Data/BullTrout/ReintroductionProject.asp

http://www.regulations.gov [Docket No. FWS-R1-ES-2009-0050]

The EA, final rule, and supporting documents may also be viewed by appointment at the Fish and Wildlife Service, Oregon Fish and Wildlife Office, 2600 SE 98th Avenue, Portland, Oregon 97266.

BACKGROUND

On December 9, 2009, the Service published: (1) a proposed rule in the Federal Register to establish a nonessential experimental population of bull trout in the Clackamas River subbasin, Oregon (74 FR 65045); and (2) a draft environmental assessment (DEA) in accordance with the National Environmental Policy Act of 1969, as amended (NEPA) (74 FR 65045). We contacted interested parties including Federal and State agencies, local governments, scientific organizations, interest groups, and private landowners through a press release and related fact sheets, and emails. In addition, we notified the public and invited comments through news releases to local media outlets. The public comment period for the proposed rule and DEA closed on February 8, 2010.

In development of the final rule and environmental assessment (EA), we reviewed all comments received for substantive issues and new information regarding the proposed NEP. Substantive comments received were addressed in the *Public Comment* section of the final rule published concurrently with this FONSI and associated EA, are appended to the EA, or are incorporated directly into the final rule or EA as appropriate.

PURPOSE AND NEED FOR ACTION

The purpose of the project is to re-establish a self-sustaining bull trout population ranging from 300 to 500 spawning adults annually in the Clackamas River by 2030 that contributes to the conservation and recovery of bull trout in the Willamette River Basin and to overall draft recovery criteria outlined in the Service's draft bull trout recovery plan (USFWS 2002), or as updated in a final recovery plan.

Bull trout are extirpated from the Clackamas River subbasin and due to geographic distance to extant bull trout populations in other subbasins, natural recolonization is extremely unlikely without human assistance (USFWS 2002, Shively et al., 2007). Extirpation occurred during the 1960s and was likely due to many of the factors that led to the decline of the species across its range including migration barriers from hydroelectric and water diversion dams, direct and incidental harvest in sport and commercial fisheries, targeted eradication with bounty fisheries, and habitat and water quality degradation from forest management and agricultural activities (Shively et al., 2007). The last documented bull trout observation in the Clackamas River subbasin was in 1963 (Stout 1963).

Restoring bull trout to historic habitat, where deemed suitable, is a major recovery goal and objective listed in the draft bull trout recovery plan and it is particularly relevant to habitats in the western (i.e., "coastal") portion of the species' range due to the extensive loss of distribution and the documented extirpation of multiple bull trout populations. The Willamette River, a tributary of the lower Columbia River, has experienced extirpations of bull trout from four major subbasins, including the Clackamas River. Although the overall recovery strategy is to reduce and minimize threats affecting bull trout and their habitat, the magnitude of bull trout extirpations in the Willamette Basin, combined with the size of the basin and low probability of natural recolonization, will likely require reintroductions, such as the action proposed in the Clackamas River subbasin. The Clackamas River, due to the quantity and quality of available habitat, likely provides one of the best opportunities to reestablish a viable population of bull trout into historical habitat within the "coastal" evolutionary lineage.

ALTERNATIVES CONSIDERED

The Service analyzed two alternatives in the environmental assessment: 1) The proposed action - reintroduce bull trout to the Clackamas River subbasin under 10(j) nonessential experimental population (NEP) designation; and, 2) No action alternative - do not reintroduce bull trout into the Clackamas River subbasin. The no action alternative would continue existing river management without release of bull trout and this increment of recovery for the species would not occur.

The environmental assessment considered five additional alternatives but eliminated them from further study for various reasons that are discussed in the EA. We have determined that the proposed action meets the purpose and need described above and have chosen the proposed action, as described below, as our preferred alternative over the no action alternative.

SUMMARY OF THE PROPOSED ACTION

To implement the reintroduction of bull trout to the Clackamas River we will utilize a single donor stock from the Metolius River (Deschutes River Basin) in Central Oregon. We will collect fish of various life stages (initially juvenile, subadult, and adult) consistent with project numerical goals and in proportion to donor availability. Following annual disease screening and invasive species prevention planning, bull trout will be transferred annually from the Metolius River to suitable habitat in the upper Clackamas River via a three-phased adaptive management approach until either: (1) an evaluation of the program shows the goal of the project has been met, or is on a trajectory to be met through natural reproduction based on monitoring and evaluation; (2) mid-process outcome evaluation suggests the reestablishment of bull trout is unlikely (i.e., the project is not showing success); or (3) monitoring and evaluation indicates unacceptably high population level impacts to federally listed salmon and steelhead in the Clackamas River.

ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

The EA analyzed impacts of the proposed action on the physical, biological and social environments in the Clackamas River subbasin. A summary of our findings are presented below.
Physical: Minor effects to the physical environment would occur from the proposed action from the installation and operation of passive PIT tag and radio telemetry monitoring stations in multiple locations within the Clackamas River subbasin. Some of these stations will operate year-round whereas others will be installed and operated seasonally. These monitoring stations, which will generally be located on the Mt. Hood National Forest, are portable and will not require the construction of any permanent features on the landscape. Monitoring stations not located in the Mt. Hood National Forest will utilize existing infrastructure associated with PGE's Clackamas Hydroelectric Project. The purpose of these monitoring stations is to document the distribution and seasonal movement of tagged bull trout as a component of the project's monitoring and evaluation program.

Biological: The proposed action has the potential to affect the biological environment in multiple ways including 1) food web impacts, specifically to threatened salmon and steelhead from predation, competition, and predator avoidance; 2) disease; 3) invasive species; and, 4)

impacts to the bull trout donor stock population in the Metolius River. Among these, the dominant concern expressed in the stakeholder meetings and in the public comments received on the DEA and proposed rule was potential impacts to threatened salmon and steelhead from the proposed action.

- Foodweb (Impacts to Salmon and Steelhead): Although there were no public comments on the proposed rule and DEA that opposed a reintroduction of bull trout to the Clackamas River, there was concern expressed regarding possible impacts of the project on threatened salmon and steelhead in the Clackamas River. These concerns were also identified in stakeholder/scoping meetings conducted prior to the development of the DEA, and by the NMFS, the agency with jurisdiction over federally listed anadromous salmonids.

  Commensurate with these concerns, the Service and our project partners have expended considerable effort to assess the likely impacts of the proposed action on salmon and steelhead, and to develop a monitoring and evaluation program to inform the adaptive management of the project and guide appropriate management decisions. Our assessment of potential impacts to salmon and steelhead, our monitoring and evaluation program, and the adaptive management plan are described in the EA and its appendices, as well as the final 10(j) rule. A more detailed analysis of effects can be found in our biological assessment submitted to the NMFS pursuant to Section 7(a)(2) of the Act (USFWS 2011a).

  In our assessment of direct and indirect effects from the proposed action, we identified the likelihood of predation of eggs, fry, and juvenile salmon and steelhead by bull trout, and competition between bull trout and anadromous salmonids for food resources and habitat. Avoidance of downstream fish passage facilities may constitute additional effects to juvenile salmon and steelhead if bull trout stage or forage near these facilities or other PGE hydro project features that concentrate migrating juveniles (smolts). While adverse effects to salmon and steelhead individuals (eggs, fry, juveniles) are expected due to bull trout predation and competition, direct population level effects (generally measured by adult returns), are not expected. Prior to releasing bull trout in the Clackamas River, we will complete any required interagency cooperation with NMFS pursuant to section 7(a)(2) of the Act.

  The proposed action contains three critical components that will limit adverse effects to threatened salmon and steelhead. First, we have developed, and are committed to, a robust monitoring and evaluation program to determine whether we are meeting the project's goals and objectives, including limiting impacts to salmon and steelhead. Second, the information gained through our monitoring and evaluation program will feed into the adaptive management framework outlined for the project, furthering our effectiveness with project implementation and ensuring if negative impacts to salmon and steelhead are identified, appropriate management actions are taken. Lastly, the 10(j) designation, under which the reintroduction will be implemented, will allow significant flexibility to manage the reintroduced bull trout population, and the ability to enact management actions to address project-related impacts to salmon and steelhead. We have determined that the proposed action, which includes measures to minimize impacts

and reduce risk to threatened salmon and steelhead, will not result in significant adverse effects.

- Disease: We will follow project-specific disease screening protocols for inter-basin fish transfers as required by the State of Oregon. These protocols require annual testing of 150 bull trout fry and 60 adults from the Metolius River prior to transferring fish to the Clackamas River each field season. Associated with the development of the proposed action, two years of disease screening have occurred with no pathogens of concern being detected. Due to the negative findings from recent disease screening, and our commitment to continue to adhere to the disease screening protocols developed for the project, we have determined the risk of disease transfer to be low.

- Invasive Species: The proposed action will adhere to guidance contained in a project specific invasive species plan that was created using the Hazard Analysis Critical Control Point (HACCP) protocol. The plan was developed collaboratively between the Service and ODFW (USFWS 2011). The primary invasive species concern with the proposed action is the transfer of New Zealand mud snail from the Deschutes Basin to the Clackamas River subbasin. The occurrence of New Zealand mud snail in Lake Billy Chinook was recently documented. Although the probability of field staff encountering mud snails or bull trout ingesting mud snails is low, as a precaution, the invasive species plan stipulates that bull trout collected for transfer from Lake Billy Chinook will be held for a 48 hour depuration period at Round Butte Isolation Facility in clean water, prior to transfer and release in the Clackamas River. In addition, standard protocols contained in the plan will be followed to prevent transmission of invasive species from field equipment such as wading boots, nets, traps and associated gear. Due to the low incidence of mud snail in the donor stock collection area, and our commitment to adhere to the HACCP protocol, we have determined the risk of invasive species transfer to the Clackamas River subbasin to be low.

- Donor Stock: The decision to utilize Metolius River bull trout as a donor stock was based on a rigorous assessment of donor stock suitability in the Feasibility Assessment (Shively et al. 2007). The decision was significantly influenced by the current trend and abundance of the Metolius River bull trout population which is the healthiest population in Oregon. Based on redd counts, the Metolius bull trout population has maintained greater than 1,000 spawning adults since 2002, thereby meeting current minimum abundance criteria (i.e., 800 spawning individuals) outlined in the Service's draft recovery plan (USFWS 2002). Based on the current status of Metolius River bull trout, the donor stock criteria discussed above, the methods of donor stock removal, the commitment on behalf of the donor stock advisory group to assess the donor stock program and status annually, we believe the appropriate safeguards are in place to prevent any negative impacts to the Metolius River bull trout population from its donor stock contribution to the Clackamas bull trout reintroduction.

Social: The principal activities on private property near the expected reestablishment area in the NEP are agriculture, ranching, hydropower generation, and recreation. The presence of bull trout would likely not affect the use of lands for these purposes because under a NEP designation there would be no new or additional economic or regulatory restrictions imposed upon States, non-Federal entities, or members of the public due to the presence of bull trout. Therefore, the reintroduction of bull trout to the Clackamas River under NEP designation is not expected to

have any significant adverse impacts to recreation, agriculture, hydropower generation, or any development activities.

Take of bull trout within the experimental population area will be allowed provided that the take is unintentional, not due to negligent conduct, or is consistent with State fishing regulations that have been coordinated with the Service. We expect levels of incidental take to be low because the reintroduction is compatible with existing activities and practices in the area. As recreational fishing for species other than bull trout is popular within the NEP area, we expect some incidental take of bull trout from this activity but, as long as it is in compliance with ODFW fishing regulations, such take will not be a violation of the Act.

The proposed action, and associated rulemaking, does not require any additional changes, protections, or mitigation or enhancement measures for bull trout with respect to PGE's operation of Project 2195 (Clackamas River Hydroelectric Project) pursuant to the Settlement Agreement or the new license for the Project; nor does any provision of the final rule amend or modify the Settlement Agreement or require that any plan pursuant to the Settlement Agreement be modified to address the presence of bull trout.

COORDINATION

In addition to the Service's Oregon Fish and Wildlife Office and Columbia River Fisheries Program Office, the project's primary agencies and cooperators are listed below. A complete list of agencies, organizations and persons contacted can be found in Chapter 5 of the EA.

Oregon Department of Fish and Wildlife
U.S. Forest Service, Mt. Hood & Deschutes National Forests
National Marine Fisheries Service
Confederated Tribes of the Warm Springs Reservation of Oregon
U.S. Geological Survey –Forest and Rangeland Ecosystem Science Center
Portland General Electric

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for the proposed action, it is hereby determined that the reintroduction of bull trout to the Clackamas River, Oregon, will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

Paul Henson
State Supervisor

6/17/11
Date

Reintroduction of Bull Trout to the Clackamas River, Oregon

Environmental Assessment

Prepared by:

U.S. Fish and Wildlife Service
Oregon Fish and Wildlife Office

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Photo: Joe Maroney, Kalispel Tribe

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Summary

The U.S. Fish and Wildlife Service (Service), jointly with the State of Oregon, and in cooperation with the U.S. Forest Service, Mt. Hood National Forest (USFS), National Marine Fisheries Service (NMFS) and Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), propose to establish a nonessential experimental population (NEP) of bull trout (*Salvelinus confluentus*) in the Clackamas River and its tributaries in Clackamas and Multnomah Counties, Oregon, under section 10(j) of the Endangered Species Act of 1973, as amended (Act). The geographic boundaries of the NEP include the entire Clackamas River subbasin as well as the mainstem Willamette River, from Willamette Falls to its points of confluence with the Columbia River, including Multnomah Channel. The best available data indicate that reintroduction of bull trout to historical habitat in the Clackamas River subbasin is biologically feasible and will promote the conservation and recovery of the species.

Bull trout from the Metolius River (Deschutes River Basin) have been identified as suitable donor stock and can provide sufficient individuals for release into suitable habitat identified in the upper portion of the Clackamas River subbasin (defined as the headwaters downstream to North Fork Reservoir, RM 30). We anticipate releasing bull trout annually into the upper Clackamas River via a 20-year three-phased adaptive management approach until either: (1) an evaluation of the program shows the goal of the action (Section 1.2 below) has been met, or is on a trajectory to be met; (2) mid-process evaluation suggests the reestablishment of bull trout is unlikely; or (3) evaluation indicates greater than anticipated impacts to federally listed salmon and steelhead in the Clackamas River from predation and competition.

The Service, in collaboration with ODFW, conducted stakeholder/scoping meetings in October and November, 2008, to share information from the Clackamas River Bull Trout Reintroduction Feasibility Assessment (Shively et al. 2007), as well as a draft proposed action to reintroduce the species to historical habitat in the Clackamas River. The meetings also provided an opportunity for participants to provide comments and ask questions regarding the feasibility assessment and the possible reestablishment of the species in the Clackamas River.

Based in part on the comments received through the stakeholder/scoping meetings, we developed and subsequently published a proposed rule and draft environmental assessment (DEA) on December 9, 2009, (74 FR 65045). We requested written comments on the proposed rule and DEA from the public and appropriate Federal, State, and local agencies, Tribes, scientific organizations, and other interested parties. The comment period was open from December 9, 2009 to February 8, 2010. We reviewed all comments received for substantive issues and new information regarding the proposed NEP. Substantive comments have been addressed in the *Public Comments* section of the final rule published concurrently with this environmental assessment (EA) or were incorporated directly into the final rule or this EA (*Public Comments* section of the final rule is included as Appendix A).

In addition to the proposed action and a no action alternative, this EA also considered five other action alternatives, which, while eliminated from detailed study, are summarized in section 2.3 of this EA.

1.0 Introduction, Purpose and Need

1.1 Introduction

On November 1, 1999, we published a final rule to list bull trout within the coterminous United States as threatened under the Act (64 FR 58910). The historical range of bull trout in the coterminous United States extended from the Canadian border south to the Jarbidge River in northern Nevada and from the Pacific Ocean inland to the Clark Fork River in western Montana and the Little Lost River in central Idaho. Genetic analyses have shown that bull trout in the coterminous United States are divided into major genetically differentiated (e.g., evolutionary) groups or lineages (Spruell et al. 2003; Ardren et al. 2010, In Press; Taylor et al. 1999). At a coarse scale, these assessments have identified the existence of distinct "coastal" and "interior" lineages. The "coastal" lineage includes the Deschutes River and all of the Columbia River drainage downstream (including the Willamette Basin), as well as coastal streams in Washington, Oregon, and British Columbia. The "interior" lineage includes tributaries of the Columbia River upstream from, and including, the John Day River, including major river basins in northeastern Oregon, eastern Washington, Idaho, and northwestern Montana.

In a finer-scale analysis, the Service recently identified additional genetic units within the coastal and interior lineages (Ardren et al. 2010, In Press). Based on a recommendation in the Service's 5-year Review of the species' status (USFWS 2008), the Service reanalyzed the 27 recovery units identified in the draft bull trout recovery plan (USFWS 2002) by utilizing, in part, genetic information from this finer-scale genetic analysis. In this examination, the Service applied relevant factors from the joint Service and NMFS Distinct Population Segment (DPS) policy (61 FR 4722) and subsequently identified six draft recovery units that contain assemblages of core areas that retain genetic and ecological integrity across the range of bull trout in the coterminous United States. These six draft recovery units were used to inform designation of critical habitat for bull trout by providing a context for deciding what habitats are essential for recovery (75 FR 63898). The six draft recovery units identified for bull trout in the coterminous United States include: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake.

The current distribution of bull trout in the lower Columbia River portion of the "coastal" lineage includes populations in the Deschutes (including the Metolius River subbasin), Hood, Lewis, Klickitat and the upper Willamette rivers (McKenzie and Middle Fork Willamette subbasins). Throughout much of its historical range, the decline of bull trout has been attributed to habitat degradation and fragmentation, the blockage of migratory

corridors, poor water quality, fisheries management and overharvest, entrainment (the incidental withdrawal of fish and other aquatic organisms in water diverted out-of-stream for various purposes) into diversion channels and through dams, and introduced nonnative species. Specific land and water management activities that depress bull trout populations and degrade habitat include dams and other diversion structures, forest management practices, livestock grazing, agriculture, agricultural diversions, road construction and maintenance, mining, and urban and rural development (Beschta et al., 1987; Chamberlain et al., 1991; Furniss et al., 1991; Meehan, 1991; Nehlsen, et al. 1991; Craig and Wissmar, 1993; Frissell, 1993; McIntosh et al., 1994; Wissmar et al., 1994; MBTSG, 1995a-e, 1996a-f; Light et al., 1996; USDA and USDI, 1995, 1996, 1997).

Range-wide, bull trout exhibit both resident and migratory life history strategies, although bull trout in the "coastal" lineage are generally migratory. Migratory bull trout spawn in tributary streams where juvenile fish rear one to four years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard, 1989; Goetz, 1989), or saltwater (anadromous form) to rear as subadults and to live as adults (Cavender, 1978; McPhail and Baxter, 1996; WDFW et al., 1998). Bull trout normally reach sexual maturity in four to seven years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Both consecutive-year and alternate-year spawning have been reported (Fraley and Shepard, 1989). Bull trout's preferred habitat consists of cold water, complex cover, stable channels, loose and clean gravel and barrier-free migratory corridors (Fraley and Shepard, 1989; Goetz, 1989). More information about the life history and decline of bull trout can be found in the final listing decision of the species as threatened (63 FR 58910), the final designation of critical habitat for the species (70 FR 56212), and the Service's draft bull trout recovery plan (draft recovery plan) (USFWS 2002).

Bull trout are extirpated from the Clackamas River subbasin and due to geographic distance to extant bull trout populations in other subbasins, natural recolonization is extremely unlikely without human assistance (USFWS 2002, Shively et al. 2007, Dunham et al. 2007). Extirpation occurred during the 1960s and early 1970s and was likely caused by many of the same factors that led to the decline in the species across its range including migration barriers resulting from hydroelectric and diversion dams, direct and incidental harvest in sport and commercial fisheries, targeted eradication with bounty fisheries, and habitat and water quality degradation from forest management and agricultural activities (Shively et al., 2007). The last documented bull trout observation in the Clackamas River subbasin was in 1963 (Stout 1963).

The historical distribution of bull trout in the Clackamas River subbasin likely extended from the lower Clackamas River upstream to headwater spawning and rearing areas (Shively et al., 2007). However, it is unlikely that bull trout historically occupied habitat upstream of waterfall barriers known to impede upstream movement of anadromous salmon and steelhead species in the Clackamas River.

The continued presence of bull trout populations in other subbasins of the Columbia River with similar habitat is evidence that the Clackamas River subbasin may support reestablishment of bull trout. To determine the current suitability of habitat in the Clackamas River subbasin, and availability of an appropriate donor stock, a scientifically rigorous, peer reviewed feasibility assessment was completed by members of the Clackamas River Bull Trout Working Group (CRBTWG) in 2007. The CRBTWG formally convened in 2004 for the purpose of exploring the possibility of reintroducing bull trout into the Clackamas River subbasin as part of overall recovery efforts for the species. The group is comprised of representatives from the Service, ODFW, USFS and other stakeholders including Portland General Electric (PGE). The Clackamas River Bull Trout Reintroduction Feasibility Assessment (Feasibility Assessment) determined that a reintroduction of bull trout into the upper Clackamas River is feasible based on the following factors:

(1) There is a high level of confidence that bull trout have been locally extirpated from the Clackamas subbasin;

(2) The causes for their decline have been sufficiently mitigated;

(3) High quality habitat is available in sufficient amounts;

(4) Nearby donor stocks are unlikely to naturally recolonize;

(5) Suitable donor stocks are available that can withstand extraction of individuals;

(6) Nonnative brook trout presence is restricted to a small portion of the suitable habitat and not a likely threat; and,

(7) A diverse and abundant fish assemblage would serve as a sufficient prey base with no obvious threats posed by bull trout to these species.

The November 1, 1999, final rule that listed bull trout within the coterminous United States served to consolidate the five separate DPS listings into one listing throughout the species' entire range in the coterminous United States. We published a draft recovery plan for the Columbia River, Klamath River, and St. Mary-Belly River segments on November 29, 2002 (67 FR 71439), and the Coastal Puget Sound and Jarbidge River segments on July 1, 2004 (69 FR 39950 and 69 FR 39951, respectively). We published a revised final designation of critical habitat for bull trout in the coterminous U.S. on October 18, 2010 (75 FR 63898). We anticipate publishing a revised draft and final recovery plan in 2012. The recovery objectives from the 2002 draft recovery plan are:

(1) Maintain current distribution of bull trout within core areas as described in recovery unit chapters and restore distribution where recommended in recovery unit chapters;

(2) Maintain stable or increasing trend in abundance of bull trout;

(3) Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies; and

(4) Conserve genetic diversity and provide opportunity for genetic exchange.

New draft recovery units were identified in the October 2010, bull trout critical habitat final rule (75 FR 63898). We anticipate these 6 recovery units will replace the 27 recovery units previously identified in our 2002 draft recovery plan (67 FR 71439), and that these new units will be incorporated into the revised draft recovery plan expected to be published in 2011. The recovery criteria specific to the 27 recovery units identified in the 2002 draft recovery plan continue to inform demographic recovery targets at the core area scale. Therefore, the criteria identified below for what was then described as the Willamette River Recovery Unit in the 2002 draft recovery plan (USFWS 2002, Ch. 5) are still relevant:

(1) Distribution criteria will be met when bull trout are distributed among five or more local populations in the recovery unit: four in the Upper Willamette River core area and one in the Clackamas River core habitat.

(2) Abundance criteria will be met when an estimated abundance of adult bull trout is from 900 to 1,500 or more individuals in the Willamette River Recovery Unit, distributed in each core area as follows: 600 to 1,000 in the Upper Willamette core area and 300 to 500 in the Clackamas River core habitat.

(3) Trend criteria will be met when adult bull trout exhibit stable or increasing trends in abundance in the Willamette River Recovery Unit, based on a minimum of 10 years of monitoring data.

(4) Connectivity criteria will be met when migratory forms are present in all local populations and when intact migratory corridors among all local populations in core areas provide opportunity for genetic exchange and diversity.

Establishment of an experimental population of bull trout in the Clackamas River will help to achieve distribution in the Clackamas River core habitat (recovery criterion 1 and recovery objective 1) and will increase abundance of adult bull trout in the Willamette River basin (recovery criterion 2 and recovery objective 2 from Chapter 5 of the draft recovery plan).

1.2 Purpose of the Action

The purpose of the proposed action is to re-establish a self-sustaining bull trout population ranging from 300 to 500 spawning adults annually in the Clackamas River by 2030 that contributes to the conservation and recovery of bull trout in the Willamette River Basin and to overall draft recovery criteria outlined in the Service's draft bull trout recovery plan (USFWS 2002), or as updated in a final recovery plan.

1.3 Need for the Action

Restoring bull trout to historic habitat, where deemed suitable, is a major recovery goal and objective listed in the draft bull trout recovery plan and it is particularly relevant to habitats in the western (i.e., "coastal") portion of the species' range due to the extensive loss of distribution and the documented extirpation of multiple bull trout populations. The Willamette River, a tributary of the lower Columbia River, has experienced extirpations of bull trout from four major subbasins, including the Clackamas River. Although the overall recovery strategy is to reduce and minimize threats affecting bull trout and their habitat, the magnitude of bull trout extirpations in the Willamette Basin, combined with the size of the basin and low probability of natural recolonization, will likely require reintroductions, such as the action proposed in the Clackamas River subbasin. The Clackamas River, due to the quantity and quality of available habitat, likely provides one of the best opportunities to reestablish a viable population of bull trout into historical habitat within the "coastal" evolutionary lineage.

1.4 Consultation and Coordination

In development of this EA, the ODFW has agreed to be a co-lead agency and the USFS has agreed to be a cooperating agency, as defined by NEPA. Representatives from these two agencies, the Service and other major stakeholders, including PGE, have been actively involved in the aforementioned CRBTWG. Due to the presence of, and potential impacts to, federally listed anadromous salmonids in the Clackamas River subbasin, the Service conducted an ESA section 7 consultation with the NMFS.

In accordance with the presidential memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments" (59 FR 229511), Executive Order 13175 (65 FR 67249), and the Department of the Interior Manual Chapter 512 DM 2, the Service is consulting with the CTWSRO on a government-to-government basis because (1) two percent of the acreage included in the Clackamas River subbasin is land owned and managed by the CTWSRO; and (2) CTWSRO are co-managers, along with ODFW, of bull trout in the Metolius River subbasin, the preferred donor stock source for a reintroduction to the Clackamas River. The Service is also consulting on a government-to-government basis with the Confederated Tribes of the Grand Ronde Community of Oregon (CTGRCO). The antecedent tribes and bands of CTGRCO included signatories to the Treaty with the Kalapuya Etc. of January 22, 1855,

otherwise known as the Willamette Valley Treaty, which ceded the entire Willamette Basin, including the Clackamas River system, to the United States in exchange for certain benefits and reserved rights. Of these reserved rights, one is access to cultural resources. All fish populations present on the ceded lands at the time of treaty signing are cultural resources of CTGRCO; therefore the interest of CTGRCO in the proposed action is that of restoring and protecting Tribal cultural resources.

Presentations have been provided at various stages in the development of this proposal at annual meetings of the Western Division and Oregon Chapter of the American Fisheries Society. The proposed project has also been presented to various conservation groups, Tribes, state and federal agencies and associated committees involved in recovery planning for salmon and steelhead, and other entities investigating bull trout reintroductions elsewhere within their historical range.

1.5 Scoping

The Service and ODFW solicited public input for the development of the draft EA and proposed rule through public stakeholder meetings in Portland, Oregon, in October and November 2008. These stakeholder meetings served as scoping meetings to inform the public and allow for comment on this action. Using the comments from the public stakeholder meetings, and previous discussions with the CRBTWG, other agencies, and Tribes, the Service developed a list of issues and concerns.

1.5.1. Issues and Concerns

The Service separated issues that were identified through the stakeholder meetings and other coordination into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of non-significant issues and concerns and reasons regarding their categorization as non-significant may be found in Appendix B. As for significant issues, the Service identified three such issues during scoping. These include:

1. Possible negative impacts of the reintroduction on three species of ESA listed anadromous salmon and steelhead in the Clackamas River (inclusive of associated issues such as predation and competition, potential for disease transfer, and sufficiency of forage base).

2. Possible impacts to the success of a reintroduction from hybridization and competition between bull trout and non-native brook trout that inhabit a small portion of suitable bull trout spawning and rearing habitat in the Clackamas River.

3. Possible negative impacts to the bull trout donor stock (Metolius River bull trout) from annual depletion of various life stages for transfer to the Clackamas River.

These three issues were assessed and considered in the subsequent development of the draft EA and proposed rule (74 FR 65045).

1.6 Public Comments

Based in part on the comments received through the stakeholder/scoping meetings, we developed and subsequently published a proposed rule and draft EA on December 9, 2009 (74 FR 65045). We requested written comments on the proposed rule and draft EA from the public and appropriate Federal, State, and local agencies, Tribes, scientific organizations, and other interested parties. The comment period was open from December 9, 2009, to February 8, 2010. We reviewed all comments received for substantive issues and new information regarding the proposed NEP. Substantive comments received have been addressed in the *Public Comment* section of the final rule, are appended to this EA (Appendix A), or are incorporated directly into the final rule or this EA, as appropriate.

We received comments from eight parties, including comments from natural resource management agencies, not-for-profit organizations, and private entities. All commenters specifically expressed support for the reestablishment of bull trout in the Clackamas River although three of the eight commenters expressed concerns regarding potential impacts to federally threatened salmon and steelhead present in the Clackamas River. One commenter suggested we designate critical habitat in the Clackamas River, two commenters suggested an “essential” designation rather than a “nonessential” experimental designation, and one commenter suggested bull trout in the Clackamas River should be fully protected under the ESA versus designation as “experimental.”

2.0 Alternatives

2.1 Alternative A: Proposed Action

Reintroduce bull trout to the Clackamas River subbasin under 10(j) nonessential experimental population (NEP) designation.

2.1.1 Goal of the Proposed Action.

The goal of the proposed action is to re-establish a self-sustaining bull trout population ranging from 300 to 500 spawning adults annually in the Clackamas River by 2030 that contributes to the recovery of bull trout in the Willamette Basin and to overall recovery criteria outlined in the draft recovery plan (USFWS 2002).

2.1.2 Geographic Scope of the Proposed Action

The geographic boundaries of the NEP, which encompasses all potential release sites, would include the entire Clackamas River subbasin as well as the mainstem Willamette River, from Willamette Falls to its points of confluence with the Columbia River, including Multnomah Channel. Based on recent surveys, as summarized in Shively et al. (2007), we have determined that this species currently does not exist in the Clackamas River or the portion of the Willamette River designated in this proposed action. More information about the geographic scope of the proposed action can be found in section 2.1.10.

2.1.3 Release Locations, Timing, Techniques

All juvenile bull trout will be released in habitat determined in the Feasibility Assessment (Shively et al. 2007) to be suitable for spawning and early juvenile rearing (Figure 1, section 2.6 below). With the exception of the mainstem Clackamas River habitat in Patch 1, habitat in the remaining patches is not likely suitable for year-round occupancy by adult and subadult bull trout due to stream size. Given the behavior of migratory bull trout in other basins in Oregon and Washington, we do not expect adult and subadult bull trout to be present in the relatively small streams in patches 2-6 except during the fall spawning period, typically late August through early October. As a result, and due to the spring and early summer timing of donor stock collection, releases of adults and subadults will likely occur in Patch 1 or upstream of Patch 1 in the mainstem Clackamas River between Pinhead Creek and Cub Creek. Consistent with the adaptive management of the project, if monitoring over the first several years suggests the older life stages are leaving the Clackamas River subbasin and not returning, a shift in release location and release timing may be considered. Bull trout juveniles, and fry if they are utilized in the future, will be released in all suitable streams (over a number of years) within habitat patches 1 thru 6 on a rotational basis.

Given the number of juveniles proposed for transfer on an annual basis (approximately 1,000) relative to the amount of suitable habitat available for stocking, and considering factors associated with monitoring these fish, we propose to limit annual stocking to two streams/patches within the area identified as suitable for spawning and early juvenile rearing. In addition, to account for annual environmental variability in the receiving habitat, fish condition, and to facilitate effective monitoring, we anticipate stocking the

same two streams/patches for a minimum of two years before shifting stocking to two new suitable streams/patches. We intend to split the number of juveniles equally between the two patches each year; i.e., 500 juveniles will be translocated to each patch.

2.1.4 Numbers and Life Stages

Based on existing donor population levels and donor criteria discussed above, and discussions with the CRBTWG and other project stakeholders, we propose the following maximum numbers of fish by life stage to be transferred each year during phase one of the project. As noted previously, annual monitoring of the donor stock and the reintroduced fish in the Clackamas River will further inform future numbers and life stages for transfer. The numbers and life stages of fish for transfer will be reviewed annually by the donor advisory group, as well as the two technical committees overseeing the reintroduction; the Implementation committee, and the Monitoring and Evaluation committee.

- Adults: Up to 30 per year (equal numbers of males and females if sex can be identified) for the first 2 years. Continuation through phase one is dependent on monitoring and evaluation results and donor availability. For this project adults are considered to be greater than 450 mm (18 inches). No fish greater than 650 mm (26 inches) will be transferred to the Clackamas River. Emphasis will be placed on the collection and translocation of adults at the lower end of the adult size range.

- Subadults: Up to 30 per year for the first 2 years. Continuation through phase one is dependent on monitoring and evaluation results and donor availability. For this project we consider subadults to be fish rearing in Lake Billy Chinook that are 250 mm – 450 mm (10-18 inches) in length.

- Juveniles (age 1, 2, 3): Up to 1,000 per year. Continue through phase one depending on monitoring and evaluation results and donor availability. For this project we consider juveniles to be fish less than 250 mm (10 inches) that are rearing in the Metolius River or tributaries. No bull trout will be transferred to the Clackamas River that do not meet the minimum size for tagging with a PIT tag, approximately 70 mm (2.75 inches) for a 12 mm PIT tag.

We are not proposing to utilize fry during the first phase of the project, and their future use is contingent upon the success of older life stages, as determined by monitoring and evaluation. We are not proposing to utilize fry initially for the following reasons: 1) fry inherently have a high mortality rate, thus high numbers are required to be transferred to confer survival to reproductive age; 2) fry can't be tagged effectively with current technology. We propose to PIT tag every individual translocated to the Clackamas River for monitoring presence, migration patterns, distribution, survival and growth. The

minimum length at which a fish can be PIT tagged is approximately 70 mm (2.75 inches) which precludes tagging fry; and 3) to capture the full genetic variability of a spawning population and associated run timing, outmigrating fry in the Metolius River would have to be collected throughout the spring beginning in late February and extending through May. Not only is this a labor intensive process, but access to release locations in suitable rearing habitat in the upper Clackamas River is typically blocked by snow until late spring. Therefore fry would need to be temporarily reared in a hatchery environment which, while feasible, is expensive, inherently risky, and labor intensive based on information from a bull trout captive rearing project at Leaburg Hatchery on the McKenzie River, Oregon.

Consistent with the adaptive management strategy of this project, following the initial two years of the project there will be a decision point at which time we will determine whether to continue subadult and adult transfers through phase one. The decision point will be informed by monitoring and evaluation and will be based primarily on whether older life stages are adapting to and residing in the Clackamas River, and for mature fish, showing indications of successful reproduction.

2.1.5 Timing and Duration of Reestablishment Activities

In order to meet the Purpose and Need of the proposed action, we anticipate releasing multiple life stages of bull trout into the upper Clackamas River subbasin annually (spring thru fall) during Phase One (year one through year seven). Releases may occur annually during Phase Two (year eight through year 14) and possibly Phase Three (year 15 through year 20) provided monitoring and evaluation indicates signs of success, donor stock continue to be available, and numerical goals have not been realized. Seasonal timing of releases may be contingent on access to some locations due to snow or other weather related issues. The adaptive management framework that the project will be implemented under will allow for any necessary modifications to the timing and duration of implementation based on information learned from project monitoring and evaluation.

2.1.6 Monitoring

Acknowledging the limited availability of information on fish introductions and reintroductions (Seddon et al. 2007, p. 305), the Service and our project partners adopted a goal early in project development to document, learn and report on all the major phases of the project beginning with our feasibility assessment (Shively et al. 2007; Dunham et al. 2011) and extending through project planning, development, and implementation. One of the most critical aspects of this goal is to document the effectiveness of the reintroduction by evaluating components of the implementation strategy, including the utilization of habitats chosen for release of individuals, the numbers and life stages of donor stock, the genetic health of the recipient population, documentation of reproduction

and recruitment, and ultimately the establishment of a self-sustaining bull trout population.

In order to document and adaptively manage the project, a robust monitoring and evaluation program is necessary. Along with other project documentation, we expect information gained from the monitoring and evaluation program will contribute significantly to other fish reintroductions, and specifically to bull trout recovery projects that we anticipate will occur across the species' range consistent with existing and future recovery guidance for the species (USFWS 2002). The monitoring and evaluation program, detailed in the Implementation, Monitoring and Evaluation Plan (Appendix C), has three major goals: (1) monitor and evaluate bull trout reintroduction effectiveness, (2) monitor and evaluate donor population status, and (3) monitor and evaluate impacts to listed anadromous salmonids. These three major components are summarized below:

> Reintroduction Effectiveness Monitoring: The objectives of the effectiveness monitoring program for phase 1 of the project (2011-2017) are to assess: (1) distribution and movement, (2) relative survival of translocated bull trout by monitoring presence and absence, (3) occurrence of spawning and reproduction, and (4) genetic health (as measured against the donor population). Successful reproduction in phase one of the project (2011-2017) would logically result in the incorporation of a monitoring component directed at assessing the distribution, movement, growth and survival of the initial cohorts of naturally produced bull trout. Monitoring activities in phase 2 (2018-2024) and phase 3 (2025-2030) will be informed by phase 1 monitoring and evaluation. Effectiveness monitoring of the project will be conducted jointly by the Service and ODFW, with assistance from the USFS.
>
> Donor Population Monitoring: We intend to monitor donor stock status annually to determine if the population is free of pathogens of concern, and to ensure the population maintains a minimum threshold of spawning adults to contribute as a donor stock to the Clackamas River bull trout reintroduction project. Bull trout in the Metolius River are monitored primarily by annual full census redd counts. These counts are conducted by ODFW, CTWSRO, USFS, PGE, and Service staff. In addition to the genetic monitoring of the recipient bull trout population in the Clackamas River subbasin, we will also replicate the Metolius River bull trout genetic health assessment (DeHaan et al. 2008) on the donor stock at an appropriate interval to ensure the loss of individuals via contribution to the Clackamas River reintroduction is not impacting the genetic health of the Metolius River donor stock.
>
> Monitoring Impacts to Anadromous Salmonids: The monitoring of potential impacts to juvenile anadromous salmonids will generally focus on PGE's Clackamas Hydroelectric Project area. Juvenile anadromous salmonids utilize project reservoirs, especially North Fork Reservoir, for rearing. Fish collection facilities which aid downstream migration of salmon and steelhead juveniles

necessarily concentrate the fish, increasing their vulnerability to predation and the potential for them to avoid collection facilities due to the presence of a predator. These areas of increased vulnerability for anadromous juveniles are also areas where we expect to be more able to detect a behavioral response caused by bull trout, relative to areas upstream of North Fork Reservoir or in the lower Clackamas River below River Mill Dam. We developed this monitoring component with the intent of reducing uncertainty and informing future management decisions associated with the bull trout reintroduction program.

In order to assess impacts to listed anadromous salmonids we propose to: (1) determine if adult and subadult bull trout occupy areas within the PGE hydroelectric project during periods in which they could consume particularly high numbers of rearing or migrating juvenile salmon and steelhead; (2) if so, determine if survival rates are affected for listed anadromous salmonid juveniles rearing in, or moving through the PGE hydroelectric project area; and (3) determine the degree to which bull trout are responsible for such impacts by using field data, bioenergetics, and life-cycle modeling. Monitoring of impacts to anadromous salmonids will be conducted by the Service and ODFW, with possible assistance from USGS, PGE, University of Washington, and the National Oceanic and Atmospheric Administration's Northwest Fisheries Science Center (NOAA-NWFSC).

As part of developing this proposed action, the Service conducted a section 7 consultation with NMFS due to potential impacts of the bull trout reintroduction on threatened anadromous salmonids in the Clackamas River. As part of the consultation, the Service and NMFS, in cooperation with ODFW, PGE and other project partners, developed a Stepwise Impact Reduction Plan (SIRP), included as Appendix III in the reintroduction project's Implementation, Monitoring and Evaluation Plan (Appendix C of this EA).

The purpose of the SIRP is to outline a sequence of management actions that, if necessary, will be taken to minimize impacts to federally listed salmon and steelhead from the reintroduction of bull trout in the Clackamas River, and to define the thresholds that would trigger initiation of these actions. Management actions implemented under the SIRP, and the frequency of those actions, will be driven by the population status of the listed Clackamas anadromous salmonid populations and information gathered through the reintroduction project's monitoring and evaluation program.

The SIRP is consistent with the adaptive management approach for the project. For the purposes of the SIRP, impacts (whether they can be directly monitored or not) are generally defined as: 1) direct predation on eggs, fry and juveniles of listed anadromous salmonids by bull trout; 2) competition for food and/or shelter between listed anadromous salmonids and bull trout, which could reduce juvenile salmon and steelhead fitness; and 3) predator avoidance behaviors which could reduce passage efficiencies for juvenile salmon and steelhead migrating through PGE Clackamas River Hydroelectric Project.

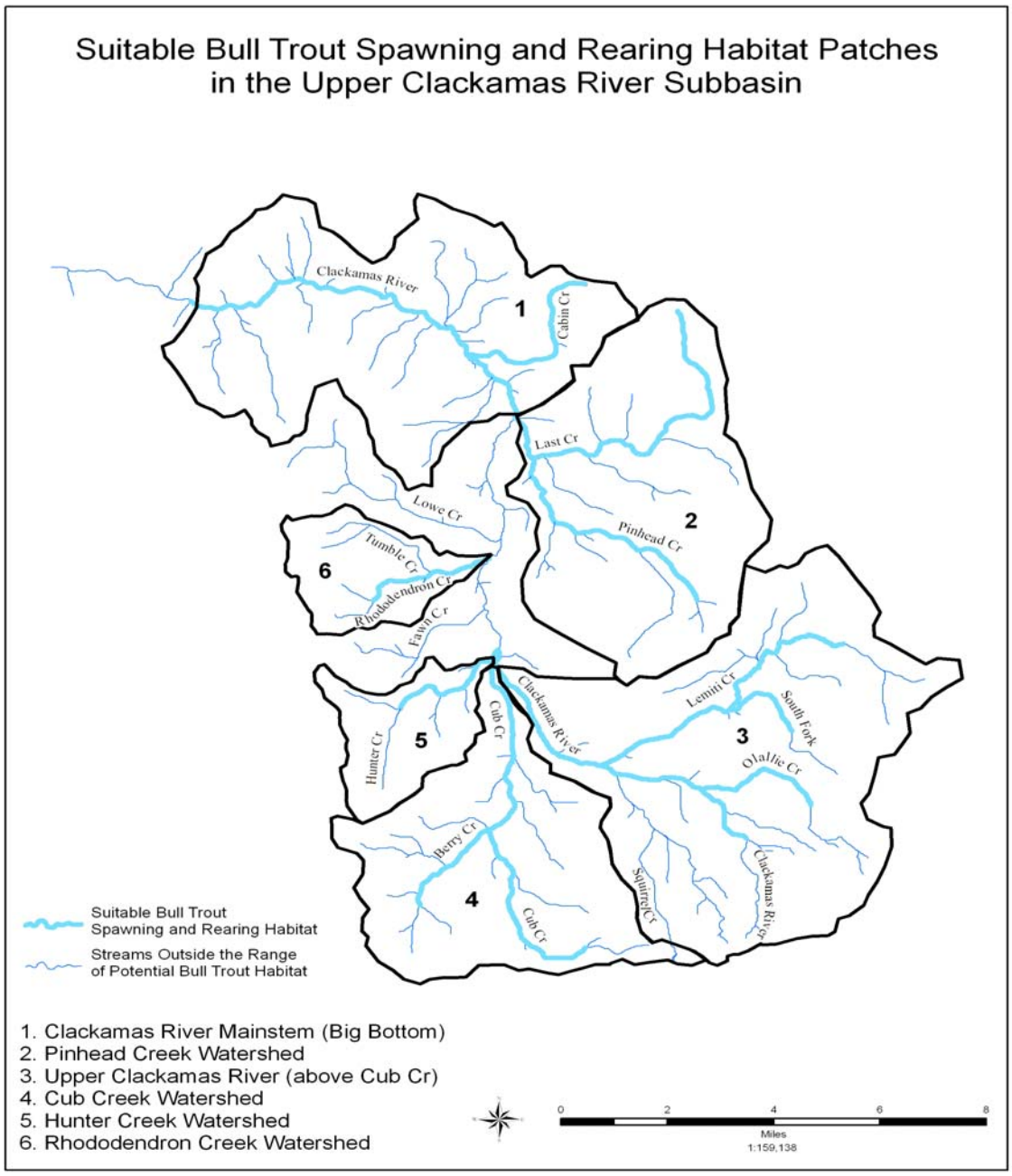

Figure 1. Suitable Bull Trout Spawning and Rearing Habitat Patches in the Upper Clackamas River

While we believe the SIRP will provide much of the guidance necessary to address potential impacts to listed salmon and steelhead from the reintroduction project, we acknowledge our inability to predict all likely impact scenarios and appropriate management responses. As a result, we anticipate the SIRP will be modified as necessary, consistent with the overall adaptive management strategy of the project, in consultation and coordination with NMFS and ODFW, and based on both the monitoring and evaluation program and the conservation status of threatened salmon and steelhead populations in the Clackamas River.

2.1.7 Adaptive Management

A key component of our proposed action is the adaptive management of the bull trout reintroduction project, ranging from the annual numbers, life stages and collection methods of the donor stock, to the locations and timing of translocations (implementation strategy), and finally the management of bull trout in the Clackamas River relative to their potential impact on threatened salmon and steelhead. Our goal with this approach is to find the greatest efficiencies and effectiveness with project implementation, while assuring no harm to the donor stock, and limiting negative impacts to other listed species in the Clackamas River subbasin.

The adaptive management of the bull trout reintroduction project will be based in part on guidance provided in the Department of Interior's technical guide to adaptive management (DOI 2009), hereby incorporated by reference. The guidance defines adaptive management as a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a 'trial and error' process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders (DOI 2009).

Benefits if using adaptive management include:

- An adaptive approach provides flexibility to act in the face of uncertainty
- An adaptive management approach is learning based
- Adaptive management specifies what actions are to be taken and when
- Adaptive management encourages long-term collaboration among stakeholders

- Adaptive management promotes optimal decision making with the information available

In designing an adaptive management project, management alternatives should be included that will produce different responses and thereby promote learning. One way to structure alternatives for this purpose is to limit their number, and maximize differences among them (DOI 2009). To ensure clarity and transparency it is important to make the management options explicit. Ambiguity as to the alternatives under consideration can lead to conflict among stakeholders.

The learning that is at the heart of adaptive management occurs through a comparison of model-based predictions against estimated responses based on monitoring data. Well designed monitoring programs facilitate evaluation and learning in adaptive management. Monitoring programs should be designed from the outset to inform decision making with data that are relevant to the management issues in the adaptive management project.

In general, monitoring provides data in adaptive management for four key purposes:

- To evaluate progress toward achieving objectives
- To determine resource status, in order to identify appropriate management actions
- To increase understanding of resource dynamics via the comparison of predictions against survey data
- To enhance and develop models of resource dynamics as needed and appropriate

2.1.8 Experimental Population

The 1982 amendments to the ESA included the addition of section 10(j) which allows for the designation of reintroduced populations of listed species as "experimental populations." The Service may designate as "experimental" a population of endangered or threatened species that has been or will be released into suitable natural habitat outside the species' current natural range (but within its probable historic range, absent a finding by the Director in the extreme case that the primary habitat of the species has been unsuitably and irreversibly altered or destroyed). The Service has always had the authority to reestablish populations in unoccupied portions of a listed species' historic range when doing so would foster the recovery of the species. However, local citizens often opposed these reestablishments because they were concerned about possible restrictions and prohibitions on Federal and private activities. By designating a population as experimental under section 10(j), the Service increases the regulatory flexibility in managing the species.

Before authorizing the release of an experimental population of an endangered or threatened species, and before authorizing any necessary transportation to conduct the release, the Service must find by regulation that such release will further the conservation

of the species. In making such a finding the Service shall use the best scientific and commercial data available to consider: (1) Any possible adverse effects on extant populations of a species as a result of removal of individuals, eggs, or propagules for introduction elsewhere; (2) The likelihood that any such experimental population will become established and survive in the foreseeable future; (3) The relative effects that establishment of an experimental population will have on the recovery of the species; and (4) The extent to which the introduced population may be affected by existing or anticipated Federal or State actions or private activities within or adjacent to the experimental population area.

Furthermore, all experimental populations designated under section 10(j) must provide: (1) Appropriate means to identify the experimental population, including, but not limited to, its actual or proposed location, actual or anticipated migration, number of specimens released or to be released, and other criteria appropriate to identify the experimental population(s); (2) A finding, based solely on the best scientific and commercial data available, and the supporting factual basis, on whether the experimental population is, or is not, essential to the continued existence of the species in the wild; (3) Management restrictions, protective measures, or other special management concerns of that population, which may include but are not limited to, measures to isolate and/or contain the experimental population designated in the regulation from natural populations; and (4) A process for periodic review and evaluation of the success or failure of the release and the effect of the release on the conservation and recovery of the species.

The Service must consult with appropriate State fish and wildlife agencies, local governmental entities, affected Federal agencies, and affected private landowners in developing and implementing experimental population rules. To the maximum extent practicable, 10(j) rules shall represent an agreement between the Service, the affected State and Federal agencies and persons holding any interest in land which may be affected by the establishment of an experimental population.

The Secretary may designate critical habitat as defined in section (3)(5)(A) of the Act for an essential experimental population. However, no designation of critical habitat will be made for nonessential populations.

Any experimental population designated for a listed species (1) determined not to be essential to the survival of that species and (2) not occurring within the National Park System or the National Wildlife Refuge System, shall be treated for purposes of section 7 (other than subsection (a)(1) thereof) as a species proposed to be listed under the Act as a threatened species. This means that formal consultation with the Service for actions likely to adversely affect the experimental population is not required. However, conference with the Service (which is advisory only) for actions likely to jeopardize the continued existence of the population is required for species proposed for listing and nonessential experimental populations.

2.1.9 Nonessential Experimental Population

When we establish experimental populations under section 10(j) of the Act, we must determine whether such a population is essential to the continued existence of the species in the wild. Although the experimental population will contribute to the recovery of bull trout in the Willamette River basin, it is not essential to the continued existence of the species in the wild. Bull trout populations are broadly distributed, occurring in 121 core areas in 5 western States, and the species' continued existence is dependent upon conserving a number of interacting populations well distributed throughout its range. Because the donor stock for the reintroduction will come from a wild population of bull trout, the reintroduced population will not possess markedly divergent genetic components or adaptive traits. Furthermore, the Clackamas River is not a unique or unusual ecological setting or geographical context for bull trout. Bull trout occur in other portions of the Willamette River basin and in other nearby tributaries to the Columbia River. Therefore, as required by 50 CFR 17.81(c)(2), we find that the experimental population is not essential to the continued existence of the species in the wild, and we hereby designate the experimental population in the Clackamas River as a nonessential experimental population (NEP).

The NEP designation for the reintroduction alleviates landowner and water-user concerns about possible land and water use restrictions by providing a flexible management framework for protecting and recovering bull trout, while ensuring that daily activities of landowners and water-users are unaffected. Landowners and managers, and the general public, are more likely to accept bull trout in the Clackamas River adjacent to their lands with the regulatory flexibility provided by a NEP designation. The NEP designation also provides State and Federal agencies flexibility to manage the reintroduced population of bull trout in a manner consistent with recovery of other ESA-listed species of salmon and steelhead present in the Clackamas River.

Most of the portion of the Clackamas River in which a population of bull trout can be expected to become established is protected and managed for other ESA-listed species of salmonids by the NMFS and managed for other natural resources by several Federal and State agencies. Furthermore, in 1988 Congress designated the Clackamas River from its headwaters to the Big Cliff area just upstream of North Fork Reservoir as part of the Federal Wild and Scenic Rivers System (USFS 1993). The state of Oregon designated 82 miles of the Clackamas River and its tributaries as part of the Oregon Scenic Waterway Program in 1989 (ORS 390.826). The majority of lands in the upper portion of the Clackamas River subbasin are public forestlands administered by the USFS and Bureau of Land Management (BLM). These lands are managed in accordance with Mt. Hood National Forest Land and Resource Management Plan (USFS 1990) and Salem District BLM Resource Management Plan (USDI 1995), respectively, as amended by the 1994 Northwest Forest Plan (USDA and USDI 1994). The 1994 Northwest Forest Plan established an Aquatic Conservation Strategy (ACS) with protective measures, standards and guidelines, and land allocations to maintain and restore at-risk fish species of which bull trout were included. The ACS Riparian Reserve land allocation extends two full site

potential tree heights (300 feet minimum) on both sides of all fish-bearing streams and prohibits scheduled timber harvest. These plans, along with the recently approved Federal legislation (Omnibus Public Land Management Act of 2009) established several new wilderness areas in the upper Clackamas River watershed, provide substantial protections for watersheds and aquatic habitats on public lands in the upper subbasin administered by the USFS and BLM. No additional changes or protections regarding forest management activities on public or non-public forest lands are believed necessary to support a successful reintroduction of bull trout in the Clackamas River subbasin (Shively et al., 2007).

2.1.10 Take

Experimental population special rules contain specific prohibitions and exceptions regarding the taking of individual animals. These special rules are compatible with routine human activities in the expected reestablishment area. Section 3(18) of the Act defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Take of bull trout within the experimental population area will be allowed provided that the take is unintentional, not due to negligent conduct, or is consistent with State fishing regulations that have been coordinated with the Service. We expect levels of incidental take to be low because the reintroduction is compatible with existing activities and practices in the area. As recreational fishing for species other than bull trout is popular within the NEP area, we expect some incidental take of bull trout from this activity but, as long as it is in compliance with ODFW fishing regulations, such take will not be a violation of the Act.

2.1.11 Geographic Boundaries for the Proposed NEP

The NEP action area, which encompasses all potential release sites, would include the entire Clackamas River subbasin as well as the mainstem Willamette River, from Willamette Falls to its points of confluence with the Columbia River, including Multnomah Channel. The Willamette River's confluence with the Columbia River occurs at river mile (RM) 101, near the City of Portland. A secondary channel of the Willamette River, Multnomah Channel, branches off the Willamette River approximately three miles upstream from its confluence with the Columbia River. This secondary channel runs approximately 20 river miles along the west side of Sauvie Island before joining the Columbia River at RM 86 near the town of St. Helen's. The NEP boundary extends down Multnomah Channel to its confluence with the Columbia River, as well as the mainstem Willamette River from Willamette Falls to its confluence with the Columbia River. Based on recent surveys, it has been determined that this species currently does not exist in the Clackamas River subbasin or the portion of Willamette River designated in this action (Shively et al., 2007).

We define the upper portion of the Clackamas River subbasin, the area where reintroduced bull trout can be expected to reestablish a viable population, as the headwaters down to and including the North Fork Reservoir (RM 30). Bull trout require cold, clean water in complex river and stream habitats with low levels of fine sediments. These habitat requirements are most stringent for the spawning and rearing life stages of bull trout. The portion of the Clackamas River subbasin providing suitable spawning and rearing habitat today is limited to the mainstem and its tributaries in the very headwaters of the subbasin upstream of the Collawash River confluence. This portion contains a total of 70.1 river miles of suitable spawning and rearing habitat delineated into six separate habitat patches (Shively et al., 2007). These patches range in size, configuration, and condition. The most downstream patch occurs along the mainstem Clackamas River in an area known as Big Bottom. This unique and complex reach of the river provides suitable spawning and rearing habitat. Other patches occur either adjacent to or up to a maximum distance of 5.9 river miles upstream into the upper headwaters of the subbasin. It is believed that the upper Clackamas River contains a sufficient amount of habitat to support a self-sustaining population of bull trout (Shively et al., 2007). Based on migration patterns and seasonable habitat use observed in nearby extant bull trout populations, such as from the Lewis, McKenzie and Metolius subbasins, it is possible some reintroduced bull trout will utilize North Fork Reservoir. Based on studies and observations of seasonal bull trout movements in other lower Columbia River bull trout populations, it is likely bull trout that overwinter in North Fork Reservoir would migrate upstream into the Clackamas River during spring and early summer.

The Service has broadened the NEP action area beyond the expected reestablishment area to account for individual bull trout that may migrate past major hydroelectric operations on the Clackamas River. If bull trout migrate downstream of North Fork Dam, they will do so through one of several mechanisms: via the existing fish bypass system, which deposits fish in the Clackamas River below River Mill Dam at RM 23 (see Figure 2 below); through spill over North Fork Dam; or, via entrainment through the turbines at North Fork Dam. The latter two mechanisms would result in bull trout occupying the river reach above Faraday Dam; these fish could move further down the river system via spill at Faraday Dam or through entrainment through the turbine units at Faraday Dam. Both avenues would deposit bull trout in Estacada Lake, the reservoir behind River Mill Dam. Similar to passage at Faraday Dam, bull trout occupying Estacada Lake could potentially migrate to areas below River Mill Dam by: (1) entrainment in spill provided through the recently constructed fish bypass chute; (2) entrainment in spill due to large flow events; or (3) by entrainment through the turbine units.

Although the above information suggests pathways by which bull trout may migrate into the lower Clackamas River below River Mill Dam and into the mainstem Willamette River, we expect the likelihood of this occurrence to be low. Habitat conditions, in particular water temperatures, are not suitable for bull trout for much of the year in the lower Clackamas and Willamette rivers. In addition, observations of bull trout migration patterns and seasonal habitat use in other nearby extant populations suggest reservoirs,

such as North Fork Reservoir, often inhibit most bull trout migration to downstream habitats.

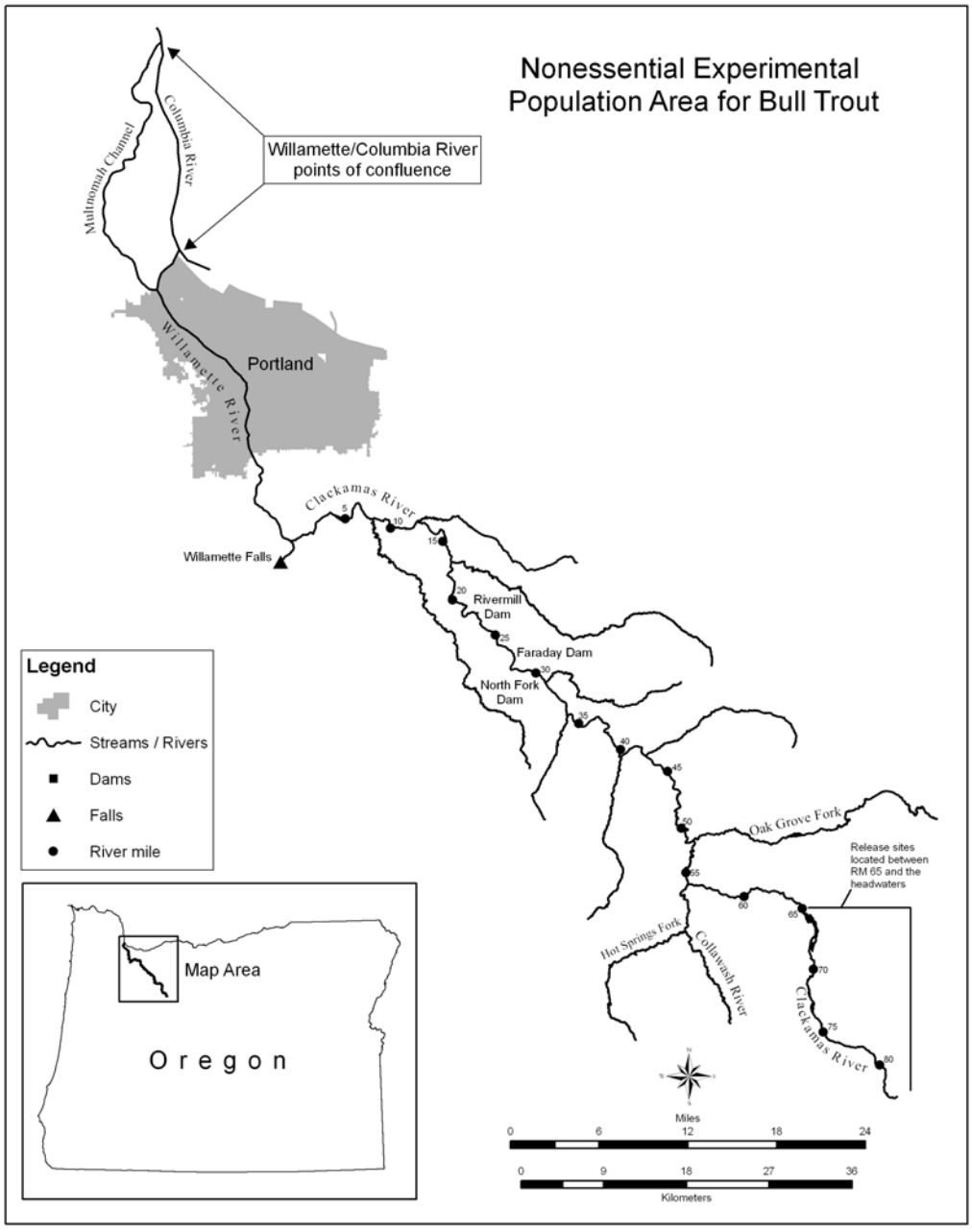

Figure 2 Nonessential Experimental Population Area for Bull Trout

2.2 Alternative B: No Action

Do not reintroduce bull trout into the Clackamas River subbasin. The No Action Alternative would continue existing river management without release of bull trout. In this alternative, bull trout would not be reintroduced in the Clackamas River and this increment of recovery for the species would not occur.

2.3 Alternatives Considered But Eliminated from Detailed Study

2.3.1 Reintroduction to Historical Habitat in Other Willamette Basin Tributaries

Bull trout have been extirpated from multiple major tributaries of the Willamette River, including the Clackamas River. A decision to investigate reintroduction in the Clackamas River was supported by recovery criteria in the Service's draft recovery plan (USFWS 2002). As noted above in section 1.1, draft recovery criteria specific to the Willamette River Recovery Unit called for the reestablishment of a population of bull trout in the Clackamas River. Within the Willamette Basin, the Clackamas River was singled out for its potential to contribute to recovery based on the abundance of information substantiating the historical presence of bull trout relative to information available for other major tributaries. In addition, the Clackamas River was thought by biologists to likely contain a greater amount of suitable habitat relative to other major tributaries in the basin.

If a reintroduction of bull trout occurs in the Clackamas River and is deemed successful, the Service may investigate reintroduction to other major tributaries of the Willamette River Basin, namely the North Santiam River, which like the Clackamas River, is thought to likely contain suitable habitat for reestablishment. However, prior to considering additional reintroductions, the Service would conduct formal feasibility assessments, similar to that conducted for the proposed reintroduction to the Clackamas River.

2.3.2 Reintroduction Utilizing an Alternate Donor Stock

By exploring issues associated with life history strategy, metapopulation dynamics, biogeography, and genetic considerations, the CRBTWG identified bull trout populations in the "coastal" lineage as the best source for a donor population. Any of the "coastal" lineage bull trout populations are likely to carry the genetic material to preserve and protect the "coastal" lineage regardless of localized and specific adaptations. Although these local adaptations are important, each of the populations is likely to contain the evolutionary potential that is characteristic of the "coastal" evolutionary lineage. However, in a further refinement, the CRBTWG determined that donor populations from

lower Columbia River tributaries would be most appropriate due to their geographic proximity to the historical bull trout population in the Clackamas River and because genetic studies indicate these populations are more closely related to one another than to other "coastal" lineage populations (Ardren et al., 2011). The potential lower Columbia River donor populations of bull trout that were considered include fish in five river basins: the Willamette River, Hood River, Lewis River, Deschutes River, and Klickitat River (Shively et al. 2007).

Specific benchmarks have been developed concerning the minimum bull trout population size necessary to maintain genetic variation important for short-term fitness and long-term evolutionary potential. Rieman and Allendorf (2001) concluded that an average of 100 spawning adults each year is required to minimize risks of inbreeding in a bull trout population and that 1,000 spawning adults each year will likely prevent loss of genetic diversity due to genetic drift. This latter value of 1,000 spawning adults may also be reached with a collection of local populations among which gene flow occurs. The CRBTWG utilized these general benchmarks in the Feasibility Assessment to assess potential risk to each of the five potential donor stocks in the lower Columbia River from the loss of individuals, recognizing that risk increases as donor populations near 100 spawning adults and diminishes as populations approach 1,000 spawning adults (Shively et al. 2007).

When the Feasibility Assessment was developed in December 2007, bull trout from two of the five river basins, the Lewis River and Deschutes River, contained groups of interacting local populations that exceeded 1,000 spawning adults. For the Lewis River basin, this included the combined Pine Creek and Rush Creek populations that occur above Swift Dam. For the Deschutes River basin, this included the three interacting populations present in the Metolius River subbasin. Since publication of the Feasibility Assessment there have been declines in adult spawner abundance in both the Lewis and Deschutes river bull trout groups, with the Lewis River population dropping significantly in 2007 and 2008, to its current estimated adult spawner abundance of 379 individuals (Doyle 2009). Although the Deschutes River (Metolius River subbasin) bull trout population has also decreased over the last 2 years, the total number of annual spawning adults is still large enough (approximately 1,000 spawning adults) to protect against the loss of genetic diversity from genetic drift, so it was selected as the donor population and other rivers were dropped from consideration.

2.3.3 Reintroduction of Bull Trout Without 10(j) Designation

A number of administrative pathways for reintroducing bull trout to the Clackamas River were explored, including section 4(d), section 6, section 7, and 10(j) of the ESA. Of these, section 10(j) provided the most permanent reduction in regulatory burden to private landowners and public land management agencies. Furthermore, 10(j) provides greater management flexibility as compared to the other administrative pathways

considered. For these reasons, all alternative administrative pathways for reintroduction were dropped from further consideration in favor of 10(j).

2.3.4 Reintroduction of Bull Trout Under 10(j) Essential Experimental Population Designation

This alternative was not selected for further analysis because we have determined that this experimental population would not be essential to the continued existence of the species for the reasons listed in section 2.1.7. Furthermore, as discussed above in section 2.1.8, the more stringent legal protection provided by the ESA under an essential population designation is not necessary to protect reintroduced bull trout in the Clackamas River, and the added regulatory burden of such a designation may create resistance to the proposed action from land owners and land managers.

2.3.5 Reintroduction of Bull Trout to the Clackamas River Under 10(j) NEP Designation with Alternative Boundary Areas.

The Service considered limiting the downstream boundary of the NEP area to the lowermost dam on the Clackamas River, Rivermill Dam (RM 23), surmising that the lack of available habitat downstream of the dam would prevent bull trout from establishing themselves outside of the reestablishment area. Upon further consideration, the Service acknowledged the possibility that individual bull trout may utilize one of several mechanisms to move downstream of Rivermill Dam (see section 2.1.10). Once deposited below the dam, these fish may continue downstream into the lower portions of the Clackamas River and into the Willamette River.

Additionally, the Service considered limiting the NEP boundary to the confluence of the Clackamas and Willamette rivers but, again, because of the migration habits of fluvial bull trout, the possibility exist that reintroduced bull trout could migrate downstream into the Willamette River.

A larger boundary area was also considered, specifically the entire Clackamas River basin, the entire Santiam River basin and the mainstem of the Willamette River between the Santiam and Clackamas rivers. The Service found it unlikely that bull trout from the expected reestablishment area on the upper portion of the Clackamas River would migrate past Willamette Falls, further up the Willamette River and into the Santiam River subbasin. While the Santiam River constitutes a possible location for future bull trout reintroduction, this consideration is not part of the Clackamas River reintroduction proposal.

3.0 Environmental Consequences

3.1 Alternative A, Proposed Action

In the DEA we analyzed the environmental consequences of the proposed action through three primary issues that were identified through stakeholder and scoping meetings. These issues included: 1) impacts to threatened salmon and steelhead in the Clackamas River; 2) impacts to the proposed action from non-native brook trout that occupy portions of the upper Clackamas River; and, 3) impacts to the bull trout donor stock in the Metolius River. In consideration of the public comments on the DEA and the proposed 10(j) rule, we have incorporated the issues above into three broad categories of environmental consequences for analysis below: Physical, Biological, and Social environments.

3.1.1 Physical Environment

Minor effects to the physical environment would occur from the proposed action from the installation and operation of passive PIT tag and radio telemetry monitoring stations in multiple locations within the Clackamas River subbasin (see Appendix C for more detail). Some of these stations will operate year-round whereas others will be installed and operated seasonally. These monitoring stations, which will generally be located on the Mt. Hood National Forest, are portable and will not require the construction of any permanent features on the landscape. Monitoring stations not located in the Mt. Hood National Forest will utilize existing infrastructure associated with PGE's Clackamas Hydroelectric Project. The purpose of these monitoring stations is to document the distribution and seasonal movement of tagged bull trout as a component of the project's monitoring and evaluation program.

3.1.2 Biological Environment

The proposed action has the potential to affect the biological environment in multiple ways including 1) food web impacts, specifically to threatened salmon and steelhead from predation, competition, and predator avoidance; 2) disease; 3) invasive species; and lastly, 4) impacts to the bull trout donor stock population in the Metolius River (Deschutes Basin). Among these, the dominant concern expressed in the stakeholder meetings and in the public comments received on the DEA and proposed rule was potential impacts to threatened salmon and steelhead from the proposed action. Commensurate with this concern, the Service and our project partners have expended considerable effort to assess the likely impacts of the proposed action, and to develop a monitoring and evaluation program to inform the adaptive management of the action and guide appropriate management decisions associated with the project. The likely effects

of the proposed action on salmon and steelhead, and the minimization measures that will be implemented to reduce potential impacts, are summarized below in Section 3.1.2.1. Potential effects related to disease transfer, invasive species, and to the bull trout donor stock are summarized following Section 3.1.2.1.

3.1.2.1 Impacts to Salmon and Steelhead

The proposed action will likely cause adverse effects to salmon and steelhead individuals (eggs, fry, juveniles) due to predation and interspecific competition in areas the species overlap. Although there is high likelihood bull trout will prey on salmon and steelhead juveniles, there is uncertainty regarding the overall population level effect predation and competition may have on the status and trend of anadromous salmonids in the Clackamas River, and their respective ESUs.

In addition to predation on, and competition with, anadromous salmonid juveniles, reintroducing bull trout to the Clackamas River will generate a response by other members of the aquatic community, namely from predation and competition for habitat and food resources. Predicting the likely response from a foodweb perspective is difficult due to the number of variables that contribute to foodweb dynamics. For example, bull trout will eat other predators that currently consume juvenile anadromous fish and eggs such as rainbow and cutthroat trout, mountain whitefish, and sculpin. In addition, foodweb dynamics are influenced by terrestrial organisms such as mammals and avian predators. Finally, there are additional uncertainties that will contribute to a foodweb response such as the carrying capacity (i.e., future population size) of the Clackamas River for bull trout, which is unknown and difficult to predict with precision, and locations in the watershed that will be utilized by bull trout for spawning, rearing, overwintering and foraging. Given the complexity of these relationships, and the dynamic nature of ecosystems, there is uncertainty whether the overall impact to salmon and steelhead at the population scale will be negative, positive or neutral.

It is important to assess the uncertainty regarding the effects of this action by using appropriate tools and methods, and then take steps necessary to reduce the uncertainty to an acceptable level while recognizing it cannot be eliminated entirely. In spite of the inherent challenges, there are multiple pathways by which we can assess the likelihood of negative impacts to salmon and steelhead from a reintroduction of bull trout in the Clackamas River. Our analysis relies on information on bull trout diet and feeding behavior, information from other watersheds where bull trout and anadromous salmonids coexist, an assessment of potential areas of vulnerability to salmon and steelhead from bull trout predation in the Clackamas River, and information and results from an expert science panel workshop that investigated potential effects to salmon and steelhead in the Clackamas River from a bull trout reintroduction. Lastly, our analysis considers the management flexibility provided by the 10(j) non-essential experimental designation for reintroduced bull trout in the Clackamas River.

Current understanding of predator/prey relationships among bull trout and other species is limited, as is information on general interactions between bull trout and anadromous fish. Underwood et al. (1995) examined interactions among Chinook, steelhead, and bull trout. However, the life history strategy utilized by the bull trout population studied was resident (smaller sized fish at maturity) where piscivory was not the primary feeding strategy and no predator/prey relationships were noted. Instead the study focused on examining and confirming habitat partitioning among the three species, a trait common among species that evolve together. Habitat partitioning among sympatric species allows the utilization of different resources thereby reducing direct competition. This strategy was documented in several studies investigating interactions between bull trout and cutthroat trout (Marnell 1985; Nakano et al.1992) and bull trout and rainbow trout (McPhail and Baxter 1996).

Although few studies have attempted to quantify bull trout predation impacts on sympatric fish species, the reputation of bull trout as an apex predator is not undeserved as there is an abundance of literature noting the aggressive piscivorous (i.e., fish eating) nature of this species. This reputation led to fish management actions that for many years included bounties, rotenone treatments, and trap and removal that ultimately extirpated many populations and in part led to the federal ESA listing of the species as threatened (Shively et al. 2007, Ratliff and Howell 1992). Despite these actions there were no attempts that the Service is aware of to quantify impacts of bull trout predation on anadromous or resident fish populations, relative to the array of other variables that determine population viability such as predation by other piscivorous fish, mammals or birds, sport and commercial angling, habitat conditions, migratory conditions, water quality and ocean conditions to name a few.

Bull trout are opportunistic feeders and prey on whatever fish species or aquatic organisms (e.g., crayfish, aquatic macroinvertebrates, etc.) are present and in the most abundance. In many rivers within the native range of bull trout, anadromous salmonids (including eggs, carcasses, juveniles) historically, and in many cases currently, constitute the most significant forage base for bull trout. Over the last century however, the decline in abundance and distribution of anadromous salmonids in many rivers in the western United States has likely led to a forage base shift by bull trout to other fish species. The reduction, and in many cases complete loss of anadromous salmonids within portions of the range of bull trout, has had unknown consequences. In some areas other species may have filled the niche previously occupied by anadromous fish and bull trout may not have been negatively affected. Conversely, the forage base in other areas may not have been replaced by other species and bull trout populations may have responded accordingly by reductions in abundance and distribution.

Within the native range of bull trout, many populations historically and currently overlap with the distribution of anadromous salmon and steelhead. In Oregon, bull trout, Chinook salmon and steelhead trout co-occur in a number of rivers including the McKenzie (Willamette River Basin), Hood, John Day, Deschutes rivers, the Wenaha, Minam, Lostine and other tributaries of the Grande Ronde River in northeast Oregon, and in the

Walla Walla and Umatilla rivers. The status of salmon, steelhead, and bull trout in each of these river systems ranges from healthy to depressed. Although we are not aware of any studies assessing interactions between bull trout and anadromous fish in these watersheds, we are also unaware of any studies that identify bull trout as a limiting factor in the status of salmon and steelhead populations these rivers. The Service was unable to find evidence that bull trout have ever extirpated a population of salmon or steelhead.

Reintroducing bull trout would add to the already highly diverse assemblage of fish species, native and nonnative, found in the Clackamas River subbasin. The Clackamas River supports naturally reproducing populations of early and late-run stocks of coho salmon (*O. kisutch*), spring Chinook salmon (*O. tshawytscha*), and winter steelhead (*O. mykiss*), all of which are federally listed as threatened under the ESA. A small, remnant run of federally listed fall Chinook salmon utilize the lower Clackamas River and a small population of sea-run coastal cutthroat trout also persists in this part of the subbasin. The upper subbasin, above PGE's North Fork Dam, is managed as a wild fish sanctuary and all anadromous salmonids identified as hatchery origin (i.e., those that are adipose fin clipped), are captured at the North Fork Dam fish trap and prevented from migrating past the dam. Pacific lamprey (*Lampetra tridentata*) also occur upstream of North Fork Dam. Downstream of North Fork Dam, hatchery produced spring Chinook, coho, and winter and summer steelhead juveniles are released each year at a number of locations.

Other fish species present throughout the subbasin include resident and fluvial coastal cutthroat trout (*O. clarki clarki*), rainbow trout (*O. mykiss*), non-native brook trout (*Salvelinus fontinalus)*, non-native brown trout (*Salmo trutta*), mountain whitefish (*Prosopium williamsoni*), largescale sucker (*Catostomus macrocheilus*), Pacific lamprey, sculpin (*Cottus sp.*), mountain sucker (*C. platyrhynchus*), longnose dace (*Rhinichthys cataractae*), western brook lamprey (*L. richardsoni*), northern pikeminnow (*Pytchocheilus oregonensis*), chisel mouth (*Acrocheilus alutaceus*), redside shiner (*Richardsonius balteatus*), threespine stickleback (*Gasterosteus aculeatus*), and peamouth (*Mylocheilus caurinus*). Introduced exotic fish species, such as bluegill (*Lepomis macrochirus*), pumpkinseed (*L. gibbosus*), brown bullhead (*Ameiurus nebulosus*), American shad (*Alosa sapidissima*), smallmouth bass (*Micropterus dolomieu*) and other species are encountered in some habitats in the lower watershed below Rivermill Dam (Murtagh et al. 1992).

Historically, juvenile anadromous fish (salmon and steelhead), along with eggs and carcasses of anadromous fish, likely comprised a significant component of the forage base for bull trout in the Clackamas River, as did other native fish such as sculpin, dace, whitefish, suckers and resident rainbow and cutthroat trout. Due to the significant reduction in the abundance of salmon and steelhead in the Clackamas River, reintroduced bull trout would be expected to rely heavily on the resident native fish community. While specific information on the relative abundance and distribution of resident native fish is generally lacking, we presume these populations to be relatively healthy based on watershed conditions in the upper Clackamas River (Shively et al. 2007).

Skagit River Bull Trout Study

Lowery (2009) investigated trophic relationships and seasonal effects of predation on Pacific salmon by fluvial bull trout in a riverine food web. The objective of the study, which combined two years of field sampling of bull trout diet, distribution and growth along with stable isotope analysis and bioenergetics modeling, was to determine the annual and seasonal energy budgets of bull trout and to estimate their potential predation impacts on juvenile salmon and steelhead. The study occurred on the Skagit River, home to one of the region's largest bull trout and Chinook salmon populations, as well as populations of steelhead trout, sockeye, coho, pink, and chum salmon. Pink salmon and chum salmon populations in the Skagit River are among the largest in the lower 48 states. The study reach extended 40km downstream from the lowest-most dam associated with Seattle City Light's hydroelectric project on the Skagit River roughly to its confluence with the Sauk River, and included two tributaries utilized by bull trout for spawning. During the 2007/2008 study period, Lowery estimated approximately 1,600 bull trout greater than 300mm existed within the study reach.

Lowery found that age 1 and 2 bull trout present in tributaries of the Skagit River consumed primarily aquatic invertebrates. After shifting to the mainstem Skagit River at age 3 and 4, bull trout derived a large portion of their energy budget from salmon eggs and carcasses although juvenile salmon, resident fishes and aquatic insects were also important components of their annual energy budget. The top five contributors to annual bull trout diets for fish > 300mm were: 1) Pacific salmon carcass flesh; 2) fish eggs, primarily Pacific salmon; 3) resident fishes, primarily sculpin and dace; 4) aquatic invertebrates; and, 5) Pacific salmon fry/alevins. The impact of predation was found to be relatively low for all Pacific salmon with the exception of steelhead trout. Predation levels on steelhead trout juveniles were found to be significant enough to likely be impacting adult returns to this reach of the Skagit River.

The Skagit study provides information on the diversity and seasonality of diet and energy consumption for a fluvial bull trout population. The study also provides evidence that under certain scenarios, bull trout predation may cause population level impacts on certain species of Pacific salmon. However, there are significant differences between the Skagit River and the Clackamas River in terms of the diversity and abundance of Pacific salmon that warrants caution in making direct correlations regarding likely effects to salmon and steelhead from a bull trout reintroduction. The Skagit River, while harboring several stocks of threatened salmon, also contains other healthy stocks that number in the hundreds of thousands in adult returns. As a result, the forage base for bull trout in the Skagit River, while still showing considerable contributions by resident fishes and aquatic insects, is significantly weighted towards Pacific salmon eggs, carcasses and juvenile fish. In contrast, while steelhead and salmon populations in the Clackamas River are among the healthiest in their respective ESUs, current abundance is much reduced from historic and likely comprises a much lower percentage of the available forage base as compared to the anadromous forage base in the Skagit River. As a result,

we expect the annual energy budget of bull trout reintroduced to the Clackamas River will be skewed towards more readily available aquatic insects and resident fishes.

Piscivory by Other Native Fish Species

Bull trout consume other fish that are capable themselves of being piscivorous predators. Sculpin, rainbow trout, cutthroat trout and other anadromous salmonid species of the Clackamas River are also piscivorous and are known to consume other fish, including anadromous salmon fry and juveniles. During USFS smolt trapping in the Clackamas in 2007, wild coho and steelhead smolts were documented preying on coho salmon fry (Tom Horning, biologist, USFS, personal comm., 2007). In California, Chinook salmon fry have been known to be eaten in large numbers by yearling coho outmigrants. In some locations coho less than 30 mm were heavily preyed upon by torrent sculpins (Groot and Margolis 1991). Mobrand et al. (2005) in a review of hatchery effects on natural fish populations, determined that yearling hatchery coho, stream-type Chinook, and steelhead smolts are the most likely predators on wild salmonid fry because of their larger size when released.

Lowery and Beauchamp (2010) investigated the current food web of the upper Clackamas River in order to establish a baseline ahead of the bull trout reintroduction and to specifically aid future monitoring of impacts to anadromous salmonids. They reported low levels of piscivory by juvenile coho salmon, hatchery and native rainbow trout, coastal cutthroat trout, brown trout, and sculpin. Sculpin, mountain whitefish, juvenile Chinook salmon, and largescale suckers represented the most common fish prey.

Clackamas River Forage Base and Importance of Anadromous Prey Base

Bull trout are opportunistic feeders and when reintroduced to the Clackamas River would likely prey on a variety of native and nonnative fish species. In many locations, mountain whitefish are a preferred bull trout prey species and in the Clackamas River watershed, adult mountain whitefish are common in large pool habitats of the Clackamas and Collawash rivers (Murtagh et al. 1992, Ratliff 2003, Beauchamp and Van Tassel 2001, Pratt 1992). Largescale suckers are also common in larger pool habitats in this watershed. Large numbers of anadromous salmonids rear as pre-smolts in the upper Clackamas River. The five year average for smolt outmigrants annually passing North Fork Dam (all anadromous species 2001-2005) was 139,152 smolts (PGE 2001, 2002, 2003, 2004, 2005). Older juvenile, subadult, and adult bull trout would be expected to prey upon rearing juvenile anadromous salmonids. Coastal cutthroat trout, rainbow trout, sculpin, and a diverse assemblage of aquatic macroinvertebrates are found in abundance in many of the smaller tributary streams within the Clackamas River subbasin and would likely be preyed upon by bull trout. North Fork Reservoir is stocked annually with approximately 70,000 non-native hatchery rainbow trout, representing an additional forage base for older life stages of bull trout if they utilize this habitat.

Lowery and Beauchamp (2010) reported that sculpins represented the greatest fraction of fish biomass in all lotic habitats sampled in the upper Clackamas River subbasin in 2009 and 2010, suggesting that current conditions are more favorable for cottids than salmonids. The other most abundant species that would be available for prey in lotic habitats included juvenile salmon, cutthroat trout, and rainbow trout. These species, along with mountain whitefish and largescale suckers, would represent the forage base in the upper mainstem Clackamas River and North Fork Reservoir.

Bull trout coexisted with many other native fish species in the Clackamas River for thousands of years, likely feeding on a variety of different species. Historically, anadromous Pacific salmon were likely the most abundant fish in the subbasin and they probably comprised a significant portion of the bull trout diet. However, current abundance and distribution of anadromous salmon in the subbasin is reduced from historic levels. In the Clackamas, bull trout may be more dependent upon other native species as a prey base, such as mountain whitefish and largescale sucker, both of which are present and abundant, along with other potential prey such as dace, sculpin, cutthroat and rainbow trout. Information on bull trout populations from other areas in the lower Columbia River Basin suggests that, while likely important, bull trout persistence is not dependent upon the presence of anadromous salmon.

Geographic Areas of Vulnerability for Salmon and Steelhead

PGE owns and operates the Clackamas Hydroelectric Project, a system of three dams beginning with Rivermill Dam at river mile 23 extending upstream to North Fork Dam at river mile 30. Fish passage facilities that PGE has constructed and maintained at their dams on the mainstem Clackamas River provide anadromous fish access to all historically occupied streams above River Mill Dam. PGE's fish passage facilities are currently, or will soon be, upgraded per the terms of the Clackamas Settlement Agreement and PGE's new license, expected to be issued by FERC in 2010. These upgrades, along with changes in flow management and habitat improvements also associated with the new FERC license, are expected to significantly improve conditions for anadromous salmonids over baseline conditions.

Upstream passage is accomplished via fish ladders at Rivermill and Faraday dams and downstream passage is accommodated via multiple routes including fish ladders, bypass pipes, spill, and entrainment through the project's turbines. All of these passage mechanisms concentrate fish unnaturally and thus increase their susceptibility to terrestrial, aquatic and avian predators. In addition, project reservoirs, particularly North Fork Reservoir, create unnatural habitats that are significantly utilized for rearing and overwintering by anadromous juvenile salmonids. Reservoir environments, while often providing good growth environments for juvenile salmonids, also unnaturally expose rearing and migrating juvenile salmonids to predators.

Although we cannot predict with certainty the dispersal and behavior of reintroduced bull trout in the Clackamas River, given the migratory nature of the species, a large fraction of the older life stages may seasonally utilize North Fork Reservoir and possibly other locations within or below PGE's Clackamas Hydroelectric Project. If that occurs, anadromous juvenile salmonids that are rearing within, or migrating through, PGE's project, may be impacted by bull trout in the following ways: 1) by predation within hydro project reservoirs, bypass facilities, fish ladders, and tailraces; and, 2) failure to emigrate due to avoidance of fish bypass or collection facilities due to presence of bull trout (i.e., predator avoidance).

The areas of highest predation vulnerability for juvenile salmon and steelhead are the areas they are most concentrated, namely the forebay of North Fork Reservoir (specifically the fish bypass and fish ladder entrance at North Fork Dam) and possibly the outflow of the fish bypass pipe below Rivermill Dam. In 2015, a surface collector will be constructed at North Fork Dam, largely replacing the existing fish bypass facility. The new surface collector is expected to increase downstream passage efficiencies for juvenile salmon and steelhead, particularly for Chinook salmon which, during relicensing studies, were noted as having greater difficulty finding the downstream fish bypass than coho or steelhead. Salmon and steelhead juveniles in other areas of PGE's project, such as North Fork Reservoir, are expected to be less vulnerable to predation impacts due to reduced concentrations of individuals, and in the case of the area between North Fork Dam and River Mill Dam, reduced numbers of rearing and migrating juvenile salmonids since the majority are bypassed around the entire project and deposited below Rivermill Dam via the North Fork Collector Pipe. As noted above, the completion of the new surface collector at North Fork Dam in 2015 is expected to increase the passage efficiency for juvenile salmon and steelhead.

Although bull trout in the upper Clackamas River above North Fork Reservoir are anticipated to prey on juvenile salmon and steelhead as part of their forage base, vulnerability of anadromous juveniles, when compared to vulnerability in areas within PGE's project area, is likely to be lower due to greater prey diversity, greater habitat availability, and habitat partitioning in which sympatric species utilize different resources thereby reducing direct competition. This strategy was documented in several studies investigating interactions between bull trout and cutthroat trout (Marnell 1985; Nakano et al. 1992) and bull trout and rainbow trout (McPhail and Baxter 1996). Vulnerability to juvenile anadromous salmonids in areas below Rivermill Dam are also expected to be low when compared to areas within PGE's Project area, due to the limited suitability of habitat for bull trout, greater diversity of prey, and lower expected probability of occupation based on bull trout behavior in other populations in the lower Columbia River.

Expert Science Panel Workshop

Potential predation and competition impacts to four ESA listed salmon and steelhead populations in the Clackamas River were identified as a concern during project scoping. In anticipation of this concern, the Service, in July 2008, sponsored an expert science panel workshop to assess potential impacts of a proposed bull trout reintroduction on ESA-listed salmon and steelhead in the Clackamas River. The panel consisted of five experts on bull trout and salmonid biology and ecology, food web dynamics, and population viability modeling. The workshop also solicited expert opinion on critical monitoring and management actions to reduce uncertainty and risk to salmon and steelhead from a reintroduction of bull trout. The results from this workshop are incorporated by reference and are summarized below.

Expert judgment is often used as a source of information in the absence of, or to supplement, empirical research and statistically-sound studies. In ecology, expert judgment has always been sought for interpreting difficult or otherwise intractable problems in modeling, management, planning, and scientific understanding. Some examples include using expert opinion to evaluate an elk habitat model (Holthausen et al. 1994), to develop general faunal distribution models (Pearce et al. 2001), modeling rare species (Marcot 2006), evaluating adaptive management options (Failing et al. 2004), and many other applications.

Reaching consensus is typically the objective of expert panels convened by the National Research Council's programs for developing criteria for contract requests for proposals. Weisberg et al. (2008) found that consensus was possible for evaluating the condition of communities of benthic substrates. However, a consensus outcome of an expert panel does not provide information on the variation in expert judgment among the individual expert panelists. Nor does it provide for "outlier" opinions from experts that might not concur with the majority views.

For the Expert Panel Workshop, it was decided by the planning team that individual expertise, not consensus, was the objective of the paneling process, in large part because (1) the expert panel was to provide technical and scientific information to be later considered by decision-makers, and not specific consensus recommendations for management or a management decision per se, and (2) it was deemed of interest to determine the type and degree of variation *among* selected experts for the difficult questions posed.

Opening presentations.--The workshop was structured with an opening series of presentations to ensure that all expert panelists were equally informed on the following topics:

- the bull trout reintroduction program feasibility assessment and draft proposed action;
- the status and distribution of ESA-listed anadromous fish species in the Clackamas River and current recovery planning efforts;
- Portland General Electric's (PGE) hydro projects, reservoirs, and fish bypass systems in the Clackamas River system; and

- bull trout trophic interactions and food webs.

Model and discussion on trophic interactions and food web dynamics.--Also presented was a preliminary Bayesian network model depicting potential food web and species interaction dynamics relevant to relationships between bull trout, anadromous salmonids, and other predators and prey species in the river system. The model was presented to help prompt panel discussion on trophic and food web dynamics, including identifying key areas of uncertainty related to bull trout-salmonid interactions. The Bayesian network model was not used *per se* further in the workshop although the resulting discussions of trophic structure and food web dynamics were recounted and continued throughout the rest of the workshop.

Panel scoring of degree of impact of bull trout on salmonids.--On day two of the workshop, the expert panelists were engaged in a structured scoring of potential effects of bull trout on the extinction probability of each of the four ESA-listed salmon and steelhead populations of interest in the Clackamas River system: spring Chinook, fall Chinook, Coho, and winter steelhead. The instructions given to the panelists included that they were to (1) assume that bull trout reintroduction objectives would be met, that is, with at least 200-500 adult bull trout sustainable in the Clackamas River system by 2030, and (2) score the relative influence of bull trout on whatever absolute extinction probability might pertain to each salmon and steelhead population.

The scoring was conducted by using a modified Delphi paneling procedure. In brief, this procedure involved the panelists scoring how a bull trout reintroduction might influence each salmonid species, by each panelist spreading 100 points (thought of as probabilities) among one or more outcome categories of potential impacts. Spreading points would be an expression of uncertainty of outcomes and a means of displaying potential differences in outcomes among the salmonid species.

The Delphi paneling process entailed the panelists first individually and anonymously recording an initial set of outcome scores; then the panelists individually disclosing and explaining their scores to each other in a structured discussion, including an opportunity to engage with other observers and experts in the room; and then individually and silently rescoring outcomes based on new knowledge or insights gained from the shared disclosure and open discussion. The disclosure and discussion portion of the panel ensured that each panelist had equal time to present their ideas, seek clarification, and ask questions. The scores and discussion comments were recorded anonymously using letter codes (A-E) for each panelist. The scoring session encouraged the panelists to synthesize their own expert experience, the pre-workshop readings, the workshop presentations, and their shared interpretations and rationale.

The panelists were prompted to score the *degree of impact that bull trout would have on the extinction probability of each salmonid species over 100 years from the start of the reintroduction project*. The panel discussed an initially-presented 5 class system, did a

first round of scoring, and then refined the classes and collectively agreed to use the following 7 categories and definitions for scoring potential bull trout impacts:

- **Very High** = bull trout influence contributes to 100% of the extinction probability
- **High** = bull trout influence contributes to about 95% of the extinction probability
- **Moderately High** = bull trout influence contributes to about 75% of the extinction probability
- **Moderate** = bull trout influence contributes to about 50% of the extinction probability
- **Moderately Low** = bull trout influence contributes to about 25% of the extinction probability
- **Very Low** = bull trout influence contributes to about 5% of the extinction probability
- **None** = bull trout influence has no contribution to the extinction probability

It was clarified to the panelists that they were to score only that portion of salmon and steelhead population extinction probabilities that would be caused by bull trout; they were not asked to score overall extinction probabilities. In this way, the relative impact contributed specifically by bull trout would be represented.

The results of the panelists' scoring of possible degree of impact of bull trout on salmonid probability of extinction ranged from moderately high impact to no impact at all. The mode of overall score values suggested that impact was viewed by the panelists in general to be very low or moderately low for spring Chinook, coho, and winter steelhead; and mostly none to very low for fall Chinook. However, some possible outcomes ranged into higher categories of impact but with far lower score levels.

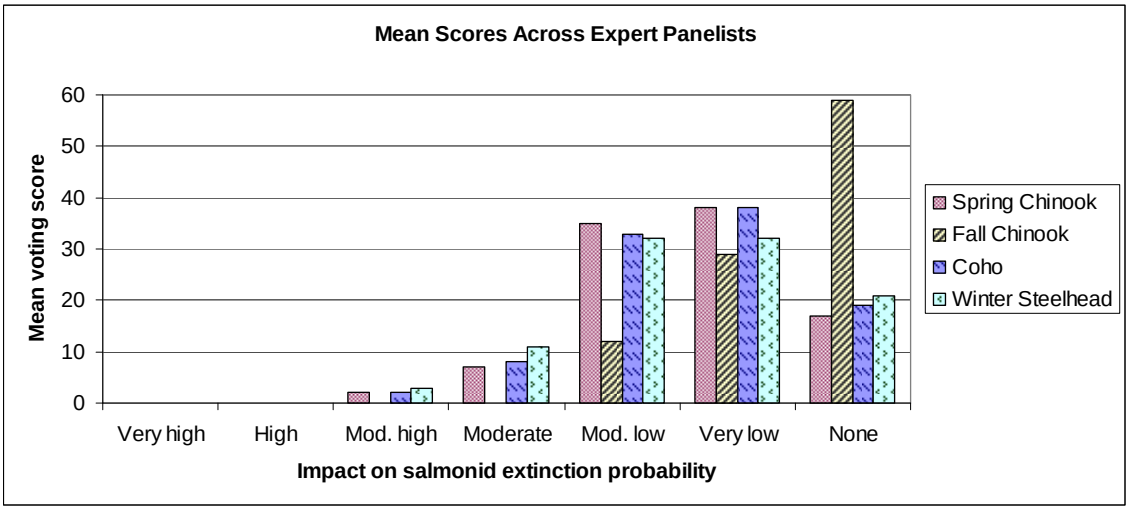

Figure 3 Mean scores of the potential impact of bull trout on salmon and steelhead population extinction probability.

These distributions of composite scores across the outcome categories for each species can be interpreted as expected probability distributions. Outcomes that scored with few points are still possible, according to at least some of the panelists, even if the probability of those outcomes is low. Figure 3 suggests that the panelists generally rated bull trout impacts on extinction probabilities of salmon and steelhead populations as "moderately low," "very low," or even "none." Also, the mean scores suggested that the panelists in general considered bull trout impacts on salmon and steelhead extinction probability to be lower for fall Chinook than for the other three populations. A different way to visualize these patterns is by summing the panelists' scores by species (Fig. 4 below):

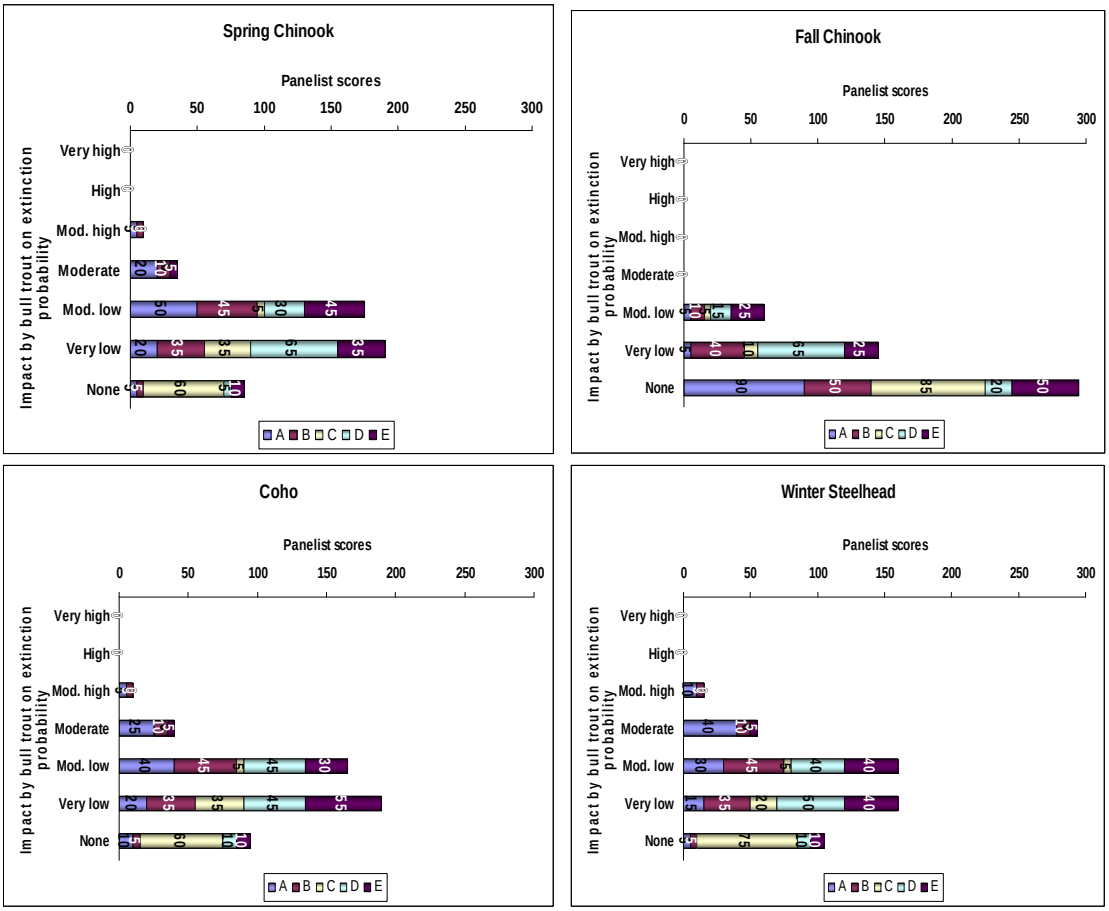

Figure 4 Sum of scores of the potential impact of bull trout on salmon and steelhead population extinction probability, across the 5 panelists (A-E) and by salmonid species.

Summarized in this way, it is more apparent that the panel generally expected lesser impacts from bull trout on fall Chinook than on the other three salmon and steelhead populations. The panel as a whole allocated most of their scores to "None" and "Very low" outcomes for fall Chinook, and most of their scores to "Very Low" and "Moderately Low" for the other three salmon and steelhead populations, with lower score levels allocated to "None," "Moderate," and "Moderately high." These distributions of

composite scores across the outcome categories for each species can also be interpreted as expected probability distributions. Outcomes that scored with few points are still possible, according to at least some of the panelists, even if the probability is low (e.g., panelists generally predicted a less than one in ten chance that bull trout would have a moderate to moderately high impact on salmonid extinction probability for spring Chinook, coho, and steelhead).

It should be reiterated that we did not ask the panelists to reach consensus on their scoring. Thus, it is also instructive to view the individual panelists' degrees of uncertainty and variation among the salmon and steelhead populations considered, across the various outcome categories, and among the individual panelists, as shown in Figure 5 below.

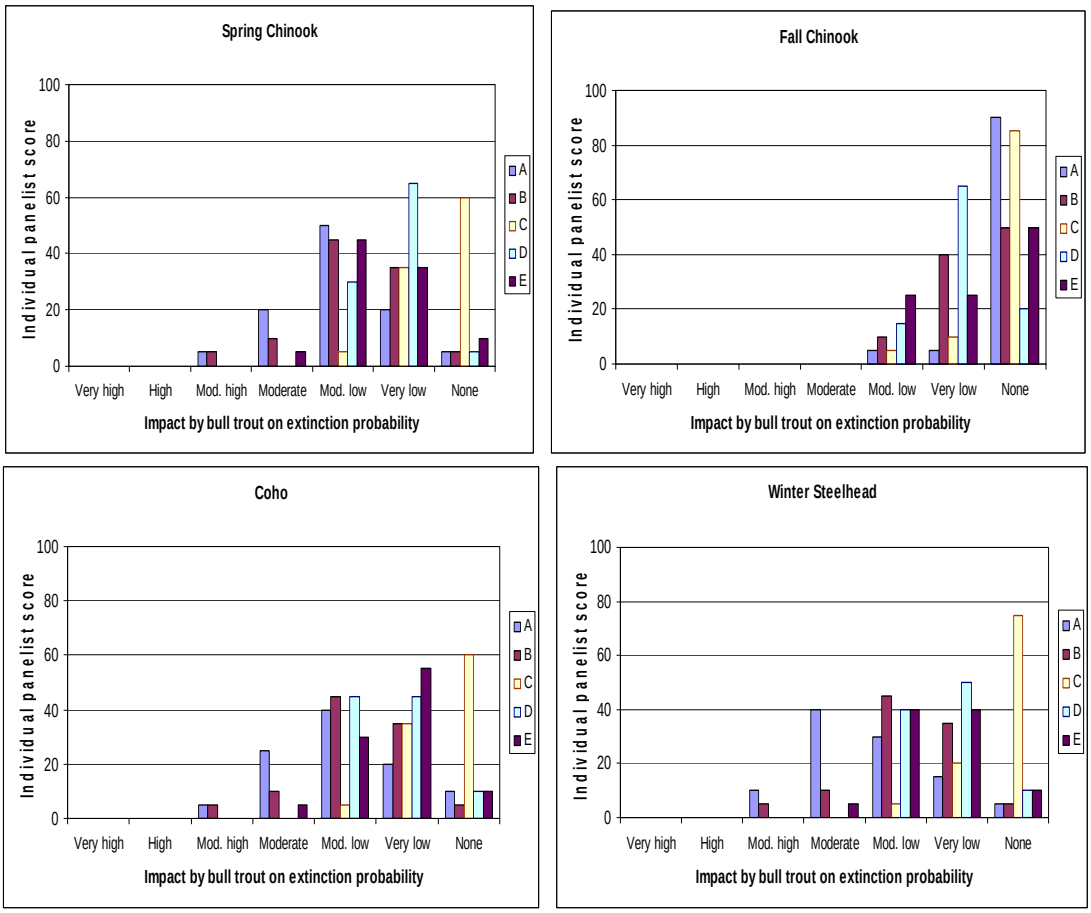

Figure 5 Individual panelist scores of bull trout impact on salmon and steelhead populations after 100 years of bull trout reintroduction. Legend: A-E represents the individual panelists.

Figure 5 suggest that (1) each panelist expressed some degree of uncertainty over the possible impact of bull trout on extinction probability of each salmon and steelhead

population, suggested by the spread of scores across multiple outcomes; and (2) although the panelists differed in their specific score values, they concurred by not scoring bull trout impact on any population as "very high" or "high," with modes mostly in the categories of "moderately low" to "none."

Monitoring, Adaptive Management, and Flexibility under 10(j) Designation

The proposed action contains three critical components that will limit adverse effects to threatened salmon and steelhead from the bull trout reintroduction project. First, we have developed, and are committed to implementing a robust monitoring and evaluation program to determine whether we are meeting the project's goals and objectives, including limiting impacts to salmon and steelhead. Second, the information gained through our monitoring and evaluation program will feed into the adaptive management framework outlined for the project, furthering our effectiveness with project implementation and ensuring if negative impacts to salmon and steelhead are identified, appropriate management actions are taken. Lastly, the 10(j) designation, under which the reintroduction will be implemented, will allow significant flexibility to manage the reintroduced bull trout population, and the ability to enact management actions to address project-related impacts to salmon and steelhead.

Summary of Effects to Listed Salmon and Steelhead

In our assessment of direct and indirect effects from the proposed action, we identified the likelihood of predation of eggs, fry, and juvenile salmon and steelhead by bull trout, and competition between bull trout and anadromous salmonids for food resources and habitat. Avoidance of downstream fish passage facilities may constitute additional effects to juvenile salmon and steelhead if bull trout stage or forage near these facilities or other PGE hydro project features that concentrate migrating juveniles (smolts).

While adverse effects to salmon and steelhead individuals (eggs, fry, juveniles) are expected due to bull trout predation and competition, direct population level effects (often measured by adult returns), and by extension ESU/DPS effects, are not expected for the following reasons:

Extinction risk: While the Evolutionary Significant Unit's (ESU) and Distinct Population Segment (DPS) to which the Clackamas River salmon and steelhead populations belong are at high risk of extinction, the Clackamas specific populations (with the exception of the LCR fall Chinook) are generally ranked at low or moderate risk of extinction, reflecting the relative health of these populations compared to others in the ESU/DPS. The low to moderate risk of extinction for these populations suggests the Clackamas River may be one of the best places, in terms of risk, to pursue a reintroduction of bull trout to historic habitat within the Lower Columbia River (LCR) and Upper Willamette River (UWR) ESU/DPS region. In addition, the multitude of actions to be carried out

under the new FERC license that was issued in 2010 to PGE (e.g., fish passage, flow, water quality, habitat restoration) are expected to significantly benefit the recovery of listed populations of salmon and steelhead in the Clackamas River (NMFS 2010).

Complexity of foodweb: Food web dynamics are complex and difficult to predict. Populations of salmon and steelhead in the Clackamas River are currently impacted by an array of aquatic, terrestrial and avian predators, and the impact of another predator in the foodweb (bull trout) does not necessarily translate to an "additive" impact to salmon and steelhead individuals (eggs, fry, juveniles). As noted previously, reintroduced bull trout will likely rely heavily on the native resident fish component in the Clackamas River and will prey on current aquatic predators of salmon and steelhead individuals (i.e., coastal cutthroat trout, rainbow trout, brown trout, sculpin).

Very-low to moderately-low extinction probably from a bull trout reintroduction: As detailed above, the expert science panel workshop to assess impacts of a bull trout reintroduction on salmon and steelhead extinction probabilities in the Clackamas River determined there was none to very-low extinction risk to LCR fall Chinook in the Clackamas River, and very-low to moderately-low extinction risk for the remaining three species of listed salmonids in the Clackamas River. In general, the expert panelists predicted a less than one in ten chance that bull trout would have a moderate impact and a one in fifty chance of a moderately high impact on extinction probability for spring Chinook, coho and steelhead.

Monitoring and evaluation program to assess impacts: We propose to closely monitor and evaluate the reintroduction project, including a monitoring component developed specifically to assess impacts to salmon and steelhead populations. We have developed this monitoring component with the intent of reducing uncertainty and informing future management decisions associated with the bull trout reintroduction program. We propose to: 1) determine if adult and subadult bull trout occupy areas within the PGE hydro project during periods in which they could consume particularly high numbers of rearing or migrating juvenile salmon and steelhead; 2) if so, determine if survival rates of listed anadromous salmonid juveniles rearing in, or moving through the PGE hydro-project area change; and, 3) if survival rates of listed anadromous salmonids juveniles decline, determine the degree to which bull trout are responsible for the decline by utilizing field data, bioenergetics and life-cycle monitoring.

As outlined in 2.1.7, adaptive management will guide how the reintroduction project is implemented on an annual basis. The primary tool to accomplish adaptive management is monitoring. The monitoring of impacts to salmon and steelhead will provide valuable information that will inform how the project is implemented in future years, including numbers, life stages, and release locations of bull trout, as well as the disposition of individual fish should they be documented or observed staging near, within or immediately below juvenile salmonid bypass systems.

Adaptive Management and the 10(j) non-essential experimental designation: The 10(j) designation will allow for significant management flexibility for the reintroduced bull trout population. We fully anticipate the adaptive management of the project, implemented under the flexibility afforded by the 10(j) designation, and the guidance in the Stepwise Impact Reduction Plan (detailed in the project's Implementation, Monitoring and Evaluation Plan, Appendix C) will allow for the appropriate management action to reduce impacts if they occur.

3.1.2.1.1 Additional Foodweb Effects (Brook Trout)

Nonnative brook trout are widespread throughout the range of bull trout and are considered an important threat to the persistence of bull trout (Rieman et al. 1997). The influence of nonnative brook trout on bull trout may depend in part on local habitat features. Rich et al. (2003) examined the influence of habitat features on the distribution and co-occurrence of nonnative brook trout and bull trout. The study suggested that bull trout and brook trout may partition themselves naturally based on habitat type and stream temperature, and that bull trout may be more susceptible to brook trout invasion in small, low-gradient streams where brook trout may have a competitive advantage (Nagel 1991; Paul and Post 2001). Brook trout appear to adapt better to degraded habitats and higher water temperatures than bull trout (Clancy 1993, Rich 1996). Yet in areas of clean, cold water with complex habitat, bull trout may successfully compete with brook trout (Paul and Post 2001; Dunham and Rieman 1999). Hybridization is most common where isolated or remnant bull trout populations overlap with brook trout (Cavender 1978; Leary et al. 1983, 1991; Markle 1992). Small resident populations are particularly susceptible to hybridization from co-occurring brook trout because individuals of spawning age are similar in size, and both spawn in the fall and utilize similar spawning habitat.

Stocking of nonnative brook trout for recreational angling began in the Clackamas River in the early 1900s, and continues today in high elevation lakes. Over time, some lakes have developed naturally reproducing populations of brook trout while others require regular stocking. While the release of brook trout into high elevation lakes with outlet streams has been discontinued, past stocking in lakes resulted in self-sustaining populations of brook trout in some streams in the Clackamas River subbasin.

Stream surveys and biological inventories completed by USFS fish biologists over the last two decades provide a reliable source for documenting observations of brook trout in particular river segments and streams. However, little to no quantitative data exists to characterize their abundance relative to that of native species. Brook trout have been observed in one of the six patches containing suitable bull trout spawning and rearing habitat; Patch Three upper Clackamas River. Within Patch Three, brook trout have been observed in Squirrel and Ollalie creeks, and in the upper Clackamas River above its confluence with Squirrel Creek. Of the approximately 70 miles of suitable spawning and rearing habitat identified for bull trout in the upper Clackamas Subbasin in the Feasibility

Assessment (Shively et al. 2007), brook trout have been observed to occupy, and be reproducing in, approximately two miles of streams. Brook trout were observed to occupy an additional one and a half miles of adjacent area in low numbers in 2004, but not in 2007 or 2008 (Fishman 2004). Brook trout also occupy, and are stocked, in some of the unconnected headwater lakes in the subbasin.

Brook trout expanded to Squirrel and Ollalie creeks and to the upper Clackamas River above its confluence with Squirrel Creek from historic stocking in headwater, mountain lakes with tributary outlets. Brook trout were repeatedly stocked over many decades by ODFW in various lakes throughout the Ollalie Lakes complex and in other lakes that feed Ollalie and Squirrel creeks. Beginning in 2003, a coordinated effort between ODFW and the USFS led to a discontinuation of stocking brook trout into lakes with tributary outlets to the upper Clackamas River and its tributaries containing suitable bull trout spawning and rearing habitat. Although recent sampling efforts have not been comprehensive, results from surveys in the Upper Clackamas River suggest brook trout distribution may be contracting over time. However, they are persisting with recruitment in the highest reaches of the upper Clackamas River (approximately through the upper 1.75 miles (2.8 km). Although additional surveys are warranted, it is possible the range of brook trout in areas that are no longer stocked has decreased.

Based on the best available information, brook trout distribution does not appear to be expanding in the upper Clackamas River and in fact may be contracting. In addition, recent surveys suggest brook trout may be reproducing in only a portion (2 miles) of their limited three and one-half mile distribution. These three and one-half miles represent only two percent of the 70 miles of identified suitable spawning and rearing habitat in the upper Clackamas River (Shively et al. 2007).

It is unlikely that brook trout will limit the potential establishment of bull trout in the upper Clackamas River for the following reasons: (1) limited distribution and reproduction of brook trout within the reintroduction area; (2) discontinuation of brook trout stocking of headwater lakes with outlets to the upper Clackamas River and its tributaries (3) high quality habitat in the Upper Clackamas River may provide an advantage to bull trout over brook trout based on recent literature (Paul and Post 2001; Dunham and Rieman 1999; Dunham et al. 1999); and (4) based on the fluvial life history type of the donor stock (Metolius) and the suspected fluvial life history type present in the Clackamas River historically, we expect reintroduced bull trout will adopt a fluvial life history type (larger migratory fish) rather than a resident life history type (small non-migratory fish). Large migratory bull trout would be expected have a competitive and reproductive advantage over the small brook trout that are currently observed in the upper Clackamas River.

3.1.2.2 Disease Transmission

Unwanted parasites and diseases frequently have been introduced through fish transfers (Hoffman and Schubert 1984). To avoid these unintended consequences, translocations of fishes between major river basins should be preceded by a thorough investigation into the potential transfer of pathogens from the donor source, as well as the resistance of the donor stock to any known pathogens present in the receiving habitat.

In order to assess the risk of disease transfer and the presence of pathogens in the Clackamas River, the Service worked closely with ODFW fish pathologists and staff from the Service's Lower Columbia River Fish Health Center. Our assessment utilized previously existing disease information from the Deschutes Basin (and Metolius River subbasin) and new information that was collected from the Clackamas and Lewis rivers as part of the disease assessment. At the time of the disease assessment, bull trout from the Lewis River, in addition to bull trout from the Metolius River, were being considered as potential donor stock for a reintroduction to the Clackamas River.

The results from our testing of fish from the Lewis and Clackamas rivers, combined with existing data from the Deschutes Basin (Engleking 2003) provided valuable information regarding (1) the risk of pathogen transfer to the Clackamas River from the Metolius or Lewis river donor stock; and, (2) the presence or absence of pathogens in the Clackamas River that may influence the health of donor stock from the Lewis or Metolius rivers. Based on the results, it appeared the predominant pathogens of concern to a reintroduction of bull trout to the Clackamas River are Infectious Hematopoietic Necrosis Virus (IHNV) and Renibacterium salmoninarum (BKD). The ODFW's primary concern is the potential to introduce the U-clade of IHNV to the Clackamas River. U-clade INHV is present in the Deschutes Basin but has not been detected in bull trout from below or above PGE's Pelton-Round Butte Hydroelectric Project (a complex of three dams).

It does not appear at this time that existing pathogens from potential donor stock or from the receiving environment will compromise the success of the reintroduction project. In addition, there does not appear to be undue risk to other native salmonids in the Clackamas River from a transfer of bull trout from the Lewis or Metolius river basins. Despite these findings, annual disease screening of a representative sample of bull trout prior to transfer to the Clackamas River is warranted. Guidelines for annual disease screening were developed in coordination with ODFW Fish Health Services.

Based on State requirements and recommendations from ODFW Fish Health Services (ODFW 2009), 60 ripe bull trout adults must be tested for virus the fall previous to transfer by collecting (non-lethal) and testing ovarian fluid and sperm. Although not required, it is preferable to have the samples come from individuals from more than one spawning tributary. In addition, each year of transfer will also require the testing (lethal) of 150 fry. Similar to the adult samples, it is preferable to have the samples come from more than one spawning tributary. As long as yearly test results for both fry and adults remain negative for U-clade IHN virus, the project is cleared by ODFW Fish Health Services to collect and transfer any life-stage of bull trout from within the Metolius River/Lake Billy Chinook system that calendar year. The testing, which will occur at

Fish Health Services labs in Madras or Corvallis, will provide a 95 percent confidence of disease detection at a 2 percent incidence rate.

The two samples are temporally separated but offer the best possible life-stages from which to pick up the virus. Clearance of the population would have to occur on an annual basis such that the results of adults sampled in the fall are combined with results of fry testing from the following spring to clear the population for transfer during that year. For example, 60 adults were tested in the fall of 2010 and 150 fry in early 2011, with no virus detected, thus any life-stage of bull trout can be transferred to the Clackamas River in calendar year (2011).

3.1.2.3 Invasive Species

Inter-basin transfer of fish and the use of fish collection equipment and associated gear in multiple watersheds inherently pose risk of transfer of invasive species. The proposed action will adhere to guidance contained in a project specific invasive species plan that was created using the Hazard Analysis Critical Control Point (HACCP) protocol. The plan was developed collaboratively between the Service and ODFW (USFWS 2011).

The primary invasive species concern with the proposed action is the transfer of New Zealand mud snail from the Deschutes Basin to the Clackamas River subbasin. The occurrence of New Zealand mud snail in Lake Billy Chinook was recently documented. Although the probability of field staff encountering mud snails or bull trout ingesting mud snails is low, as a precaution, the invasive species plan stipulates that bull trout collected for transfer from Lake Billy Chinook will be held for a 48 hour depuration period at Round Butte Isolation Facility in clean water, prior to transfer and release in the Clackamas River. In addition, standard protocols contained in the plan will be followed to prevent transmission of invasive species from field equipment such as wading boots, nets, traps and associated gear.

3.1.2.4 Impacts to Donor Stock

To implement the reintroduction of bull trout to the Clackamas River we propose to utilize a single donor stock from the Metolius River in Central Oregon. We will collect fish of various life stages (juvenile, subadult, and adult) in proportion to donors available from genetically identifiable groupings of bull trout in the Metolius River. Three major genetic bull trout groupings are present in the Metolious: (1) Whitewater River; (2) Jefferson and Candle Creeks; and, (3) Canyon, Heising, and Jack Creeks. The actual number transferred will depend on current population abundance in the Metolius River, based on ongoing annual monitoring by ODFW, USFS, CTWSRO, and PGE.

Annual Donor Availability Assessment: The numbers and life stages of donor stock to be transferred from the Metolious River to the Clackamas River were developed by

members of the Clackamas Bull Trout Working Group (CBTWG) and members of the Deschutes Bull Trout Working Group (DBTWG). The DBTWG includes members that manage and/or contribute to monitoring bull trout and bull trout habitat in the Metolius River subbasin (ODFW, CTWSRO, USFS, PGE, FWS). Members of these two working groups assembled in March 2008, to discuss and develop donor stock availability criteria that will inform the number of bull trout available on an annual basis from the Metolius River for the first seven-years (Phase 1) of the reintroduction to the Clackamas River. Members of the Clackamas and Deschutes bull trout working groups that met on the issue of donor availability will be subsequently referred to as the donor stock advisory group.

The donor stock availability criteria, ultimately developed to reduce the potential impact to the donor stock, represent the maximum number of individuals that could be removed on an annual basis based on the recent population status of bull trout in the Metolius River. Should the status of bull trout in the Metolius River significantly change these criteria will be reevaluated by the Service, ODFW, CTWSRO and other members of the donor stock advisory group (advisory group).

Of primary concern to both the Deschutes and Clackamas bull trout working groups is continued viability of bull trout populations within the Metolious River. To that end, the lead implementing agencies of the Clackamas River Bull Trout Reintroduction Project (the Service and ODFW) are committed to an adaptive management framework for the reintroduction effort. All take of bull trout from the Metolius River will be assessed every year at an annual meeting of the donor stock advisory group.

The advisory group's support towards Metolius River bull trout as a donor stock is dependent upon the adult spawning population in the Metolius River remaining above 800 individuals annually. The spawning population estimate peaked in 2004 at approximately 2,500 fish but dropped to approximately 900 adult spawners in 2008 (does not include Whitewater River bull trout which likely puts the total count over 1,000). If the adult spawning population drops below 800 individuals (including bull trout in Whitewater River) for a single year, the bull trout co-managers in the Deschutes Basin (ODFW and CTWSRO) and other members of the advisory group, will evaluate and provide further guidance to the Clackamas Project as to donor availability by life stage for subsequent years.

Adult and Subadult Transfers: The advisory group determined up to a 100 adults and 100 subadults total could be available for transfer to the Clackamas River annually provided the total number of adult spawners in the Metolius River maintains 800 or more individuals as called for in recovery criteria outlined in the draft recovery plan (USFWS 2002). Maintaining 800 spawning individuals is generally consistent with the donor stock risk assessment in the Feasibility Assessment (Shively et al. 2007) which found low risk (from loss of individuals) to populations that maintain a spawning population size that approaches 1,000 individuals.

Adults and subadults will be captured annually by hook and line and/or trap nets in the Metolius River arm of Lake Billy Chinook from late April through mid-June. Adults and subadults may also be collected from the fish collection facility at Round Butte Dam.

Fry and Juvenile Transfers: The group determined up to 1,000 juveniles (age 1+ and 2+) and up to 10,000 fry could be available for transfer to the Clackamas River annually provided that this take was spread among multiple spawning tributaries (excluding direct take of individuals from Whitewater River per request from CTWSRO). In order to replicate as much of the genetic diversity as possible to the Clackamas River we intend to utilize donors from the majority of Metolius River tributaries used by bull trout for spawning. However, the capacity and current number of spawners differs among tributaries and thus the number of individuals removed from each tributary will be commensurate with the number of adult fish spawning in each tributary. For example, we expect to transfer more donors from Jack Creek which averages more than 150 redds annually then from Heising Spring which averages less than 50 redds annually. Collection of juveniles would occur primarily in spawning tributaries whereas the collection of fry, if utilized, will likely occur both in spawning tributaries and in the mainstem Metolius River.

Summary of Donor Stock Risk: The decision to utilize Metolius River (Deschutes Basin) bull trout as a donor stock was based on a rigorous assessment of donor stock suitability in the Feasibility Assessment (Shively et al. 2007). The decision was significantly influenced by the current trend and abundance of the Metolius River bull trout population which is the healthiest population in Oregon. Based on redd counts, the Metolius bull trout population has maintained greater than 1,000 spawning adults since 2002, thereby meeting current minimum abundance criteria (i.e., 800 spawning individuals) outlined in the Service's draft recovery plan (USFWS 2002). Based on the current status of Metolius River bull trout, the donor stock criteria discussed above, the methods of donor stock removal, the commitment on behalf of the donor stock advisory group to assess the donor stock program and status annually, we believe the appropriate safeguards are in place to prevent any negative impacts to the Metolius bull trout population from its donor stock contribution to the Clackamas bull trout reintroduction.

3.1.3 Social Environment

3.1.3.1 Recreation, Agriculture, Development

Due in part to the nonessential experimental population (NEP) designation, the proposed action will have no effect on recreation, agriculture and development. Experimental population special rules contain specific prohibitions and exceptions regarding the taking of individual animals. These special rules are compatible with routine human activities in the expected reestablishment area. Section 3(18) of the Act defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in

any such conduct." Take of bull trout within the experimental population area will be allowed provided that the take is unintentional, not due to negligent conduct, or is consistent with State fishing regulations that have been coordinated with the Service. We expect levels of incidental take to be low because the reintroduction is compatible with existing activities and practices in the area. As recreational fishing for species other than bull trout is popular within the NEP area, we expect some incidental take of bull trout from this activity but, as long as it is in compliance with ODFW fishing regulations and Tribal regulations on land managed by the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), such take will not be a violation of the Act.

The principal activities on private property near the expected reestablishment area in the NEP are agriculture, ranching, hydropower generation, and recreation. The presence of bull trout would likely not affect the use of lands for these purposes because there would be no new or additional economic or regulatory restrictions imposed upon States, non-Federal entities, or members of the public due to the presence of bull trout. Therefore, the reintroduction of bull trout to the Clackamas River under NEP designation is not expected to have any significant adverse impacts to recreation, agriculture, hydropower generation, or any development activities.

The area affected by the proposed action includes the Clackamas River subbasin and the mainstem of the Willamette River, from Willamette Falls to its points of confluence with the Columbia River, including Multnomah Channel, in Oregon. Because NEP designations do not establish substantial new regulation of activities, we do not expect the reintroduction of bull trout to the Clackamas River under NEP designation to have any significant effect on recreational, agricultural, hydropower generation, or development activities. Although the entire NEP boundary encompasses a large area, the section of the NEP area where we can anticipate the establishment of an experimental population of bull trout is mainly public land owned by the USFS.

3.1.3.2 Clackamas River Hydroelectric Project

The proposed action, and associated rulemaking, does not require any additional changes, protections, or mitigation or enhancement measures for bull trout with respect to PGE's operation of Project 2195 (Clackamas River Hydroelectric Project) pursuant to the Settlement Agreement or the new license for the Project; nor does any provision of the final rule amend or modify the Settlement Agreement or require that any plan pursuant to the Settlement Agreement be modified to address the presence of bull trout.

The Service recognizes that the provisions of PGE's Clackamas Settlement Agreement do not reflect the reintroduced presence of bull trout in the Clackamas River subbasin. However, no additional changes or protections regarding PGE's operation of the Clackamas River Hydroelectric Project are necessary to support a successful reintroduction of bull trout to the Clackamas River subbasin.

3.2 Alternative B, No Action

3.2.1 Fish and Wildlife

The Service acknowledged in the draft recovery plan the necessity for reestablishing bull trout in portions of its historic range (USFWS 2002). Although the Clackamas River represents a small portion of the historic range of the species that has been lost, reestablishing bull trout in this subbasin would move the species incrementally closer to meeting draft recovery goals. In the Willamette River Basin, where bull trout have been extirpated over a significant portion of its former range, the establishment of bull trout in the Clackamas River would represent a significant achievement towards meeting basin-wide, and range-wide recovery goals for the species. The No Action alternative would eliminate or postpone our ability to meet draft recovery criteria in the Willamette River Basin.

The present status of Clackamas River and Willamette River fish species and communities, threatened and endangered species, and other wildlife in the Clackamas River subbasin and the Willamette River basin is likely to remain unchanged if a NEP is not designated and bull trout are not reintroduced.

Under the No Action alternative, the following effects would not be realized: apex predators such as bull trout play important roles in food web dynamics. If a reintroduction of bull trout is successful in the Clackamas River we expect to see a response within the aquatic community driven by predation and competition for habitats and food resources. Impacts may be beneficial for some species and negative for others. Although we expect bull trout would forage on juvenile anadromous salmon and steelhead as well as eggs and carcasses of anadromous fish, they would also forage on other species of native fish that forage on juvenile anadromous fish and eggs such as sculpin, whitefish, and rainbow and coastal cutthroat trout. The response to bull trout presence within the aquatic community is likely to vary by season and by species (see Lowery 2008). Predicting the overall impact on individual species within the foodweb is a difficult endeavor as discussed in section 3.1 above. We acknowledge a successful reintroduction of bull trout to the Clackamas River could potentially have positive effects to some species within the native fish community, perhaps including anadromous salmon and steelhead. Under the No Action alternative, these potential positive and negative effects would not be realized.

3.2.2 Land Use

A decision to forego designation of a NEP and reestablishment of bull trout would have no direct social or economic impacts in the Clackamas River subbasin or the portion of the Willamette River included in the NEP boundary area. Recreational use of these rivers would be unaffected by this alternative. The State of Oregon and USFS will continue to

exercise authority over most recreational use in the Clackamas River and the City of Portland will continue its authority over use in the portion of the Willamette River included in the NEP boundary area.

In and upstream from the Clackamas River subbasin, Federal, State and private actions would continue to be subject to existing environmental regulations. USFS would continue to manage most of the river and riparian habitat within the upper portion of the Clackamas River subbasin in such a way as to provide for recreation and to preserve the area's ecological character and biological diversity. Likewise there would be no effect on Federal agency actions in the lower Clackamas River or the portion of the Willamette River included in the NEP boundary area.

4.0 List of Preparers

The United States Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and the United States Forest Service contributed to the development of this document.

5.0 List of Agencies, Organizations and Persons Contacted

Project Cooperators and Collaborators:
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U.S. Forest Service, Mt. Hood National Forest & Deschutes National Forest
Oregon Department of Fish and Wildlife
National Marine Fisheries Service
U.S. Geological Survey
Confederated Tribes of the Warm Springs Reservation of Oregon
Portland General Electric

Peer Review of Reintroduction Feasibility Assessment
State of Oregon's Independent Multidisciplinary Science Team

Project Presentations to the Following:
American Fisheries Society – Oregon Chapter and Western Division Chapter
The Nature Conservancy of Oregon
Lower Columbia Technical Recovery Team (for salmon and steelhead)
Oregon Fish and Wildlife Commission
Salvelinus confluentus Curiousity Society (ScCS)
Trout Unlimited – Clackamas Chapter

Stakeholder Group:
Portland General Electric
Northwest Steelheaders Association
Native Fish Society

Trout Unlimited
Estacada Tackle Shop
Clackamas Watershed Council
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7.0 Appendix A – Public Comments and Responses on the Draft Environmental Assessment and Proposed Rule on the Reintroduction of Bull Trout to the Clackamas River

Note: Appendix A was taken directly from the *Public Comment* Section of the Final Rule to designate a nonessential experimental population of bull trout in the Clackamas River, Oregon.

Public Comments

(1) *Comment:* Several commenters suggested reintroduction of bull trout to the Clackamas River under section 10(j) of the Act may not provide ample protection to ensure the long-term viability of the population, and encouraged the Service to reintroduce bull trout to the Clackamas River under full protections of the Act, along with designated critical habitat.

Our Response: Any population determined by the Secretary to be an experimental population will be treated as if it were listed as a threatened species for purposes of establishing protective regulations with respect to that population pursuant to section 4(d) of the Act. The protective regulations adopted for an experimental population will contain applicable prohibitions, as appropriate, and exceptions for that population. In addition, before authorizing the release of an experimental population (including eggs, propagules, or individuals) of an endangered or threatened species, the Service must consider the extent to which the introduced population may be affected by existing and anticipated Federal or State actions or private activities within or adjacent to the experimental population area.

We have assessed existing or anticipated Federal or State actions and private activities within or adjacent to the experimental population area and, along with the applicable prohibitions in this final rule, we have determined these actions to be compatible with, and protective of, a reestablished population of bull trout in the Clackamas River. We believe, based on this assessment, that the protective regulations adopted by this rule are appropriate and provide adequate protections for a reintroduced population of bull trout.

Lastly, under 50 CFR 17.81(f), the Secretary may designate critical habitat as defined in section 3(5)(A) of the Act for an essential experimental population but not for a nonessential population.

(2) ***Comment:*** One commenter suggested reintroductions of bull trout to historical habitat are essential for the continued survival of the species, and thus encouraged the Service to designate the experimental population in the Clackamas River as an "essential" population under the Act, rather than a "nonessential" population.

Our Response: We have determined that restoring bull trout to the Clackamas River is not essential to the continued existence of the species. We maintain that releasing bull trout under the section 10(j) NEP provision of the Act is the most appropriate way to achieve conservation for this species in the Clackamas River and that this action is consistent with the purposes of the Act.

(3) ***Comment:*** One commenter suggested that the Service should consider removing the "experimental nonessential" designation under section 10(j) of the Act if the bull trout reintroduction project is successful.

Our Response: Our intent is for the section10(j) rule to remain in place until the status of the species improves to a point where listing is no longer necessary. Section 10(j) of the Act does not give us the authority to ''permanently'' declare an NEP. However, we have made it clear that it is not our intention to change this designation until the species meets the requirements for delisting, and we currently do not anticipate that any circumstances would warrant changing this designation. The proposed rule and this final rule contain language on this subject found in 50 CFR 17.85(a)(1)(iii), specifically: ''We do not intend to change the NEP designations to 'essential experimental,' 'threatened,' or 'endangered' within the NEP area. Additionally we will not designate critical habitat for the NEP, as provided by 16 U.S.C. 539(j)(2)(C)(ii).''

(4) ***Comment:*** Several commenters noted the lack of quantitative information on the distribution, abundance, and diversity of the native fish community in the upper Clackamas River and suggested the Service conduct an assessment prior to implementing the bull trout reintroduction project to affirm the sufficiency of a prey base to support the reestablishment of a viable bull trout population.

Our Response: We agree there is limited quantitative information on the native fish community in the upper Clackamas River. However, upper Clackamas River baseline foodweb surveys that were conducted in association with the action considered in this final rule (Lowery and Beauchamp 2010), along with an abundance of qualitative information collected by the USFS and State of Oregon (Shively et al. 2007, Appendix F, p. 24), confirm the full complement of native species (except for bull trout) in the upper Clackamas River. There is no evidence to suggest the upper Clackamas River forage base would not compare favorably with the abundance, distribution, and diversity of native fishes found in other major subbasins in the lower Columbia River that support viable populations of bull trout, including the McKenzie, Lewis, and Deschutes rivers. Although historical reductions in the anadromous forage base in the Clackamas River may have negatively impacted the historical bull trout population, as noted above in *Biological Information*, the primary factors leading to the extirpation of bull trout in the Clackamas River were migration barriers from hydroelectric and diversion dams, direct and incidental harvest in sport and commercial fisheries, targeted eradication through bounty fisheries (currently known as "sport reward" programs), and habitat and water quality degradation from forest management and agricultural activities not in accordance with best management practices (Shively et al. 2007, Ch. 1, pp. 18–22).

(5) ***Comment:*** In order to minimize and offset potential impacts to anadromous salmon and steelhead from bull trout predation and competition, one commenter suggested initiating habitat improvement actions such as adding refuge cover and distributing

excess hatchery salmon and steelhead carcasses into the upper Clackamas River to increase marine-derived nutrients and stream productivity.

Our Response: Although we do not anticipate significant impacts from bull trout on threatened salmon and steelhead, if our monitoring program indicates bull trout are having population-level impacts, the Service and our project partners will implement actions to minimize and offset these impacts. While these actions may include habitat restoration projects such as those recommended, the most immediate management actions to reduce impacts will be modification of the bull trout reintroduction implementation strategy such as the numbers, life-stages, and locations of releases, and removal of individual bull trout if they are found occupying areas that artificially concentrate juvenile salmon and steelhead such as fish passage facilities associated with the Clackamas Hydroelectric Project.

(6) ***Comment:*** One commenter noted the presence of nonnative brook trout in a small portion of the suitable habitat identified for bull trout reintroduction, and suggested that they should be eradicated in order to prevent hybridization and competition with reintroduced bull trout.

Our Response: While we agree that nonnative brook trout can negatively affect bull trout through hybridization, predation, and competition, our literature review on the subject for the Clackamas Bull Trout Reintroduction Feasibility Assessment (Shively et al. 2007, Ch. 4. pp. 1–2) suggests negative effects are variable across the range these two

species overlap. In some places, brook trout appear to have a strong negative impact, whereas in others there is no apparent impact (Dunham et al. 2002, pp. 384–385). The influence of nonnative brook trout on bull trout may depend in part on local habitat features. Rich et al. (2003, pp. 1059–1061) examined the influence of habitat features on the distribution and co-occurrence of nonnative brook trout and bull trout. This study suggested that bull trout and brook trout may partition themselves naturally based on habitat type and stream temperature, and that bull trout may be more susceptible to brook trout invasion in small, low-gradient streams where brook trout may have a competitive advantage (Paul and Post 2001, pp. 424–428). In areas of clean, cold water with complex habitat, bull trout may successfully compete with brook trout (Rieman et al. 2005, pp. 72–76).

Although systematic quantitative surveys for brook trout have not occurred in the upper Clackamas River, stream surveys and biological inventories by the USFS over the last several decades provide a reliable source for documenting observations of brook trout in particular river segments and streams (Shively et al. 2007, Appendix F, p. 24). Brook trout are present in a small portion of the habitat identified as suitable for bull trout reintroduction (less than 10 percent) in the upper Clackamas River (Shively et al. 2007, Ch. 4. p. 2). Given their limited distribution in the upper Clackamas River, we do not anticipate brook trout will adversely affect the success of this reintroduction project. Further, while we support the goal of eradication of nonnative species, our assessment of the feasibility of eradication of brook trout in the upper Clackamas River suggests the

likelihood of complete eradication is low and the cost would likely be high. Consequently, it is unlikely we will pursue eradication efforts in the foreseeable future.

(7) ***Comment:*** Several commenters requested that the Federal rulemaking cause no additional requirements of Portland General Electric above and beyond those currently outlined in the multiparty settlement agreement for relicensing of the Clackamas Hydroelectric Project, nor that any potential ecological effects from the bull trout reintroduction project in and of itself trigger mitigation requirements outlined in the agreement.

Our Response: Language in the proposed rule was intended to convey our position on this issue, consistent with the request above. This final rule and the above background discussion in "Addressing Causes of Extirpation" contains additional language in several sections to clarify our support for this request. See also our response to Comment 9 below.

(8) ***Comment*****:** One commenter indicated that the Draft Implementation, Monitoring and Evaluation Plan, appended to the draft EA, lacked detailed information and should be expanded. The same commenter suggested the monitoring portion of the draft plan did not provide adequate information for decisionmaking.

Our Response: While the general implementation strategy (transfer numbers, life stages, donor stock, release locations) has not changed from that outlined in the proposed rule

and draft EA, the Service and our project partners have added specificity to the implementation component of the plan. Similarly, and based strongly on comments received on the proposed rule and draft EA, we developed a robust monitoring and evaluation component of the plan to document the effectiveness of the reintroduction, assess potential impacts to the bull trout donor stock in the Metolius River, and assess potential impacts to threatened salmon and steelhead. The monitoring and evaluation program, which will begin immediately upon initiation of the project, will feed directly into the adaptive management of the reintroduction project. Given the level of detail that has been added to the Implementation, Monitoring and Evaluation Plan since publication of the proposed rule and draft EA, we are confident the plan has sufficient detail to appropriately guide the project and provide necessary information for decisionmaking. The monitoring program is summarized above in the *Monitoring and Evaluation* section of this final rule and is appended to the final EA as a component of the Implementation, Monitoring, and Evaluation Plan. See also our response to Comment 12 below.

(9) *Comment*: One commenter suggested that the draft EA was insufficient and suggested the action proposed may warrant the development of an Environmental Impact Statement (EIS) due to the possibility of significant impacts to the Clackamas Hydroelectric Project settlement agreement and to federally threatened salmon and steelhead through competition and predation by bull trout.

Our Response: An EIS is required only when a project is a major Federal action with significant impact(s) to the human environment, or alternatively where there is substantial

controversy surrounding the potential for significant impacts to the human environment, such that the more limited analysis in an EA to support a "Finding of No Significant Impact (FONSI)" may not be appropriate. If an EA fully considers the potential direct, indirect and cumulative impacts of the project and that analysis is sufficient in reaching a FONSI, then the preparation of an EIS is not warranted. Our analysis in the EA did not suggest a likelihood of significant environmental effects; nor did it identify substantial controversy surrounding the potential for significant impacts to the human environment.

Scoping and public comments identified concerns with potential impacts to the Clackamas River hydroelectric project settlement agreement, as well as to salmon and steelhead populations from predation and competition by bull trout. We have addressed these concerns by: (1) Including clarifying language in several sections of this final rule and the final EA, (2) modifying components of the proposed action, and (3) developing a Stepwise Impact Reduction Plan as part of our adaptive management program to reduce risk and uncertainty with regards to impacts to listed anadromous salmonids, and to guide management of a Clackamas River bull trout population and future implementation of the project.

As noted elsewhere in this final rule, the designation of an NEP population of bull trout in the Clackamas River will not cause additional requirements of Portland General Electric above and beyond those currently outlined in the multiparty settlement agreement for relicensing of the Clackamas Hydroelectric Project, nor will any potential ecological effects from the bull trout reintroduction project in and of itself trigger

mitigation requirements outlined in the agreement. While we acknowledge some uncertainty around the interactions between bull trout and anadromous salmon and steelhead, the preponderance of information does not suggest that significant population-level impacts will occur.

(10) *Comment*: One commenter suggested the adaptive management plan for the action lacked detail and needed improvement.

Our Response: We agree. As a result we added substantially to the adaptive management plan for the action considered in this final rule. Most notably, we incorporated recommendations provided in the Department of the Interior's technical guidance manual on adaptive management (USDI 2009), and we developed a Stepwise Impact Reduction Plan specifically to assist in management decisions associated with potential impacts from the reintroduction of bull trout on threatened salmon and steelhead in the Clackamas River. Recommendations adopted from the Department of the Interior's technical manual on adaptive management, and the Stepwise Impact Reduction Plan to address potential impacts to threatened salmon and steelhead, are summarized in this final rule above in *Potential impacts to other Federally listed fish species,* and are presented in more detail in the final EA.

(11) *Comment*: One commenter suggested that the Service had not adequately consulted with the individual in developing the proposed rule per the procedural requirements of experimental population regulations, and further, that the proposed rule did not represent

the required agreement between the Service and affected State and Federal agencies, and persons holding any interest in land that may be affected by the establishment of an experimental population.

Our Response: Under 50 CFR 17.81(d), the Service must consult with appropriate State fish and wildlife agencies, local governmental entities, affected Federal agencies, and affected private landowners in developing and implementing experimental population rules. To the maximum extent practicable, section 10(j) rules represent an agreement between the Service, the affected State and Federal agencies, and persons holding any interest in land that may be affected by the establishment of an experimental population.

The language above does not require the Service to agree on all issues and concerns, nor are we required to have full agreement from potentially affected local, State, Federal, and private partners prior to finalizing section 10(j) experimental population rules. In development of the proposed and final rule, we coordinated closely with the appropriate State fish and wildlife agencies, local governmental entities, affected Federal agencies, and affected private landowners, to resolve as many concerns as possible. In addition, we assembled management and technical committees with representation from all major stakeholders in the reintroduction, to further ensure we addressed as many concerns as possible prior to finalization of the final rule. Given these efforts, it is clear that we have complied with the requirements of section 10(j) of the Act in the development of the proposed rule and this final rule. As during the development of

this action, we are committed to working with project partners and stakeholders during and following implementation of the reintroduction to address concerns that may arise.

(12) ***Comment:*** Several commenters suggested that the assessment of potential impacts to threatened salmon and steelhead from the bull trout reintroduction was inadequate and suggested a more thorough risk assessment prior to implementing the project.

Our Response: While we disagree that our pre-project assessment of potential impacts to threatened salmon and steelhead was inadequate, we do recognize the concern for the recovery of these species in the Clackamas River and for their respective evolutionarily significant units/distinct population segments. In recognition of those concerns the Service has invested, and will continue to invest, significant resources toward assessing potential impacts from the bull trout reintroduction on salmon and steelhead in the Clackamas River.

The expert science panel workshop (Marcot et al. 2008), the final report of which was appended to the draft EA, was conceived and implemented precisely to investigate the potential impact of a bull trout reintroduction on threatened salmon and steelhead in the Clackamas River. In addition, we funded, together with our primary project partners and stakeholders, a pre-project baseline food web investigation in the upper Clackamas River subbasin specifically to allow for greater precision in determining impacts to salmon and steelhead from bull trout during and following the reintroduction. Finally, a

large component of our monitoring and evaluation program is designed to investigate impacts on salmon and steelhead.

(13) ***Comment:*** One commenter suggested the draft EA did not adequately consider the ability and capacity of the Clackamas River to support a reintroduced population of bull trout and as a result, the proposed reintroduction strategy is overly aggressive and population goals likely unattainable. The same commenter recommended that the Service modify the implementation strategy to eliminate the use of older life stages of bull trout to minimize the chance of exceeding the carrying capacity of the Clackamas River.

Our Response: The draft EA and proposed rule both summarized the conclusions of the feasibility assessment (Shively et al. 2007), which found that a reintroduction of bull trout to the Clackamas River is biologically feasible based in large part on habitat suitability for spawning and early juvenile rearing, reduction and elimination of threats that led to extirpation, and availability of a suitable donor stock. The amount and type of suitable habitat, as well as the available forage base, compares favorably to other river systems in the lower Columbia River with extant bull trout populations, such as the McKenzie, Lewis, and Deschutes rivers. The feasibility assessment (Shively et al. 2007), the conclusions of which were presented in the draft EA, clearly considered the ability and capacity of the Clackamas River to support a reintroduced population of bull trout.

The goal of the project is to reestablish a self-sustaining bull trout population of 300–500 spawning adults in the Clackamas River by 2030 that contributes to the recovery of bull trout in the Willamette basin and to overall recovery criteria outlined in the Service's 2002 draft recovery plan (USFWS 2002, Chapter 1, p. v). For this project we define a self-sustaining population as one that maintains a minimum adult annual spawner abundance of 100 individuals, contains a high level of genetic diversity representative of the donor stock, and requires little or no additional transfers. The numerical goal of 300–500 adult spawners is consistent with 2002 draft recovery planning targets for bull trout abundance in the Clackamas River subbasin. Although the amount of suitable habitat in the Clackamas River suggests there is sufficient capacity to support a population of this size, bull trout distribution across the species' range, even within areas of suitable habitat, is patchy; thus, the true capacity of the Clackamas River subbasin is unknown.

The Service and our project partners view the inclusion of older life stages of bull trout in the implementation strategy as an important component of the project. In addition, we believe that, given the limited number of these older-aged individuals that will be transferred, the risk of exceeding the carrying capacity of the Clackamas River is extremely low. We chose to use multiple life stages of bull trout in order to maximize our likelihood of success with the reintroduction, and to test whether older life stages of bull trout could be successfully moved from one major watershed to another to promote reestablishment of extirpated populations in a less intensive and more timely effort than would occur if only fertilized eggs, fry, or juveniles were used. However, we

acknowledge the uncertainty regarding whether translocated subadult and adult bull trout will adapt to the Clackamas River and contribute to successful natural reproduction. In response to this uncertainty, we plan to intensively monitor the behavior, distribution, movement, and reproductive success of these older life stages over the first 2 years of the project by utilizing passive integrated transponder tag and radio tag technology. Continued transfer of older life stages beyond the second year of the project would occur only if monitoring and evaluation indicates the translocated older life stages are adapting to the Clackamas River and contributing to successful natural reproduction.

(14) Comment: One commenter expressed concern with potential predation and competition impacts to threatened salmon and steelhead in the Clackamas River from reintroduced bull trout. In order to facilitate future management of the reintroduction project, and if successful, the bull trout population, the commenter recommended that the Service work with the State (Oregon Department of Fish and Wildlife) and National Marine Fisheries Service (NMFS) to assess and define an acceptable level of impact on salmon and steelhead.

Our Response: We support this recommendation. This Federal action requires that we formally consult with NMFS under section 7 of the Act due to potential impacts to federally threatened salmon and steelhead under their jurisdiction. The Service initiated formal consultation with NMFS pursuant to section 7(a)(2) of the Act in December 2010 (USFWS 2010) and will ensure section 7(a)(2) compliance prior to releasing bull trout into the Clackamas River. This Federal action also required an amendment to the State's

Clackamas River Subbasin Plan to include the reintroduction of bull trout (ODFW 2010); this process required a review of the project by the State's Fish and Wildlife Commission, who voted unanimously in September 2010 to support the action and the plan amendment. These two actions acknowledge the formal administrative role the State of Oregon and NMFS have had in the review of this Federal action. And just as importantly, the State of Oregon and NMFS have had full representation in the multiyear planning of this effort through the Clackamas Bull Trout Working Group, as well as the project's Manager's Committee and several technical committees.

The State and NMFS are jointly developing a formal recovery plan for the threatened salmon and steelhead in the lower Columbia River, which includes the threatened species of salmon and steelhead found in the Clackamas River. The current draft recovery plan, and the information utilized in development of the draft plan, does not include information that would allow the Service to define an "acceptable level of impact" as applied to recovery planning objectives for threatened salmon and steelhead. We expect NMFS may conduct this type of analysis as part of the section 7 consultation process in response to the biological assessment we submitted in December 2010.

Independent of the formal consultation process with NMFS, we have initiated discussions with technical staff from NMFS NW Region Science Center and the U.S. Geological Survey (USGS) to investigate the feasibility and utility of life-cycle and bioenergetics modeling to better predict the potential influence of the bull trout reintroduction project on threatened salmon and steelhead in the Clackamas River. We

are committed to working closely with the State of Oregon, NMFS, and other project partners and stakeholders during and following project implementation to assess the potential impact of the bull trout reintroduction on threatened salmon and steelhead in the Clackamas River.

8.0 Appendix B – Non-Significant Issues Identified During Stakeholder Meetings and other Coordination

Non-Significant Issues and Supporting Rationale

The Service separated issues that were identified through the stakeholder meetings and other coordination into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)". Issues we identified as significant are listed in Chapter 1, Section 1.5.1 of this document. These significant issues were analyzed in Chapter 3, Environmental Consequences. Issues and concerns we identified as non-significant are listed below, along with supporting rationale regarding their categorization as non-significant.

Non-significant Issues Specifically Associated with Impacts to Salmon and Steelhead

Many of the issues raised during the planning stages of this proposed project and during the stakeholder meetings, revolved around potential impacts to Clackamas River salmon and steelhead due to potential predation and competition from bull trout. We deemed the majority of these issues significant and thus analyzed them in aggregate in Chapter 3, Section 3.1 of the DEA. Remaining issues associated with impacts to salmon and steelhead that we determined to be non-significant are addressed below.

Issue: Reintroduction should not occur until the status of salmon and steelhead improves.
Response: Salmon and steelhead in the Clackamas River are listed threatened under the Federal Endangered Species Act, as are bull trout. A major objective in the draft bull trout recovery plan (USFWS 2002) is to restore bull trout distribution to historical habitat where suitable habitat is deemed to exist. As documented in the Clackamas River Bull Trout Reintroduction Feasibility Assessment (Shively et al. 2007) bull trout were historically widely distributed in the Clackamas River, previous causes for extirpation have been largely ameliorated, and a significant amount of suitable habitat currently exists. Until final recovery plans are published by NMFS for salmon and steelhead in the Clackamas River, we have no way of assessing what constitutes recovery of these fish.

Issue: Reintroduction should start out by transferring low numbers of individuals until we know better how they will respond in the Clackamas River.
Response: Based on stakeholder input, we modified the draft proposed action to reduce the number of adult and subadult bull trout proposed for transfer during the initial years of Phase One. While an overall conservative transfer strategy has merit, we are concerned with extending the timeframe of active translocation for several reasons. One, it would increase the length of time we would be dependent on the Metolius River as a donor stock, thereby influencing the ability of the Metolius River to contribute as donor stock to other reintroductions currently being investigated, namely into the upper Deschutes River. Secondly, funds to implement this project are likely to be limited and thus we would like to limit the number of years of active fish translocation. The Middle Fork Willamette River Bull Trout Rehabilitation Project has been implemented for over 10 years with limited numbers of fish utilized (approximately 10,000 fry) relative to the resources expended to carryout and evaluate the project. Although the project has shown preliminary success in reestablishing a small population of reproducing bull trout, current abundance levels will require ongoing transfers of fry into the future. Assuming some level of initial success in a reintroduction of bull trout to the Clackamas River, we hope to reach project abundance goals in abbreviated fashion so as to eliminate the time and personnel necessary for active fish transfers.

Issue: What is the likelihood that we will be able to detect a measurable impact to salmon and steelhead from a bull trout reintroduction? Are there alternative approaches to assessing impact?
Response: We acknowledge the likely difficulty in measuring impact to salmon and steelhead from bull trout competition and predation. In order to provide the best opportunity to assess impact we have been working with staff from the U.S. Geological Survey to collect baseline information in the proposed reintroduction area ahead of implementing the project. The collection of this information, which includes species composition, distribution, diet, and growth information will greatly increase our ability to detect impacts and response once bull trout are introduced to the Clackamas River. In addition, ODFW, PGE and the USFS monitor salmon and steelhead populations in the upper Clackamas River annually and this information will continue to be collected and used to assess the status of salmon and steelhead populations. Several alternative approaches were suggested by individuals at our stakeholder meetings. These approaches will be discussed and investigated further prior to implementation of the proposed project.

Issue: With respect to concerns expressed about impacts to salmon and steelhead, shouldn't the overall goal be ecological restoration of native fish assemblages in the Clackamas River?
Response: The Service agrees with this statement. From the early planning stages of the proposed action we have viewed the project as a native fish community restoration project. We do not believe it is appropriate or conducive to pit one listed species against another.

Non-significant Issues Not Associated with Impacts to Salmon and Steelhead

Issue: Why would this reintroduction be proposed and why choose the Clackamas River for this proposal?
Response: Bull trout are a species listed as "threatened" under the federal Endangered Species Act, and the goal of that law is to recover species from being threatened or endangered to the point that they no longer need its protection. Their reintroduction into the Clackamas River is under consideration because it would meet objectives of the current Fish and Wildlife Service recovery strategy for the species in the Willamette Basin, as well as other agencies' goals to restore native fish communities.

The Clackamas was considered for reintroduction even before the bull trout was listed as threatened, in years of discussion between the Forest Service and Oregon Department of Fish and Wildlife. With these two key partners already exploring the possibility, and the need expressed in the bull trout recovery plan, it was logical to continue exploring the idea. There are other appropriate locations for bull trout reintroduction, and examination of this possible reintroduction will gain knowledge and experience that can be applied elsewhere. From the bull trout's perspective, the Clackamas is a good candidate because bull trout haven't been documented there since about 1963; the factors which caused them to disappear have been remedied, and about 70 miles of the upper river and tributaries contain suitable habitat for bull trout spawning and rearing.

Issue: How can a "nonessential" experimental population contribute to recovery?
Response: A nonessential experimental population would contribute to the recovery of the bull trout in the Willamette Basin, but it is not essential to the survival of the species in the wild. The designation allows for greater flexibility in managing other land uses and human activities, without the usual level of protections being given to individuals of the reintroduced species. The designation of nonessential experimental populations [through Section 10(j)] was added to the Endangered Species Act in 1982 by Congress in order to increase the public's tolerance for putting a protected species back into an area where it had been previously.

Issue: Will the bull trout leave the area where they are released?
Response: Bull trout do tend to migrate within large river systems, and some of the reintroduced fish are expected to move out of the release area on the upper Clackamas. To ensure that any reintroduced bull trout that may move are covered by the nonessential experimental population designations, the area's boundaries are proposed to extend downstream from the release areas the entire length of the Clackamas River, and include the Willamette river downstream to where it meets the Columbia River (including Multnomah Channel) and upstream to Willamette Falls. It is expected that the majority of reintroduced fish and future offspring of these fish will remain within the area boundaries. If bull trout move outside the boundaries, the Fish and Wildlife Service could propose to extend the boundaries to include the entire range of the expanded population.

Issue: Do we know how the public will react to a reintroduction?

Response: Although we expect the public is generally supportive of native fish restoration projects such as the one proposed in the Clackamas River, we do not know the specific public response to the action proposed. That is the purpose of the public comment period on both this draft EA and the associated proposed 10(j) rule (experimental nonessential population) published in the Federal Register. In scoping meetings we saw reactions that ranged from expressions of concern to strong support.

Issue: Why hasn't the bull trout reintroduction in the Middle Fork Willamette River above Hills Creek Dam been a bigger success? On a related note, at what point would the Clackamas effort be abandoned if it is not working?
Response: From the standpoint of reestablishing a reproducing population of bull trout in the Middle Fork Willamette River, the project has absolutely demonstrated success. The currently low numbers of reproducing bull trout may be the result of translocating a life stage with low survival (fry), the relatively few individuals translocated over time (10,000), unknown bull trout carrying capacity of the Middle Fork Willamette River above Hills Creek Dam, or some combination thereof. Ultimately it may be another decade before it is known whether a more abundant and self-supporting population is possible in the Middle Fork Willamette River above Hills Creek Dam.

The effort to reintroduce bull trout to the Clackamas River will be based on an adaptive management framework. The first phase (year 1 through year 7) will be the most active learning phase. Monitoring and evaluation during this phase will help refine the life stages that are utilized, the locations they are translocated, timing of transfers and the numbers transferred, among other project components. If monitoring and evaluation during Phase One do not suggest some level of initial success, and subsequent modifications to implementation strategy during the initial years of Phase Two do not have a positive impact, the project will likely be terminated. The decision to terminate the project would be jointly made by the Service and ODFW with input from other major cooperators such as the U.S. Forest Service. Although we are confident in the ability of the Clackamas River to support a successful reintroduction of bull trout, we view the proposed project as experimental.

Issue: What is the rational behind the various life stages for reintroduction?
Response: As noted above, we view the proposed project as experimental. One of the overarching goals of the project is to learn as much as possible about why reintroductions are successful or not successful so that we can apply this knowledge to other future reintroductions. In the case of bull trout, few reintroductions have occurred and most have utilized only the fry life stage. To the extent possible, we would like to test the success of various life stages to inform not only subsequent phases of this proposed project but future bull trout reintroductions elsewhere within their native range.

Issue: Is the Clackamas River starved of nutrition? Maybe this lack of nutrients is hurting current salmonid populations and would hurt reintroduced bull trout as well?
Response: We are not aware of any studies in the Clackamas River that have investigated this issue, although the reductions of anadromous salmon and steelhead from

historical levels have no doubt reduced the overall availability of marine-derived nutrients (from decaying carcasses of anadromous fishes). Marine derived nutrients have been shown to influence aquatic invertebrate production, fish growth, and riparian ecosystems. Despite a reduction in marine-derived nutrients from historical levels, we believe, as outlined in Chapter 4 of the Clackamas Bull Trout Reintroduction Feasibility Assessment (Shively et al. 2007), that the forage base in the Clackamas River is healthy enough to support the reestablishment of bull trout.

Issue: How would this reintroduced population contribute to recovery of the species?
Response: The reestablishment of bull trout in the Clackamas River would reduce the risk of elimination of bull trout from the greater Willamette Basin, and contribute to stabilizing bull trout populations in the lower Columbia River. The specific recovery objectives that would be supported by this action are:

- Maintain current distribution of bull trout and restore distribution where recommended in recovery unit chapters.
- Maintain stable or increasing trend in abundance of bull trout.
- Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
- Conserve genetic diversity and provide opportunity for genetic exchange.

Issue: Would the presence of a protected species in the Clackamas River affect land management activities, like timber harvest? What about recreational river uses?
Response: The proposal under consideration would be to designate a "nonessential experimental population," under the authority of Section 10(j) of the Endangered Species Act, specifically to avoid restricting land management and recreational activities. Throughout the entire nonessential experimental population area, no federal agency or its contractors would be in violation of the Endangered Species Act for harming or killing bull trout as a result of any authorized agency action. The reintroduction will not conflict with recreational uses of the river. For example, since it would be within a nonessential experimental population area, a person fishing in accordance with Oregon angling regulations would not be in trouble for inadvertently harming a bull trout.

Issue: What activities will be prohibited because of this nonessential experimental population area?
Response: It remains illegal to deliberately "take" (harm or kill) bull trout, which generally would occur if they are taken or possessed in violation of state fish and wildlife laws or regulations. In other words: fishing in violation of state regulations which results in catching these fish, or polluting the waters in violation of state or federal law, could result in additional penalties for harming the fish. Fishing and other activities conducted legally will not result in penalties if they happen to result in catching or otherwise harming the fish.

9.0 Appendix C – Clackamas River Bull Trout Reintroduction: Implementation, Monitoring, and Evaluation Plan

Clackamas River Bull Trout Reintroduction

Implementation, Monitoring, and Evaluation Plan

Joel Sartore – National Geographic Stock with assistance from Wade Fredenberg, USFWS

June 2011

U.S. Fish and Wildlife Service
Oregon Fish and Wildlife Office and
Columbia River Fisheries Program Office

In collaboration with
Oregon Department of Fish and Wildlife

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1. Background

1.1 Overview

Bull trout (*Salvelinus confluentus*) is a species of char native to the Pacific Northwest, and currently occurs in Oregon, Washington, Idaho, Montana, and Nevada. Bull trout require cold, clean water in complex stream habitats, and populations have been negatively affected by several factors including habitat degradation (e.g., Fraley and Shepard), barriers to migration (e.g., Rieman and McIntyre 1995), and the introduction of non-native species trout (e.g., Leary et al. 1993). Consequently, bull trout populations have declined across their native range (Rieman et al. 1997) and were listed as threatened under the Endangered Species Act on November 1, 1999 (64 FR 58910).

Consistent with the U.S. Fish and Wildlife Service's ("Service") Draft Bull Trout Recovery Plan (USFWS 2002), this Implementation, Monitoring, and Evaluation Plan ("Plan") will guide the effort to reintroduce bull trout in an area of its natal range where it has been extirpated. Additionally, the information gained from this experimental reintroduction will be used to inform other bull trout reintroduction efforts in other parts of its historic range.

1.2 Project History

Bull trout were once distributed throughout the Willamette River Valley, including the Clackamas River Basin (Goetz 1989). They were a historical component of the Clackamas native fish assemblage that currently includes both Pacific and western brook lamprey, white sturgeon, coastal cutthroat trout, rainbow trout / steelhead, coho, Chinook, mountain whitefish, and several species of minnow, suckers, and sculpin (USFWS 2002). However, based on extensive surveys (e.g., Eberl and Kamikawa 1992; Zimmerman 1999), bull trout are believed to be presently extirpated from the Clackamas River subbasin (Shively et al. 2007). On November 1, 1999, we published a final rule to list bull trout within the coterminous United States as threatened under the Act (64 FR 58910). This final rule served to consolidate the five separate distinct population segment (DPS) listings into one coterminous U.S. DPS listing. We published a draft recovery plan for the Columbia River, Klamath River, and St. Mary-Belly River segments on November 29, 2002 (67 FR 71439) and the Coastal Puget Sound and Jarbidge River segments on July 1, 2004 (69 FR 39950 and 69 FR 39951, respectively). The draft **recovery objectives** are:

(1) Maintain current distribution of bull trout within core areas as described in recovery unit chapters and restore distribution where recommended in recovery unit chapters;

(2) Maintain stable or increasing trends in abundance of bull trout;

(3) Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies; and

(4) Conserve genetic diversity and provide opportunity for genetic exchange.

Draft **recovery criteria** specific to the Willamette River Recovery Unit follow:

(1) Distribution criteria will be met when bull trout are distributed among five or more local populations in the recovery unit: four in the Upper Willamette River core area and one in the Clackamas River core habitat.

(2) Abundance criteria will be met when an estimated abundance of adult bull trout is from 900 to 1,500 or more individuals in the Willamette River Recovery Unit, distributed in each core area as follows: 600 to 1,000 in the Upper Willamette core area and 300 to 500 in the Clackamas River core habitat.

(3) Trend criteria will be met when adult bull trout exhibit stable or increasing trends in abundance in the Willamette River Recovery Unit, based on a minimum of 10 years of monitoring data.

(4) Connectivity criteria will be met when migratory forms are present in all local populations and when intact migratory corridors among all local populations in core areas provide opportunity for genetic exchange and diversity.

Restoring bull trout to historic habitat is a major recovery goal and objective listed in the Service's Draft Recovery Plan (USFWS 2002), and it is particularly relevant to habitats in the western portion of the species' range due to the extensive loss of distribution and the documented extirpation of multiple bull trout populations. The Willamette River, a tributary of the lower Columbia River, has experienced extirpations of bull trout from four major subbasins, including the Clackamas River (Fig. 1). Although the overall recovery strategy is to reduce and minimize threats affecting bull trout and their habitat in the Willamette River Basin, the magnitude of bull trout extirpations, combined with the size of the basin and low probability of natural recolonization, will likely require reintroductions. Reestablishment of bull trout in the Clackamas River will help to achieve distribution in the Clackamas River core habitat (defined as habitat that contains, or if restored would contain, all of the essential physical elements to provide for the security of and allow for the full expression of life history forms of one or more local populations of bull trout) (recovery criterion 1 and recovery objective 1) and will increase abundance of adult bull trout in the Willamette River Recovery Unit (recovery criterion 2 and recovery objective 2).

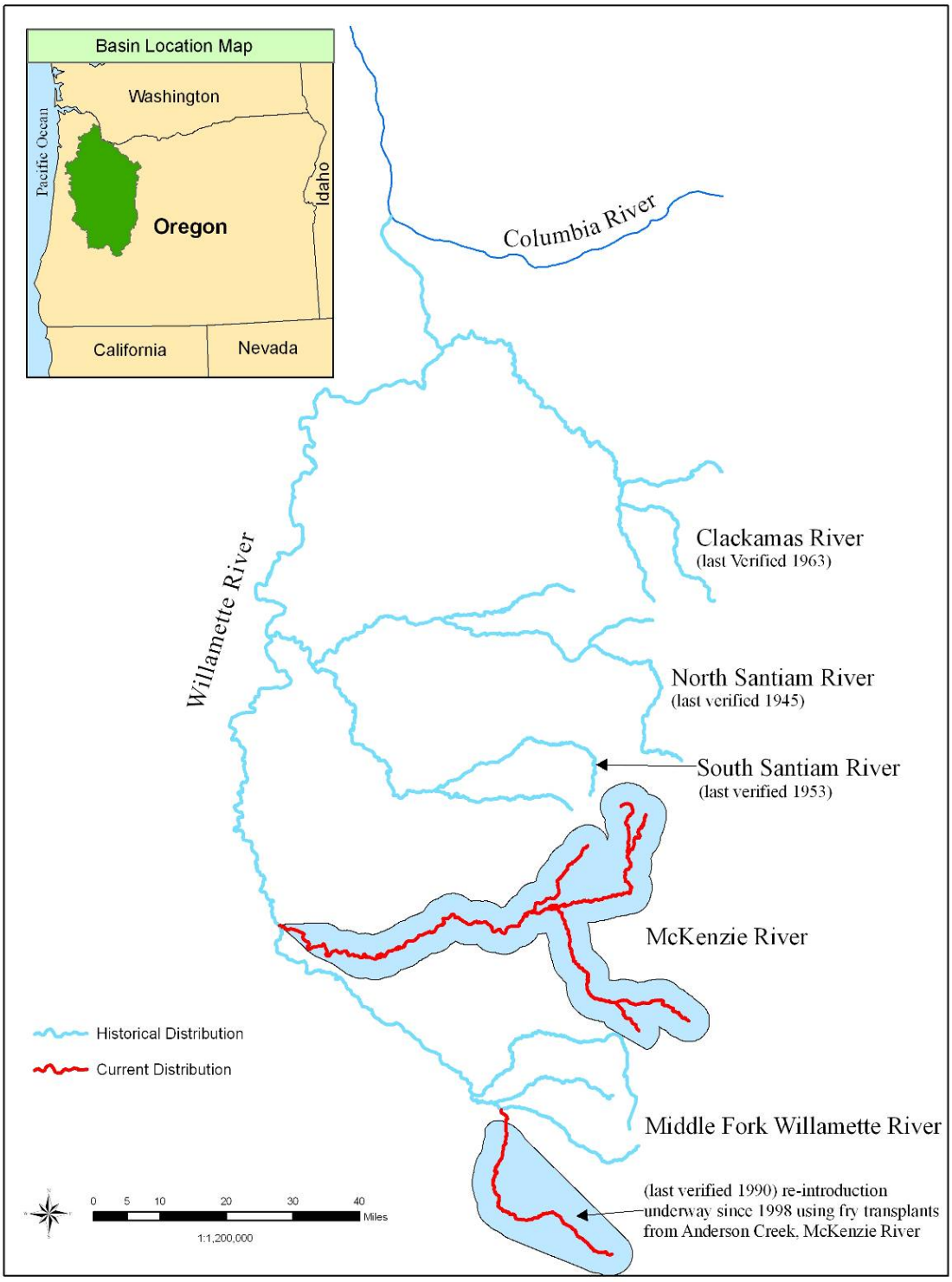

Figure 1. Historical and Current Bull Trout Distribution in the Willamette Basin.

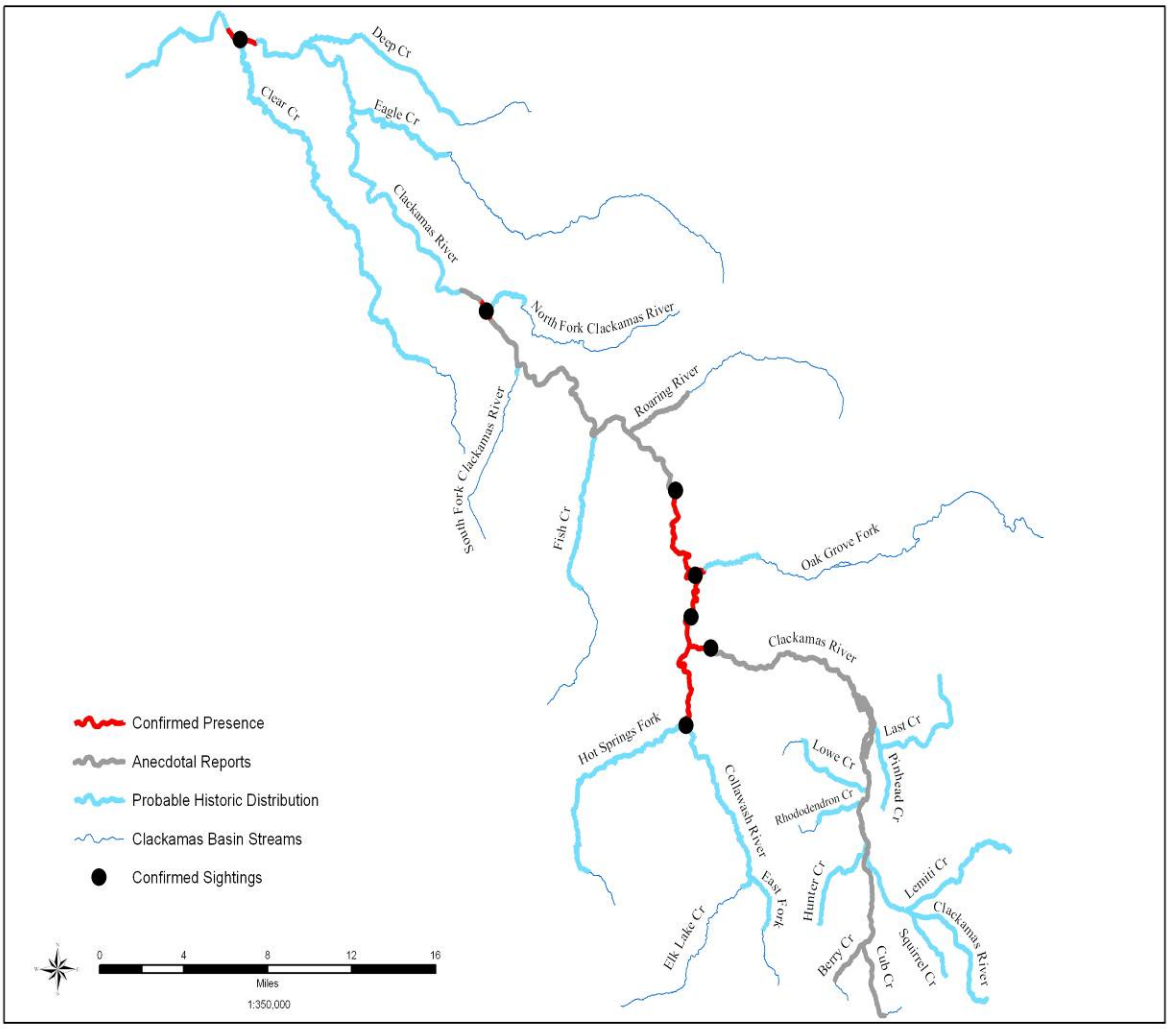

Figure 2. Historical Bull Trout Distribution in the Clackamas River (Shively et al. 2007)

In the early 1990s, fisheries managers from the Oregon Department of Fish and Wildlife (ODFW) and the U.S. Forest Service, Mount Hood National Forest (USFS) recognized bull trout had not been observed in Clackamas River creel surveys for three decades. As a result, a multi-year effort was undertaken in the upper reaches of the watershed to determine if the species was still extant. The effort determined that there was a statistically small probability that bull trout were still present in the upper Clackamas and was consistent with similar efforts to document presence that occurred throughout the mid-to late 1990s. A review by ODFW in 1998 of historical records and anecdotal accounts suggested bull trout distribution once extended from North Fork Reservoir upstream to the Big Bottom area of the mainstem Clackamas River, as well as the lower Collawash River and the lower Oak Grove Fork of the Clackamas River (Fig. 2). No information is available on historical abundance or the location of bull trout spawning and rearing areas.

Extirpation was likely due to many of the same factors that led to the decline in the species across its range including migration barriers from hydroelectric and diversion dams, direct and incidental harvest in sport and commercial fisheries, targeted eradication with bounty fisheries, and habitat and water quality degradation from forest management and agricultural activities (Shively et al. 2007). The last confirmed record of a bull trout in the Clackamas River was in 1963 although anecdotal reports of observations continued through the early 1970s.

To determine the current suitability of habitat in the Clackamas River Subbasin, and the availability of an appropriate donor stock, a peer-reviewed feasibility assessment was completed by members of the Clackamas River Bull Trout Working Group (CRBTWG) in 2007. The CRBTWG formally convened in 2004, for the purpose of exploring the possibility of reintroducing bull trout into the Clackamas River Subbasin as part of overall recovery efforts for the species. The group is comprised of representatives from the Service, ODFW, USFS, NMFS, U.S. Geological Survey (USGS), and other major stakeholders including Portland General Electric (PGE), Confederated Tribes of the Warm Springs Reservation (CTWSRO), and Confederated Tribes of the Grand Ronde Reservation (CTGRR). The *Clackamas River Bull Trout Reintroduction Feasibility Assessment* (Feasibility Assessment) (Shively et al. 2007) determined that a reintroduction of bull trout into the upper Clackamas River is feasible based on the following factors:

(1) There is a high level of confidence that bull trout have been locally extirpated from the Clackamas River Subbasin;

(2) The causes for their decline have been sufficiently mitigated;

(3) High quality habitat is available in sufficient amounts;

(4) Nearby donor stocks are unlikely to naturally recolonize;

(5) Suitable donor stocks are available that can withstand extraction of individuals;

(6) Nonnative brook trout presence is restricted to a small portion of the suitable habitat and is not a likely threat; and,

(7) A diverse and abundant fish assemblage would serve as a sufficient prey base with no obvious threats posed by bull trout to these species.

Following publication of the Feasibility Assessment (see 1.3 below for more information) the Clackamas Manager's Committee, comprised of managers from the participating agencies/organizations of the CRBTWG, expressed support for moving forward with development of a proposed action, with the Service and ODFW designated as the lead agencies. Concurrently, the Manager's Committee also assessed administrative alternatives for moving the proposed action forward, ultimately electing a federal rule-making process that would designate a reintroduced bull trout population in the Clackamas River as nonessential experimental under section 10(j) of the ESA.

The proposed action was developed in 2008 and 2009, which included joint stakeholder/scoping meetings were conducted by the Service and ODFW in the fall of 2008. On December 9, 2009, we published a proposed rule (74 FR 65045) and draft Environmental Assessment (DEA) (USFWS 2009) prepared pursuant to the National Environmental Policy Act of 1969, as amended (NEPA), which analyzed the potential environmental impacts associated with the proposed reintroduction. The publication of these documents initiated a 60-day public comment period which closed on February 9, 2009.

Based in part on the public comments received, and input and assistance from ODFW, USFS, NMFS, PGE and other project cooperators, the Service is currently developing the final rule and environmental assessment. We are concurrently coordinating with CTWSRO on utilization of Metolius River bull trout as a donor stock for the Clackamas reintroduction. It is our intent to complete these administrative requirements, including issuance of a BO from NMFS to the Service, in the fall and winter of 2010. We plan to begin the transfer of fish from the Metolius River to the Clackamas River in Spring, 2011.

1.3 Reintroduction Feasibility Assessment

The CRBTWG initiated a Clackamas River bull trout reintroduction feasibility assessment in 2004. The Feasibility Assessment focused on the biological feasibility rather than social or economic feasibility, or implications to other species from a reintroduction. In addition, the Feasibility Assessment did not address whether or not a reintroduction should be done or how it should be done. The Feasibility Assessment examined four questions adapted from Epifanio et al. (2003):

(1) Is there a high level of confidence that bull trout are no longer present that would serve as a natural gene bank?

(2) Is there suitable habitat remaining, what conditions or stressors currently prevent bull trout from occupying suitable habitats, and have these been corrected?

(3) Is suitable habitat expected reasonably to be recolonized through natural processes if conditions are improved?

(4) Is a suitable or compatible donor population(s) available that can itself tolerate some removal of individuals?

The following briefly summarizes the primary findings of the Feasibility Assessment:

The CRBTWG has a high confidence that bull trout have been extirpated from the Clackamas River Subbasin because extensive sampling targeting bull trout presence occurred from the 1990s to 2004. The factors leading to the decline of bull trout began in the early 20th Century and extended into the 1970s. The primary factors for their decline include migration barriers from hydroelectric and diversion dams, direct and incidental harvest in sport and commercial fisheries, targeted eradication with bounty fisheries, and habitat and water quality degradation from forest management and agricultural activities. A more detailed explanation of bull trout extirpation in

the Clackamas River Subbasin is provided in Appendix B of the Feasibility Assessment (Shively et al. 2007). The causative factors responsible for the decline and extirpation of bull trout in the Clackamas River Subbasin are believed to be sufficiently remedied so as not to impede or negatively influence the reintroduction effort.

Suitable habitat for bull trout was examined using a tiered approach. Bull trout require very cold water for spawning and rearing. The portion of the Clackamas River Subbasin providing suitable bull trout spawning and rearing habitat today is located in the Clackamas River mainstem and its tributaries upstream of the Collawash River confluence. This portion of the Subbasin contains approximately 70 miles of suitable spawning and rearing habitat configured into six separate habitat patches (Fig. 3). Habitat patches range in size, configuration, and condition. The most downstream habitat patch occurs along the mainstem Clackamas River known as Big Bottom. This unique and complex reach of the river provides suitable spawning and rearing habitat, and would also likely serve as an important foraging area for bull trout. Other habitat patches occur either adjacent to or up to a maximum distance of approximately six river miles upstream into the headwaters of the Subbasin.

The Service has described a method for delineating population boundaries for bull trout that will aid in defining consistent sampling units (i.e., local populations), minimizing the potential for bias, and improve the ability to compare and contrast conditions and trends among recovery units (USFWS 2008). A patch is defined as "the limits or boundaries of environmental conditions that can support a biological response" (Dunham et al. 2002). In the context of bull trout, patches are meant to represent local populations, and are further defined as "a contiguous geographical area that contains the spawning and early rearing habitat used by a bull trout population".

Habitat patches in the Clackamas Basin were defined as sub-watershed areas containing sufficient quantities of suitable habitat for bull trout spawning and rearing (Shively et al. 2007). In general, patches were identified using a three-step process to determine bull trout spawning and rearing habitat suitability (Shively et al. 2007). First, all historically accessible habitat available to bull trout was identified. Next, small streams (less than 2 m summer low-flow width; i.e., streams in watersheds less than 1742 acres) were removed from consideration. Finally, water temperature criteria were used to refine the focus to smaller, higher elevation river and stream segments within the Upper Clackamas River Subbasin. Streams capable of providing suitable bull trout spawning and rearing habitat generally exhibit maximum water temperature no greater than 15 degrees Celsius. The resulting patch boundaries were developed to reflect watershed boundaries at the 7th field HUC scale; a total of six habitat patches were ultimately identified (Fig. 3).

A donor stock should be comprised of fish that most closely resemble the bull trout that historically inhabited the Clackamas River (e.g., genotype, phenotype, behavior, and life history expression). However, because little is known about the biology and evolutionary history of bull trout that historically occupied the Clackamas River, and no genetic material is available for analysis, the CRBTWG was limited to an assessment of biological information from other local populations, existing studies of the evolution and biogeography of bull trout, information derived from historical harvest data from the Clackamas River, and recent regional bull trout genetic analyses.

Genetic studies of bull trout indicate the existence of at least two major evolutionary lineages; Coastal and Interior (Taylor et al. 1999). Other studies have suggested additional genetic assemblages within the Interior lineage (Spruell et al. 2003, USFWS 2008 unpublished data). By exploring issues associated with life history strategy, metapopulation dynamics, biogeography, and genetic considerations, the CRBTWG identified bull trout populations in the Coastal lineage as the best source for a donor population. Although these local adaptations are important, any of the Coastal lineage bull trout populations are likely to carry the genetic material to preserve and protect the "coastal" lineage regardless of localized and specific adaptations. However, in a further refinement, the CRBTWG determined that donor populations from lower Columbia River tributaries would be most appropriate due to their geographic proximity to the historical bull trout population in the Clackamas River and because genetic studies indicate these populations are more closely related to one another than to other Coastal lineage populations (USFWS 2008, unpublished data). The potential lower Columbia River donor populations of bull trout include fish in five river basins: the Willamette, Hood, Lewis, Deschutes, and Klickitat river basins (Shively et al. 2007, Ch. 3, pp. 8-14). These populations are located a considerable distance away from the Clackamas River Subbasin, and in many cases, the presence of migration barriers makes natural recolonization highly unlikely.

Specific benchmarks have been developed concerning the minimum bull trout population size necessary to maintain genetic variation important for short-term fitness and long-term evolutionary potential. Rieman and Allendorf (2001, pp. 762) concluded that an average of 100 spawning adults each year is required to minimize risks of inbreeding in a bull trout population and that 1,000 spawning adults each year will likely prevent loss of genetic diversity due to genetic drift. This later value of 1,000 spawning adults may also be reached with a collection of local populations among which gene flow occurs. The CRBTWG utilized these general benchmarks in the Feasibility Assessment to assess potential risk to each of the five potential donor stocks in the lower Columbia River from the loss of individuals, recognizing that risk increases as donor populations near 100 spawning adults and diminishes as populations approach 1,000 spawning adults (Shively et al. 2007).

When the Feasibility Assessment was completed in December 2007, bull trout from two of the five river basins, the Lewis River and Deschutes River, contained groups of interacting local populations that exceeded 1,000 spawning adults. For the Lewis River Basin, this included the combined Pine Creek and Rush Creek populations that occur above Swift Dam. For the Deschutes River Basin, this included the three interacting populations present in the Metolius River Subbasin. Since publication of the Feasibility Assessment there have been declines in adult spawner abundance in both the Lewis and Deschutes river bull trout groups, with the Lewis River population dropping significantly in 2007 and 2008, to its current estimated adult spawner abundance of 379 individuals (Doyle 2009). Although the Deschutes River (Metolius River Subbasin) bull trout population has also decreased over the last two years, the CRBTWG considered this population to be the least at risk of the potential donor stocks. Furthermore, per Rieman and Allendorf (2001), the total number of annual spawning adults is sufficiently large enough (approximately 1,000 spawning adults) to protect against the loss of genetic diversity from genetic drift.

Our Feasibility Assessment concluded that there is a high level of confidence bull trout have been extirpated from the Clackamas River and that factors leading to their extirpation have been largely ameliorated. The Feasibility Assessment further concluded that there is sufficient high quality habitat available and a forage base to support a reintroduction, and that the limited presence of non-native brook trout is not a substantial threat. Several suitable donor stocks were identified that could support, with low population risk, the extraction of individuals for translocation to the Clackamas River. Finally, nearby extant populations were determined to be unlikely to naturally recolonize the Clackamas River due to geographic distance and/or isolation due to migratory barriers.

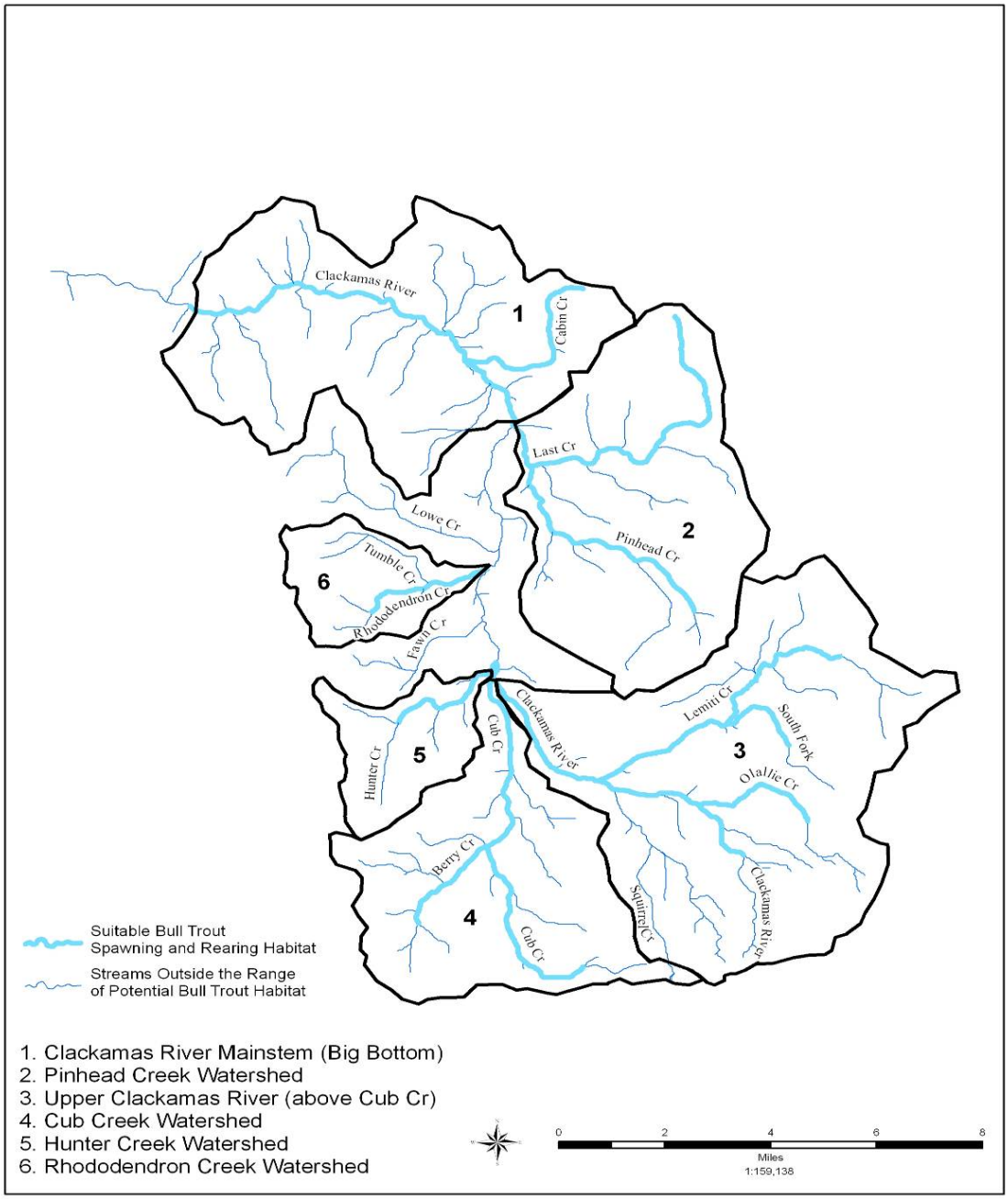

Figure 3. Suitable Habitat Patches in the Upper Clackamas River (*from* Shively et al. 2007).

1.4 Action Area

Although the release sites of translocated fish will be in the upper Clackamas River above the Collawash River confluence, the migratory nature of bull trout suggests the action area should be represented by the entire Clackamas River Subbasin. The exception is the Oak Grove Fork above Timothy Lake Dam. The majority of the Oak Grove Fork watershed was not accessible to bull trout and anadromous salmonids historically due to an impassable natural barrier a short distance below the current dam site.

In addition, we determined during development of the proposed rule on the establishment of a nonessential experimental population of bull trout, that even though the likelihood of bull trout migrating down to the Willamette River is low, it remains a possibility. For that reason, the action area for this consultation follows the 10(j) boundary that includes the Willamette River from Willamette Falls downstream to the confluence with the Columbia River, including the Multnomah Channel (see Section 1.5.6 below for a more detailed description).

1.5 Section 10(j) of the ESA

The 1982 amendments to the Act (16 U.S.C. 1531 et seq.) included the addition of section 10(j) which allows for the designation of reintroduced populations of listed species as "experimental populations." Under section 10(j) of the Act and 50 CFR 17.81, the Service may designate a population of endangered or threatened species that has been or will be released into suitable natural habitat outside the species' current natural range as an experimental population .

Before authorizing the release as an experimental population of any population (including eggs, propagules, or individuals) of an endangered or threatened species, and before authorizing any necessary transportation to conduct the release, the Service must find by regulation that such release will further the conservation of the species. In making such a finding, the Service uses the best scientific and commercial data available to consider: (1) Any possible adverse effects on extant populations of a species as a result of removal of individuals, eggs, or propagules for introduction elsewhere; (2) the likelihood that any such experimental population will become established and survive in the foreseeable future; (3) the relative effects that establishment of an experimental population will have on the recovery of the species; and (4) the extent to which the introduced population may be affected by existing or anticipated Federal or State actions or private activities within or adjacent to the experimental population area.

Under 50 CFR 17.81(d), the Service must consult with appropriate state fish and wildlife agencies, local governmental entities, affected federal agencies, and affected private landowners in developing and implementing experimental population rules. To the maximum extent practicable, 10(j) rules represent an agreement between the Fish and Wildlife Service, the affected state and federal agencies, and persons holding any interest in land which may be affected by the establishment of an experimental population.

The Nonessential Experimental Population (NEP) designation for the reintroduction alleviates landowner and water-user concerns about possible land and water use restrictions by providing a

flexible management framework for protecting and recovering bull trout, while ensuring that the daily activities of landowners and water-users are unaffected. Landowners and managers, and the general public, are more likely to accept bull trout in the Clackamas River adjacent to their lands with the regulatory flexibility provided by a NEP designation. The NEP designation also provides State and Federal agencies flexibility to manage the reintroduced population of bull trout in a manner consistent with the recovery of other ESA-listed species of salmon and steelhead present in the Clackamas River.

Experimental population special rules contain specific prohibitions and exceptions regarding the taking of individual animals. These special rules are compatible with routine human activities in the expected reestablishment area. Section 3(19) of the Act defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Take of bull trout within the experimental population area would be allowed provided that the take is unintentional, not due to negligent conduct, or is consistent with State fishing regulations that have been coordinated with the Service. We expect levels of incidental take to be low because the reintroduction is compatible with existing activities and practices in the area. As recreational fishing for species other than bull trout is popular within the NEP area, we expect some incidental take of bull trout from this activity but, as long as it is in compliance with ODFW fishing regulations, and Tribal regulations on land managed by the CTWSRO, such take will not be a violation of the Act.

1.6 Geographic Boundaries of the 10(j) Designation

The NEP action area, which encompasses all potential release sites, would include the entire Clackamas River subbasin as well as the mainstem Willamette River, from Willamette Falls to its points of confluence with the Columbia River, including Multnomah Channel. The Willamette River's confluence with the Columbia River occurs at river mile (RM) 101, near the City of Portland. A secondary channel of the Willamette River, named the Multnomah Channel, branches off the Willamette River approximately three miles upstream from its confluence with the Columbia River. This secondary channel runs approximately 20 river miles along the west side of Sauvie Island before joining the Columbia River at RM 86 near the town of St. Helen's. The NEP boundary extends down the Multnomah Channel to its confluence with the Columbia River, as well as the mainstem Willamette River from Willamette Falls to its confluence with the Columbia River (Fig. 4).

We define the upper portion of the Clackamas River Subbasin, the area where reintroduced bull trout can be expected to reestablish a viable population, as the headwaters down to and including the North Fork Reservoir (RM 30). Bull trout require cold, clean water in complex river and stream habitats with low levels of fine sediments. These habitat requirements are most stringent for the spawning and rearing life stages of bull trout. The portion of the Clackamas River Subbasin providing suitable spawning and rearing habitat today is limited to the mainstem and its tributaries in the very headwaters of the subbasin upstream of the Collawash River confluence. This portion contains a total of 70.1 river miles of suitable spawning and rearing habitat delineated into six separate habitat patches (Shively et al. 2007). These patches range in size, configuration, and condition. The most downstream patch occurs along the mainstem Clackamas River in an area known as Big Bottom. This unique and complex reach of the river provides

suitable spawning and rearing habitat. The other patches occur either adjacent to or up to a maximum distance of 5.9 river miles upstream into the upper headwaters of the subbasin.

The upper Clackamas River contains a sufficient amount of habitat to support a self-sustaining population of bull trout (Shively et al. 2007). Based on migration patterns and seasonable habitat use observed in nearby extant bull trout populations, such as from the Lewis, McKenzie and Metolius subbasins, it is possible some reintroduced bull trout will utilize North Fork Reservoir. Based on studies and observations of seasonal bull trout movements in other lower Columbia River bull trout populations, it is likely bull trout that overwinter in North Fork Reservoir would migrate upstream into the Clackamas River during spring and early summer.

The Service has broadened the action area beyond the expected reestablishment area to account for individual bull trout that may migrate past major hydroelectric operations on the Clackamas River. If bull trout migrate downstream of North Fork Dam (RM 30), they will do so through one of several mechanisms: via the existing fish bypass system, which deposits fish in the Clackamas River below River Mill Dam at RM 23; through spill over North Fork Dam; or, via entrainment through the turbines at North Fork Dam. The latter two mechanisms would result in bull trout occupying the river reach above Faraday Dam; these fish could move further down the river system via spill at Faraday Dam or through entrainment through the turbine units at Faraday Dam. Both avenues would deposit bull trout in Estacada Lake, the reservoir behind River Mill Dam. Similar to passage at Faraday Dam, bull trout occupying Estacada Lake could potentially migrate to areas below River Mill Dam by: (1) entrainment in spill provided through the recently constructed fish bypass chute to increase passage; (2) entrainment in spill due to large flow events; (3) by entrainment through the turbine units; or (4) by entrainment into the River Mill downstream migrant surface collector (expected completion in 2012).

Although the above information suggests pathways by which bull trout may migrate into the lower Clackamas River below River Mill Dam and into the mainstem Willamette River, we expect the likelihood of this occurrence to be low. Habitat conditions, in particular water temperatures, are not suitable for bull trout for much of the year in the lower Clackamas and Willamette rivers. In addition, observations of bull trout migration patterns and seasonal habitat use in other nearby extant populations suggest reservoirs, such as North Fork Reservoir, often inhibit most bull trout migration to downstream habitats.

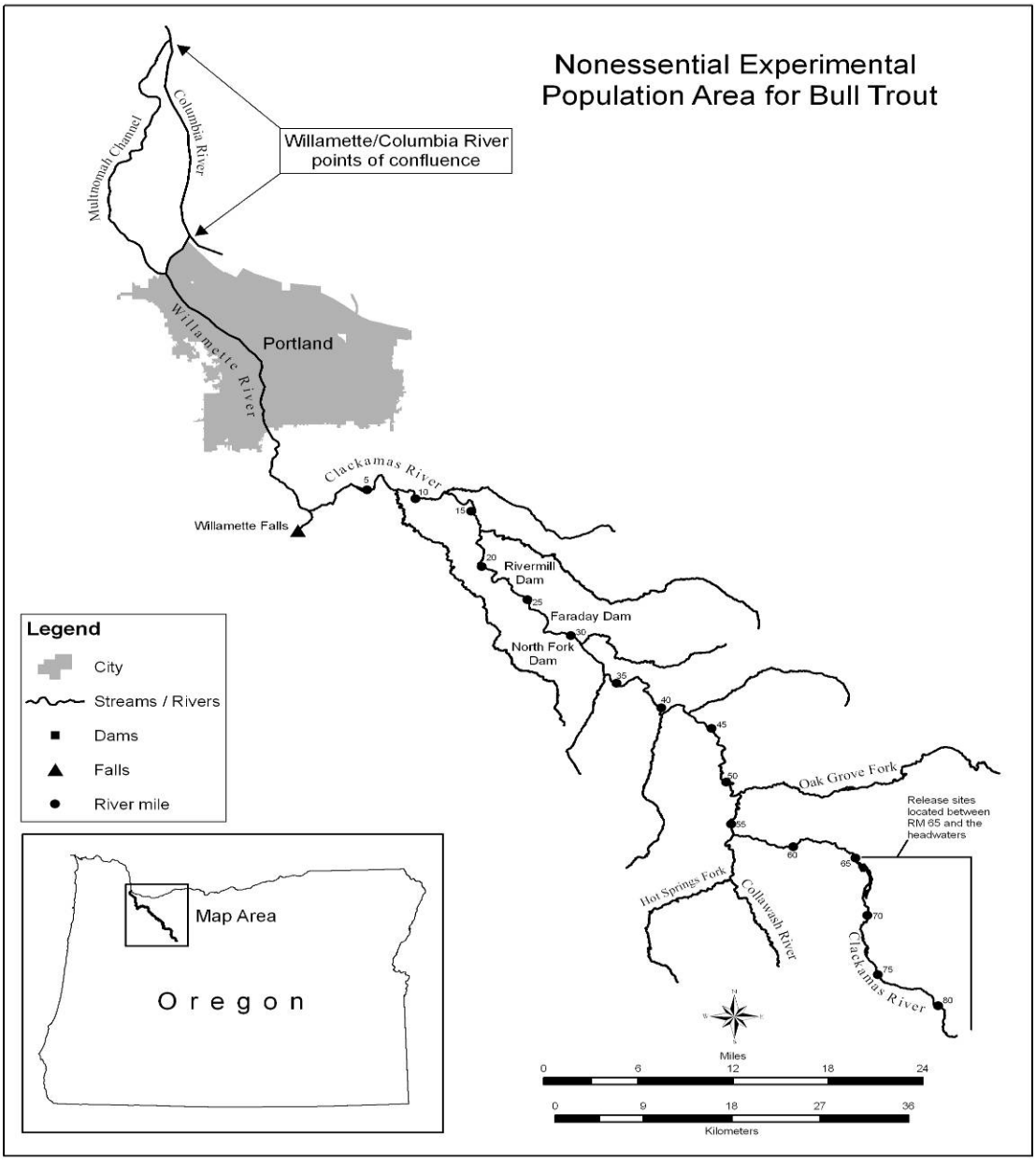

Figure 4. Nonessential Experimental Population Area for Bull Trout Showing Release Locations in the Upper Clackamas River.

1.7 Project Management Structure

The reintroduction project will be guided by two technical committees and a manager's committee (Figure 5). The Clackamas Manager's Committee is represented by the Service, ODFW, USFS, CTWSR, PGE and NMFS. The Clackamas Implementation and Logistics Committee and the Clackamas Monitoring and Evaluation Committee are technical groups represented generally by fisheries biologists from the agencies noted above. Monitoring and evaluation of the project may involve additional entities such as the U.S. Geological Service (USGS) and the University of Washington.

During project planning the Manager's Committee met as frequently as three to four times a year. We expect once we start implementing the project that the committee would, at a minimum, meet annually. The technical committees will be responsible for all detailed and administrative tasks associated with the project including annual planning, disease screening, donor stock capture, tagging, transfer and release, monitoring and evaluation, funding, and annual reporting.

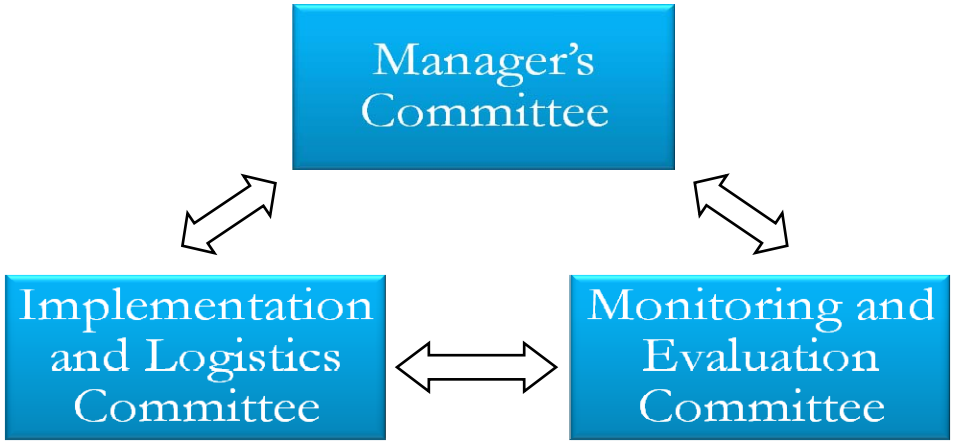

Figure 5. Clackamas Reintroduction Project Oversight Committees

2. Reintroduction Plan and Implementation Strategy

The action is a joint proposal with the State of Oregon to reintroduce bull trout into the Clackamas River. As part of this proposal, on December 9, 2009, we formally proposed designation of a nonessential experimental population of bull trout in the Clackamas River under section 10(j) of the ESA (74 FR 65045). As the primary landowner in the upper Clackamas River where the reintroduction will occur, the USFS Mt. Hood National Forest is our primary cooperating agency, along with NMFS and the CTWSRO, co-manager of bull trout in the Metolius River Subbasin which is the source of our preferred donor stock for the reintroduction.

The goal of the project is to re-establish a self-sustaining bull trout population of 300-500 spawning adults in the Clackamas River by 2030 that contributes to the conservation and recovery of bull trout in the Willamette Basin and to overall recovery criteria outlined in the Draft Bull Trout Recovery Plan (USFWS 2002). For this project we define a self-sustaining population as one that maintains a minimum adult annual spawner abundance of 100 individuals (see Section 1.3 above regarding minimum effective population size), contains a high level of genetic diversity representative of the donor stock, and requires little or no additional transfers. The numerical goal of 300-500 adult spawners is consistent with draft recovery planning targets for abundance (Section 1.1 above). Although the amount of suitable habitat in the Clackamas River suggests there is sufficient capacity to support a population of this size, bull trout distribution across the species' range, even within areas of suitable habitat, is patchy; thus, the true capacity of the Clackamas Subbasin for bull trout is unknown.

To accomplish the project goal, this plan has three objectives relative to project implementation, monitoring, and evaluation:

(1) Ensure that the proposed action does not threaten the donor stock population;

(2) Monitor and evaluate the effectiveness of the bull trout reintroduction strategy for re-establishing a self-sustaining bull trout metapopulation in the Clackamas River; and

(3) Evaluate the effects of bull trout reintroduction on ESA-listed salmonids that currently occupy the Upper Clackamas River Subbasin.

To implement the reintroduction of bull trout to the Clackamas River, we propose to utilize a single donor stock from the Metolius River in Central Oregon. We will collect fish of various life stages (initially juvenile, subadult, and adult) consistent with project numerical goals (see Section 2.1 below) from genetically identifiable groupings of bull trout in the Metolius River. Three major genetic bull trout groupings are present in the Metolious: (1) Whitewater River; (2) Jefferson and Candle Creeks; and, (3) Canyon, Heising, and Jack Creeks.

Due to limited knowledge regarding the status of bull trout in the Whitewater River, and per a request from CTWSRO, we propose to limit potential donor impacts by not targeting individuals specifically in the Whitewater River. However, collections of bull trout from the mainstem Metolius River and Lake Billy Chinook may include some individuals from the Whitewater

River due to the fact they would be physically indistinguishable from bull trout from the other two genetic groupings.

We propose to annually translocate multiple life stages of bull trout directly from the Metolius River to the upper Clackamas River via a three-phased adaptive management approach until either: (1) an evaluation of the program shows the goal of the project has been met or is on a trajectory to be met through natural reproduction based on monitoring and evaluation; (2) mid-process outcome evaluation suggests the reestablishment of bull trout is unlikely (i.e., the project is not showing acceptable levels of success); or (3) evaluation indicates an unacceptable level of impact to other federally listed fish species in the Clackamas River from predation and/or competition. The three phases of the project are outlined below:

> **Phase One (2011-2017):** Phase One of the reintroduction will be the key active management and learning phase. The release strategy varies with the life stage being reintroduced and may be modified as necessary based on monitoring results. Older life stages captured in Lake Billy Chinook or at Round Butte Dam's fish collection facility will be released in the mainstem Clackamas in patch 1 (Fig. 3 above). Juveniles (and fry if utilized in the future) will be released in all suitable patches on a rotating basis.
>
> **Phase Two (2018-2024)**: Based on Phase One monitoring, adaptively manage the implementation strategy to favor more successful life stages and preferred habitat patches. If Phase One is determined to be unsuccessful, reevaluate components of the reintroduction strategy such as donor stock, release locations and timing, life-stages and numbers transferred, to inform whether to significantly modify or discontinue the project.
>
> **Phase Three (2025-2030)**: By the year 2030 (or sooner if the goal and objectives are achieved) discontinue active management and stop implementation. Continue to implement a post-treatment monitoring and evaluation program.

2.1 Annual Donor Stock Availability

The numbers and life stages of donor stock to be transferred from the Metolious River to the Clackamas River were developed by members of the CRBTWG and members of the Deschutes Bull Trout Working Group (DBTWG). The DBTWG includes members that manage and/or contribute to monitoring of bull trout and bull trout habitat in the Metolius River Subbasin (ODFW, CTWSRO, USFS, PGE, Service). Members of these two working groups assembled on March 13, 2008, to discuss and develop donor stock availability criteria that will inform the number of bull trout available on an annual basis from the Metolius River for the first seven-years (Phase 1) of the reintroduction. Members of the Clackamas and Deschutes working groups that met on the issue of donor availability will be subsequently referred to as the donor advisory group.

The donor stock availability criteria, ultimately developed to minimize risk to the donor stock, represent the maximum number of individuals that could be removed annually based on the recent population status of bull trout in the Metolius River. Should the status of bull trout in the

Metolius River significantly change, these criteria will be reevaluated by the Service, ODFW, CTWSRO and other members of the donor advisory group.

Of primary concern to both the Deschutes and Clackamas bull trout working groups is continued viability of bull trout populations within the Metolius River. To that end, the lead implementing agencies of the Project (the Service and ODFW) are committed to an adaptive management framework for the project. All collection of bull trout from the Metolius River will be assessed annually by the donor advisory group.

The advisory group support detailed below is dependent upon the adult spawning population in the Metolius River remaining above 800 individuals annually (based on full census redd counts), including Whitewater River. Maintaining 800 spawning individuals is generally consistent with the donor stock risk assessment in the Feasibility Assessment (Shively et al. 2007) which found low risk (from loss of individuals) to populations that maintain a spawning population size that approaches or exceeds 1,000 individuals. The spawning population estimate peaked in 2004 at approximately 2,500 bull trout but has since dropped to approximately 900 adult spawners in 2008 (does not include Whitewater River bull trout which likely puts the total count over 1,000). If the adult spawning population drops below 800 individuals for a single year, the bull trout co-managers in the Deschutes Basin (ODFW and CTWSRO) and other members of the donor advisory group, will evaluate and provide further guidance to the Clackamas Project as to donor availability by life stage for subsequent years.

Availability of Adult and Subadult Life Stages for Transfer

The donor stock advisory group determined up to a 100 adults and 100 subadults could be available for transfer to the Clackamas River annually provided the total number of adult spawners in the Metolius River maintains 800 or more individuals as called for in recovery criteria outlined in the Draft Recovery Plan (USFWS 2002). For the purposes of our project, we characterize adult bull trout as individuals having spawned at least once or individuals staging for spawning in the Metolius River Arm of Lake Billy Chinook. Information suggests most bull trout in the Metolius River mature at age 5 although there is evidence some mature at age 4. Spawning (i.e., mature) bull trout in the Metolius River range in size from 230-824 mm (9-32 inches) but most are 450-650 mm (18-26 inches) (Ratliff et al. 1996). We define the subadult life stage as individuals two years old or older that have migrated from the Metolius River to Lake Billy Chinook and have not yet spawned. Given that most bull trout in the Metolius River mature at age five, subadult bull trout in Lake Billy Chinook will generally be two to four years of age. Studies suggest annual growth rates in Lake Billy Chinook are variable but generally subadult bull trout in Lake Billy Chinook will range from 150 mm to 450 mm (6-18 inches).

Availability of Fry and Juvenile Life Stages for Transfer

For the purposes of our project we define the juvenile life stage of bull trout as individuals that are age one to age three that are rearing in the Metolius River or tributaries of the Metolius River. Information from Metolius River bull trout studies suggest juvenile bull trout will generally range from 50 mm to 250 mm (2-10 inches).

The donor stock advisory group determined that up to 1,000 juveniles and up to 10,000 fry could be available for transfer to the Clackamas River annually (USFWS 2002), and that take of juveniles and fry is spread among multiple spawning tributaries (excluding direct take of individuals from Whitewater River per request from CTWSRO). In order to transfer as much of the genetic diversity as possible to the Clackamas River we intend to utilize donors from the majority of Metolius River tributaries used by bull trout for spawning. However, the capacity and current number of spawners differs among tributaries and thus if we collect fish from tributaries rather than the mainstem Metolius River, the number of individuals removed from each tributary will be roughly commensurate with the number of adult fish spawning in each tributary. For example, we expect to transfer more donors from Jack Creek which averages more than 150 redds annually then from Heising Spring which averages less than 50 redds annually. Collection of juveniles and fry, if the fry life stage is utilized for the Clackamas reintroduction in future years, will likely occur both in spawning tributaries and in the mainstem Metolius River.

2.2 Numbers and Life Stages Proposed for Transfer

Based on existing donor population levels and donor criteria discussed above, and discussions with the CRBTWG and other project stakeholders, we propose the following approximate numbers of fish by life stage to be transferred each year during Phase 1 of the project. As noted previously, annual monitoring of the donor stock and the reintroduced fish in the Clackamas River will further inform future numbers and life stages for transfer. The numbers and life stages of fish for transfer will be reviewed annually by the donor advisory group, as well as the Implementation Logistics and Monitoring and Evaluation committees associated with the project.

- Adults: Approximately 30 per year (equal numbers of males and females if gender can be identified) for the first 2 years. Continuation through Phase 1 is dependent on monitoring and evaluation results and donor availability. For this project, adults are considered to be greater than 450 mm (18 inches). No fish greater than 650 mm (26 inches) will be transferred to the Clackamas River. Emphasis will be placed on the collection and translocation of adults at the lower end of the adult size range.

- Subadults: Approximately 30 per year for the first 2 years. Continuation through Phase 1 is dependent on monitoring and evaluation results and donor availability. For this project we consider subadults to be fish rearing in Lake Billy Chinook that are 250 mm – 450 mm (10-18 inches) in length.

- Juveniles (age 1, 2, 3): Approximately 1,000 per year. Continue through Phase 1 depending on monitoring and evaluation results and donor availability. For this project we consider juveniles to be fish less than 250 mm (10 inches) that are rearing in the Metolius River or tributaries. No bull trout will be transferred to the Clackamas River that do not meet the minimum size for tagging with a PIT tag (approximately 70 mm for a 12 mm PIT tag).

We are not proposing to utilize fry during the first phase of the project, and their future use is contingent upon the success of older life stages, as determined by monitoring and evaluation. We

are not proposing to utilize fry initially for the following reasons. First, fry inherently have a high mortality rate thus high numbers are required to be transferred to confer survival to reproductive age. Second, fry can't be tagged effectively with current technology. We propose to PIT tag every individual translocated to the Clackamas River for monitoring presence, migration patterns, distribution, survival and growth (when possible). The minimum length at which a fish can be PIT tagged is approximately 70 mm (2.75 inches) which precludes tagging fry. Lastly, to capture the full genetic variability of a spawning population and associated run timing, outmigrating fry in the Metolius River would have to be collected throughout the spring beginning in late February and extending through May. While a large number of fry are captured at the screw trap in the lower Metolius in the spring that would serve this purpose, access to release locations in suitable rearing habitat in the upper Clackamas River is typically blocked by snow until late spring. Therefore fry would need to be temporarily reared in a hatchery environment which is expensive, risks fish mortality, and is labor intensive.

Consistent with the adaptive management strategy of this project, following the initial two years of the project there will be a decision point at which time we will examine whether to continue subadult and adult transfers through Phase 1. The decision point will be informed by monitoring and evaluation and will be based primarily on whether older life stages are adapting and residing in the Clackamas River, and for mature fish, showing indications of reproduction and subsequent recruitment.

2.3 Donor Stock Collection and Timing

As noted above, all donor stock will come from the Metolius River Subbasin and from Lake Billy Chinook. Juvenile bull trout, defined as fish < 250 mm (10 inches), will be collected from the mainstem Metolius River and its tributaries including Jefferson (Tribal permission may be required), Candle, Canyon, Jack creeks and Heising Spring. Juveniles will not be taken directly from Whitewater River but may be collected for donor stock if mainstem Metolius River collections occur. Juvenile collections could occur any time spring through fall but will likely coincide with collections of adults and subadults which are most vulnerable to collection in May and June (D. Ratliff, PGE, personal communication June 2010). Juvenile capture techniques will include minnow trapping, seine netting, electrofishing, dip-netting, collection from the mainstem screw trap, and hook and line angling. Juveniles will be PIT-tagged (see Section 3.3) as close to capture as possible, sorted by size, and placed in live cages (or a hatchery truck on site if necessary) within streams. Juveniles will be held for a maximum of 1-2 days.

In general, adults and subadults would be collected in the Metolius River arm of Lake Billy Chinook when they stage in the late spring and early summer (May and June) prior to migrating into the Metolius River. Collection techniques will be based on methods utilized by personnel on previous bull trout studies at Lake Billy Chinook, namely hook and line angling and Onieda trap netting. If monitoring and evaluation over the first several years of the reintroduction project indicates translocated adults are not remaining in the Clackamas River following a May/June release, or if they remain in the Clackamas River but do not show signs of spawning, then the timing of adult and subadult collections may be revisited by the project technical teams.

An alternative collection opportunity for adult and subadult bull trout now exists given the operation of the new Fish Transfer Facility (FTF) at Round Butte Dam. From early December 2009 through June 30, 2010, over 300 bull trout entered the facility, most of which were 350 mm (13.8 inches) or larger (Fig. 6 below). Six collection tanks associated with the operation of PGE's Round Butte Fish Isolation Facility are capable of holding subadult and adult bull trout (Don Ratliff, PGE, personal communication, July 2010), separated by size, for up to one week. As of April, 2011, adult bull trout have been observed moving through the FTF (Don Ratliff, PGE, personal communication, April 2011). For the first year of translocation, adults will most likely be captured, in part, at the FTF, and all subadults and adults that have been captured and tagged (see below) will be held at the Round Butte Fish Isolation Facility until ready for transport to the Clackamas. Fish will be held for a minimum of five days to ensure that there is no transfer of New Zealand mud snails, an aquatic invasive species that has been found in the Crooked River arm of Lake Billy Chinook.

All fish will be transferred to the Clackamas via a fish transfer truck with a 150 gallon portable tank. Cold water for the tank could be obtained at Wizard Falls, or ice blocks will be used to keep water cold. Fish will be segregated by size, perhaps by using a series of mesh bags, and transported to the Clackamas after any required holding period (for adults and subadults) and then released according to Section 2.4 (below).

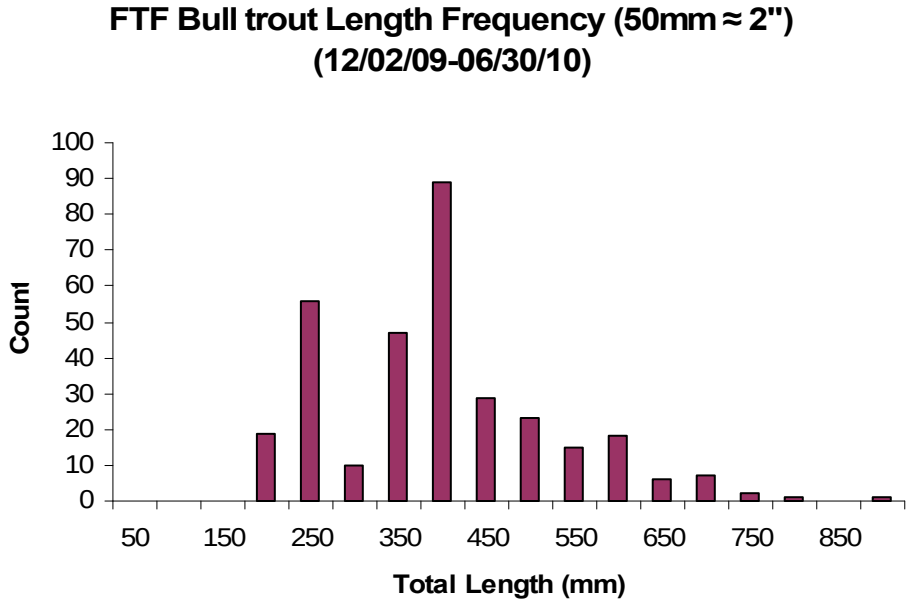

Figure 6. Bull trout length frequency during seven months of collections at Round Butte Dam's Fish Transfer Facility (FTF) (Don Ratliff, PGE, pers. com. 2010)

2.4 Release Locations and Timing

All bull trout will be released in habitat identified in the Feasibility Assessment (Shively et al. 2007) to be suitable for spawning and early juvenile rearing (Patches 1-6 in Fig. 3 above). With the exception of the mainstem Clackamas River habitat in Patch 1, habitat in the remaining patches is not likely suitable for year-round occupancy by adult and subadult bull trout due to stream size. Given the behavior of migratory bull trout in other basins in Oregon and Washington, we do not expect adult and subadult bull trout to be present in the relatively smaller streams in patches 2-6 except during the fall spawning period, typically late August through early October. As a result, and due to the spring and early summer timing of donor stock collection (see 2.3 above), releases of adults and subadults will occur only in Patch 1 or upstream of Patch 1 in the mainstem Clackamas River between Pinhead Creek and Cub Creek. However, bull trout juveniles, and fry if they are utilized in the future, will be released in all suitable streams (over a number of years) within habitat patches 1 thru 6 on a rotational basis (described below).

Given the number of juveniles proposed for transfer on an annual basis (1,000) relative to the amount of suitable habitat available for stocking, and considering factors associated with monitoring these fish, a recommendation was made by the project's technical teams to limit annual stocking to two patches. Due to monitoring considerations, and accounting for annual environmental variability in the receiving habitat and in fish condition, a second recommendation was made to stock the same two patches for a minimum of two, perhaps three years consecutively before shifting stocking to two new suitable patches. We intend to split the number of juveniles equally between the two patches each year; i.e., 500 juveniles will be translocated to each patch. We considered weighing the number of juveniles per patch by catchment size or stream volume, but decided that because there is no evidence that either of those factors would affect habitat suitability in patches there was no reason to do so. At this point, we do not know how many juveniles we will be able to capture for translocation. To prevent too few bull trout from being seeded among two patches (for example, if only 500 juveniles are captured, 250 fish per patch might be too few to measure), we plan on seeding one patch until 500 juveniles are released, and then we will proceed to seeding the second patch.

When releasing juveniles into habitat patches, efforts will be taken to distribute fish as widely as possible (as opposed to releasing them in 1-2 locations), and as far upstream as appropriate. We assume that this will help to minimize intra-specific predation and/or competition. We are initially planning on backpacking juveniles into habitat patches, using approximately 5 gallons of water per backpack, with no more than 15 similarly-sized bull trout per pack. Fish may be separated in small groups between several bags (3-5 groups) within the pack that are individually oxygenated. After reaching a release site, the location of the site will be marked with a GPS and fish will be acclimated to the stream temperature by placing a bag in the stream for several minutes. To maintain dissolved oxygen levels, the bag will be kept closed until fish are ready to be released.

Principle Components Analysis

To avoid arbitrarily choosing the initial two streams/patches for release, and to maximize our probability of reintroduction success by trying different streams within the range of suitable habitats, we conducted a principle components analysis (PCA) that considered differences in habitat variables between each of the upper subbasin patches. We used data collected by ODFW (NEED REF for Shively data) to generate our analysis. We considered maximum water temperature ("Max_Temp"), minimum summer stream width ("Width_ft"), stream gradient ("Gradient_num"), basin area (in acres, "Basin_ac"), and the percent of the basin that fell within the High Cascade (vs. West Cascade) flow regime ("High_Cas"). The PCA generated relationships between each patch and habitat characteristic dimensions. Component loading is a measure of how much a particular variable (gradient, basin size, etc.) corresponds with the component. Dimension (or principal component) 1 is mostly a measure of summer stream width and basin size (both have high positive loadings), as well as gradient (high negative loading). Dimension 2 has large loadings of maximum temperature and percent of the watershed in the high cascades. Together, these two dimensions account for about 72% of the variance between the streams.

Based on where each basin falls relative to each dimension axis (Figure 7), the Cub and Berry patches appear to be similar in that both have higher summer temperatures (i.e., both fall near each other on the dimension 2 axis) whereas Pinhead and Last are also fairly similar but have lower summer temperatures. Rhododendron and Hunter patches are similar based on gradient (dimension 1) but are not particularly close to each other regarding temperature. While the Upper Clackamas patch appears to be distinct, note that the basin acreage is fairly large and includes the Upper Clackamas and Lemiti drainages; data was not available for the Upper Clackamas above its confluence with Lemiti Creek.

In deciding which two patches to initially seed with translocated bull trout, it may be reasonable to choose two patches that are on opposite ends of a PCA axis but that are still characterized by (what we assume to be) appropriate bull trout habitat. In this case, if we choose dimension 2 (which is characterized by maximum temperature and high cascade flow regime), we might decide to use Pinhead or Last Creek for one translocation patch and Cub or Berry Creek for the second patch, as these sites are opposite each other on the dimension 2 axis but still relatively similar in respect to dimension 1.

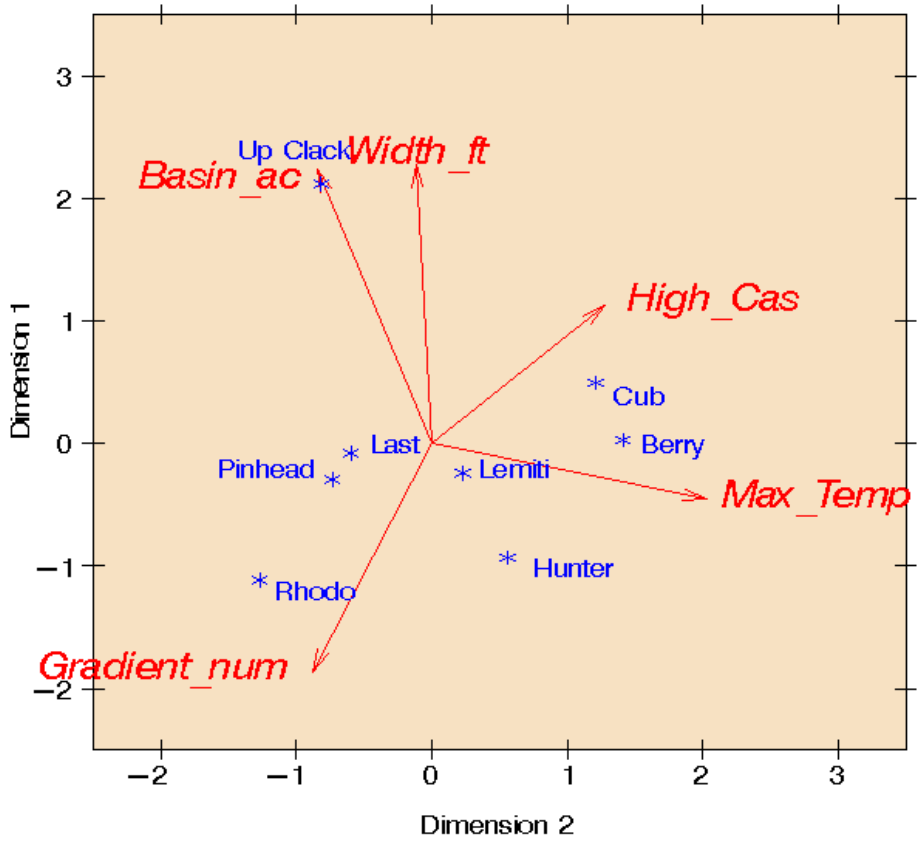

Figure 7. Principal Components Analysis of the Upper Clackamas subbasin patches.

2.5 Pathogen Screening

Annual Protocols for Pathogen Screening

Based on State requirements and recommendations from ODFW Fish Health Services (ODFW 2009), 60 ripe bull trout adults must be tested for virus the fall previous to transfer by collecting (non-lethal) and testing ovarian fluid and sperm. Although not required, it is preferable to have the samples come from individuals from more than one spawning tributary. Testing of adult fluids was initiated in the fall of 2010; 59 adults were tested with negative results for virus. In addition, each year of transfer will also require the testing (lethal) of 150 fry, which will begin in the spring of 2011. Similar to the adult samples, it is preferable to have the samples come more than one spawning tributary. As long as yearly test results for both fry and adults remain negative for IHNV, the project is cleared by ODFW Fish Health Services to collect and transfer any life-stage of bull trout from within the Metolius River/Lake Billy Chinook system that calendar year. The testing, which will occur at Fish Health Services labs in Madras or Corvallis, will provide a 95 percent confidence of pathogen detection at a 5 percent incidence rate for the adult population and 2 percent incidence rate in the fry.

The two samples are temporally separated but offer the best possible life-stages from which to pick up the virus. Clearance of the population would have to occur on an annual basis such that the results of adults sampled in the fall are combined with results of fry testing from the following spring to clear the population for transfer during that year. For example, if adults are tested in the fall of 2010 and fry in early 2011, with no virus detected, then any life-stage of bull trout can be transferred to the Clackamas River that calendar year (2011).

Baseline Pathogen Assessment

Unwanted pathogens and diseases have occasionally been introduced through fish transfers (Hoffman and Schubert 1984). To avoid these unintended consequences, translocations of fishes between major river basins should be preceded by a thorough investigation into the potential transfer of pathogens from the donor source, as well as the resistance of the donor stock to any known pathogens present in the receiving habitat.

In order to assess and minimize the risk of pathogen transfer and the presence of pathogens in the Clackamas River we worked closely with ODFW Fish Health Services and staff from the Service's Lower Columbia River Fish Health Center. Our pathogen assessment utilized existing information from the Deschutes Basin (and Metolius subbasin) and new information that was collected from the Clackamas and Lewis rivers as part of the pathogen assessment. At the time of the assessment bull trout from the Lewis River, in addition to bull trout from the Metolius River, were being considered as potential donor stock for a reintroduction to the Clackamas River.

The results from our testing of fish from the Lewis and Clackamas rivers, combined with existing data from the Deschutes Basin (Engleking 2003) provided valuable information regarding (1) the risk of pathogen transfer to the Clackamas River from the Metolius or Lewis river donor stock; and, (2) the presence or absence of pathogens in the Clackamas River that may influence the health of donor stock from the Lewis or Metolius rivers. Based on the results, it appears the predominant pathogens of concern to a reintroduction of bull trout to the Clackamas River are Infectious Hematopoietic Necrosis Virus (IHNV) and *Renibacterium salmoninarum* (the causative agent of Bacterial Kidney Disease, BKD). The State's expressed primary concern is introducing U-clade IHNV to the Clackamas River. U-clade INHV is present in the Deschutes Basin but has not been detected in bull trout from below or above the Pelton-Round Butte Project.

Based on our pathogen assessment there is no evidence that pathogens from potential donor stock or from the receiving environment will compromise the success of the reintroduction project. In addition, there does not appear to be undue risk to other native salmonids in the Clackamas River from a transfer of bull trout from either the Lewis or Metolius rivers. Despite these findings, annual pathogen screening of a representative sample of bull trout prior to transfer to the Clackamas River is warranted.

3. Monitoring Strategy

The purpose of this project's monitoring and evaluation program is twofold; 1) to assess the effectiveness of the reintroduction to inform the adaptive management of the project (i.e., refine the implementation strategy and apply appropriate management); and, 2) to document the effectiveness of the reintroduction strategy and learn from the results of our actions so that we can apply our increased knowledge elsewhere. The monitoring program has three major objectives:

(1) Ensure that the proposed action does not threaten the donor stock population;

(2) Monitor and evaluate the effectiveness of the bull trout reintroduction strategy for establishing a self-sustaining bull trout metapopulation in the Clackamas River; and

(3) Evaluate the effects of bull trout reintroduction on ESA-listed salmonids that currently occupy the Upper Clackamas River Subbasin.

The monitoring strategy will use an adaptive management approach; that is, future monitoring and evaluation actions will depend upon, and be informed by, what is learned as the project is implemented. Additionally, information gained from the monitoring and evaluation program will be used to guide management actions to ensure that neither the donor stock nor listed anadromous salmonid populations in the Clackamas basin suffer significant negative impacts as a result of bull trout reindroductions. Because there are many possible results in response to our actions, this plan will focus on the first phase of this project (years 1 – 7) to guide our monitoring and evaluation strategy. As we move through Phase 1, the results we observe will guide us towards a continued monitoring and evaluation strategy in Phase 2 and beyond. Subsequently, this plan identifies prioritized study questions and monitoring techniques for Phase 1, and what we believe will be relevant study questions in Phases 2 and 3 of project implementation (see Appendices 1 and 2 for a summary of prioritized questions and monitoring strategies).

3.1 Monitoring and Evaluation Guidance

As part of the overall responsibility of designing an effective monitoring and evaluation program for bull trout, the USFWS has established the Bull Trout Recovery Monitoring and Evaluation Technical Group (RMEG) (USFWS 2008). The bull trout RMEG is a multi-agency body chaired by USFWS fisheries technical staff and independently facilitated. The group consists of several members representing a balance of skills in population dynamics, char biology, field studies, biometrics, and experimental design. The USFWS has asked the RMEG to undertake the following tasks: 1) summarize bull trout monitoring and evaluation needs, 2) review analytical methods of characterizing bull trout population and habitat status, 3) increase the utility of current data collection for recovery planning, 4) direct and prioritize future monitoring efforts associated with bull trout recovery, 5) develop and standardize design elements, and 6) foster coordination among monitoring programs.

The RMEG has begun to address monitoring and evaluation components related to all four Recovery Plan objectives: distribution, abundance/trends in abundance, habitat conditions and

genetic diversity/exchange. Initial RMEG efforts have focused principally on distribution questions, with more recent efforts targeting abundance and connectivity (habitat condition and genetic exchange). The intent of the RMEG is to provide guidance and support to bull trout recovery efforts in three primary areas: 1) monitoring design; 2) specific monitoring techniques; and 3) analytical methods for assessing recovery.

This Plan identifies guidance recommended by RMEG (USFWS 2008) to evaluate the presence / absence of reintroduced bull trout in Upper Clackamas habitat patches, monitor their distribution and movement, and assess reproduction. These aspects will be discussed further below.

3.2 Donor Population Monitoring

Two questions guide monitoring of the Clackamas reintroduction donor population in the first phase of the reintroduction project:

D1. Does the donor stock population have the minimum threshold number of spawning adults required to continue donor stock removal?

D2. Is the donor population is pathogen-free?

Pathogen screening (addressing D2) is described in detail in section 2.5 of this plan. To address question D1, the Clackamas bull trout reintroduction is dependent upon the adult spawning population in the Metolius River remaining above 800 individuals annually. The spawning population estimate peaked in 2004 at approximately 2,500 fish but has since dropped to approximately 900 adult spawners in 2008 (this estimate does not include Whitewater River bull trout). If the adult spawning population drops below 800 individuals for a single year, the bull trout co-managers in the Deschutes Basin (ODFW and CTWSR) and other members of the Advisory Group will evaluate and provide further guidance to the Clackamas Project as to donor availability by life stage for subsequent years.

Monitoring the donor population is necessary to detect any deleterious effects from removal of individuals and also to serve as a guide for the number of fish available for the reintroduction program. Current population monitoring by ODFW, USFS, CTWSR and PGE consists of redd surveys throughout the Metolius subbasin, creel surveys in Lake Billy Chinook, operation of a screw-trap for outmigrant monitoring in the Metolius River at Monty Campground, and juvenile bull trout density monitoring at index reaches in spawning streams (USFWS 2002). Bull trout in the Metolius River are monitored primarily by annual fall census redd counts (USFWS 2002). A fish-to-redd conversion factor derived from mark-resight studies in the Metolius River is used to estimate the annual adult spawning population size (Ratliff et al. 1996). This conversion factor was initially generated in the 1990s and is currently being tested in the field, with Service financial support in 2009 and 2010 (ODFW, pers. comm. 2011). These monitoring programs, which have occurred for almost two-decades, will continue into the future and be used to evaluate the donor population.

The donor stock availability criteria, ultimately developed to reduce the potential impact to the donor stock, represent the maximum number of individuals that could be removed on an annual

basis based on the recent population status of bull trout in the Metolius River. Should the status of bull trout in the Metolius River significantly change (including genetic health, see below), these criteria will be reevaluated by the Service, ODFW, CTWSR and other members of the Donor Stock Advisory Group. All take of bull trout from the Metolius River will be assessed every year at an annual meeting of the Donor Stock Advisory Group.

A third question, which may be addressed more explicitly at the end of Phase 1 or at the beginning of Phase 2 (pending resource availability), is D5: Are there any indications of deleterious impacts (genetic fitness or population abundance) to the donor population from removing individuals for translocation (see Appendix 1)? Genetic assignment techniques (Anderson et al. 2008) can be used to monitor impacts to the donor population. Genetic monitoring of the Metolius will help to determine if any spawning populations show a decrease in levels of genetic variation, experience a genetic bottleneck, or show a decrease in effective population size. A Metolius River bull trout baseline genetic analysis was conducted in 2008 by the Service's Abernathy Conservation Genetics Lab (DeHaan et al. 2008). This analysis utilized collections of approximately 50 juvenile bull trout from each of seven Metolius River spawning tributaries. Using the genetic baseline dataset, adults and subadults collected in Lake Billy Chinook, along with any other individuals of unknown origin, can be assigned to their population or spawning complex of origin. This will allow us to determine the proportion of adults transferred to the Clackamas that originate from each population/spawning complex. This analysis will be particularly useful for assessing the direct impact of the reintroduction program on the Whitewater population since fish from Whitewater River can be assigned with a high degree of confidence.

Genetic samples will be collected and stored at Abernathy Fish Technology Center throughout Phase 1 in anticipation of addressing this question later in the monitoring and evaluation program. We expect to repeat an analysis similar to that conducted in 2008 in the future at appropriate intervals (every 5-7 years, likely to occur at the end of Phase 1 or early in Phase 2) to ensure the contribution of individuals to the Clackamas River is not reducing the genetic fitness (i.e., allelic frequencies) of Metolius River bull trout donor stock. Although juveniles will not be collected from the Whitewater River for transfer to the Clackamas, collections for genetic monitoring of the Metolius spawning tributaries should also include individuals from the Whitewater River so that any impacts to this population can be documented; this may require additional tribal approval. It will be important to separate fluctuations in genetic variation that occur naturally from those that may result from transferring fish from the Metolius River to the Clackamas River. Fin clips collected from the first few years of juveniles transferred to the Clackamas River should provide the appropriate baseline genetic samples to examine natural fluctuations in genetic variation in the Metolius River. This analysis will help determine if any changes observed in genetic variation once transfers begin are greater than what we might expect due to natural annual fluctuations. Should the genetic health of bull trout in the Metolius River significantly change the status of the Metolius bull trout population will be reevaluated by the Service, ODFW, CTWSR and other members of the Donor Stock Advisory Group to determine whether removal of bull trout from the Metolius is still appropriate.

3.3 Clackamas Bull Trout Monitoring

As stated in Section 3, the purpose of this monitoring program is to 1) to assess the effectiveness of the reintroduction to guide adaptive management of annual project implementation, and 2) to document the effectiveness of the reintroduction strategy and learn from the results of our actions. While there are an abundance of interesting questions that we could ask, there are four primary questions that guide the monitoring of reintroduced bull trout in the Upper Clackamas Subbasin during Phase 1 (see Appendix 1), which are described in detail below:

B1. Older life stage retention: do translocated adult and subadult bull trout remain in the upper Clackamas Basin (above River Mill Dam)?

   a. If yes, what is their seasonal distribution?
   b. If yes, is there evidence of spawning activity? If no, does changing the release timing/location provide a different result?

B2. Juvenile life stage retention: do juveniles remain in the habitat patches they are outplanted to in the short-term or do they move relatively quickly out or into other habitat patches?

   a. If they stay, how are juveniles distributed within tributaries?

B3. Reproduction: which translocated life stages are successful in contributing naturally produced progeny in the Clackamas River?

   a. Do adults and subadults produce progeny in years 1-3 (and beyond, if applicable)?
   b. Do translocated juveniles mature to produce progeny in years 4-7?

B4. Genetic diversity: is the level of genetic variation in the donor population adequately represented by translocated fish (measured in years 4-7 of Phase 1)?

For the initial phase of the project (2011 – 2017), the primary components of our monitoring program will be focused on answering the above questions. We plan to monitor distribution and movement of all translocated life stages, document evidence of successful reproduction (if any), and assess genetic diversity (as measured against the donor population). Monitoring activities in Phases 2 and 3 will be informed by Phase 1 monitoring and evaluation. Monitoring of translocated bull trout will be conducted jointly by the Service and ODFW, with assistance from the USFS and potentially USGS and the University of Washington.

3.3-a Older life stage retention (B1)

Movement and distribution of subadult and adult bull trout will be monitored intensively through the first phase of the reintroduction. During this phase, all translocated subadult and adult bull trout will be implanted with a 23 mm, half-duplex Passive Integrated Transponder (PIT) tag and a small (2 mm^2 – 1cm^2) fin clip will be taken. At the same time, all subadults and adults will

also be implanted with radio transmitters for at least the first two years of the project. Tagging will occur upon collection from Lake Billy Chinook in May and June of each year subadults and adults are to be translocated, starting in 2011. Radio transmitter models will be selected for maximum battery longevity with the constraint that the weight of the transmitter will only be approximately 2% of the body weight of the fish. Given the expected fish sizes, radio tags should be able to last 2-4 years. The need to transfer subadults and adults and radio tag fish in subsequent years will be assessed based on the results of the first two years of monitoring.

Monitoring of subadult and adult movement and distribution will involve radio fixed stations and stationary PIT antennas (which will be installed in the spring of 2011 at key locations described below), and mobile radio telemetry tracking. If most subadult and adult bull trout leave the upper Clackamas River and do not return, we will have strong evidence that these life stages are not effective for reintroduction. To investigate this, a radio fixed station will be located immediately below the River Mill Dam and a PIT antenna will be installed in the PGE downstream by-pass facility (see Figure 8). In combination, the two detection methods should have a high likelihood of recording subadult and adult bull trout leaving the introduction area.

If subadult and/or adult bull trout stay within the introduction area, it will be important to know a) how they distribute seasonally, and b) if they migrate to suitable spawning habitats in the fall. Again, we intend to collect data using radio and PIT tracking. Fixed radio stations will be strategically located to monitor fish movement in key sections of the Clackamas River (Figure 8). The sections include (in order of priority) 1) PGE project between River Mill Dam and North Fork Dam, 2) North Fork Reservoir, 3) Clackamas River between NF Reservoir and the Collawash River, 4) Clackamas River between the Collawash River and Pinhead Creek, and 5) Clackamas River and tributaries upstream of Pinhead Creek. In addition to the radio receivers, stationary PIT antennas will be located near the mouth of each of the major tributaries identified as a suitable reintroduction patch (Shively et al. 2007). PIT antennas will be located at the confluence of Last and Pinhead creeks, Cub Creek and the Clackamas River, on Hunter Creek, and on Rhododendron Creek. Readers will have multiple antennas to increase overall detection efficiency and to indicate movement direction when fish are detected at both antennas.

After radio fixed-stations and PIT tag arrays are installed spring 2011, data will need to be uploaded every 7-10 days once fish are in the system (may be less frequent in the winter months, depending on fish movement). Teams that upload data will also ensure that these stations and antennas are in good working order with an adequate power source. In addition to movement and distribution data collected from these fixed locations, stationary radio and PIT detections will be analyzed regularly to direct mobile tracking efforts. Mobile tracking to detect subadult and adult movement will occur in conjunction with summer ground-based surveys to detect the presence of juveniles and/or naturally produced progeny (described in detail below), starting in 2011 and continuing each year through the end of Phase 1. From August through October each year, we will use mobile tracking to search for evidence of spawning activity with the ultimate goal of observing bull trout redds or actively spawning fish.

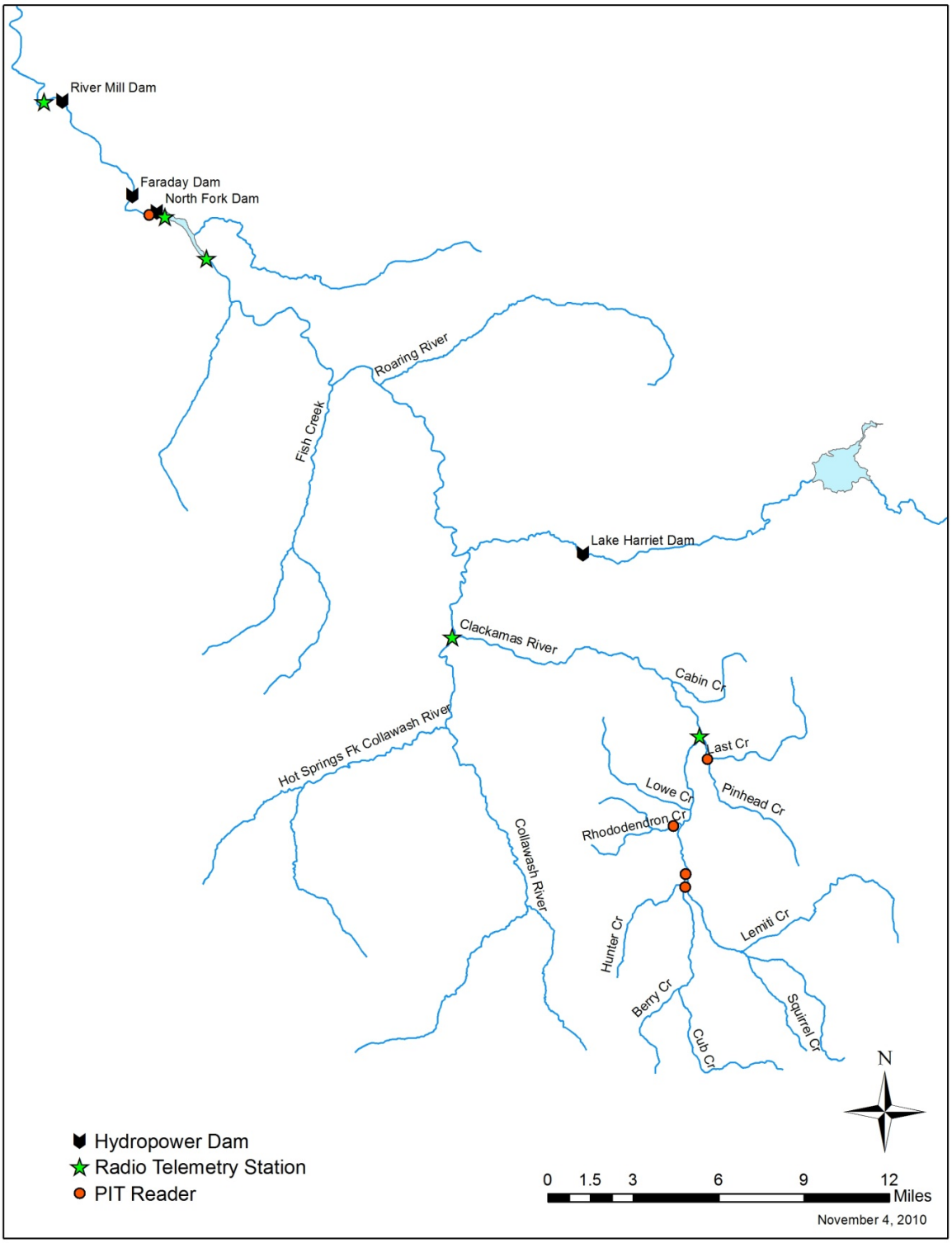

Figure 8. Locations of fixed radio telemetry stations and PIT antenna arrays

3.3-b Juvenile life stage retention (B2)

Upon reintroduction of juvenile bull trout into the upper Clackamas subbasin, we will assess whether juveniles remain in the tributary streams they are outplanted to in the short-term or if they are moving relatively quickly out of or into other tributaries. If juveniles remain in upper basin tributaries, we will also monitor to determine how they are distributed within the tributaries. To assess this, we will monitor juveniles in two ways: 1) the use of PIT-tags and antennae array reader stations, and 2) ground-based presence/absence surveys.

Upon collection from the Metolius basin and prior to release in the Clackamas River, all bull trout between 70 and 120 mm in total length will be PIT tagged using 12 mm half-duplex tags. Juveniles greater than 120 mm will be PIT tagged using 23 mm half-duplex tags; all PIT tags will be placed in the body cavity of fish less than 300 mm by ODFW staff (and assisted by USFS and/or USFWS as available). At this same time a small (2 mm^2 – 1cm^2) fin clip will also be taken from all juveniles for genetic analysis. At least one fixed PIT tag antenna array will be placed in the habitat patch where juvenile bull trout are released, with the primary array stationed just above the confluence of the main patch drainage and the mainstem Clackamas River (see Figure 8; locations of antennae arrays are also described in section 3.3-a). Placing antennas in these locations will provide information on movement between patches.

The goal of presence and absence monitoring is to document the distribution and relative survival of translocated juvenile fish (i.e., determine whether at least some juvenile bull trout survived the translocation and are surviving in new habitat) and to detect any progeny that may result from translocated individuals. The focus of this monitoring component is on the juvenile life stage since older life stages will be radio tagged and thus their status should be readily obtainable during the years the tags are operational (at least years 1-4 of Phase 1). Monitoring the presence and absence of juveniles (including any progeny) will occur by quantifiable methods including electrofishing and/or snorkel surveys, and PIT tag detection systems.

RMEG outlined a protocol for assessing bull trout patch occupancy (USFWS 2008). Patches are intended to represent the area of spawning and early rearing for a population. A population is considered "present" if multiple age classes of pre-migratory juvenile or resident bull trout are found (USFWS 2008). RMEG guidance suggests that the presence of adult bull trout and at least two bull trout redds must be observed at a site to indicate that spawning occurred (USFWS 2008). In the case of the Clackamas reintroduction, we are not necessarily interested in the need to assess the presence of multiple age classes but are more interested in determining whether outplanted juveniles occupy any particular areas within a patch. The goal of the approach is to balance the ability to make statistical inferences about patch occupancy with the realities of logistical and financial constraints. The RMEG approach to evaluating patch occupancy requires an assumed or estimated site-specific detection probability for the sampling method utilized, the probability of presence (given no detection) deemed acceptably low, and the random identification of spatially-balanced sample sites to achieve a sample framework that allows for estimation of presence and the refinement of detection probabilities (USFWS 2008). Assessing patch occupancy requires the following steps, which we have modified (where noted) to suit our specific needs:

1) **Identify a habitat patch.** Habitat patches have been delineated in the Upper Clackamas Subbasin (Fig. 3) based on access to suitable habitat, stream size, and maximum temperature.

2) **Utilize a GRTS design to generate sampling sites within the patch.** The Generalized Random Tessellation Stratified (GRTS) design will generate numerous random, spatially balanced sampling sites (i.e., 50 m reach, with an average density of one site per 500 m of stream) in a specific order. Using an assumed site detection probability, the number of sites to sample should be determined (see Fig. 3.1 in the RMEG guidance document, USFWS 2008). The top 35 GRTS sampling points have been identified for each of the upper Clackamas basin habitat patches (M. Hudson, personal communication, 2010).

3) **Conduct reconnaissance surveys to evaluate the viability of selected sample sites.** If any of these sites are ineligible (e.g., the site is dry, less than 1 m wide, over 18% gradient, etc.), evaluate the next site that was generated by the GRTS design. Repeat until the number of eligible sites required for sampling are selected.

4) **Select a field protocol to apply at each site.** We anticipate that most surveys will consist of electrofishing to detect juveniles, and snorkeling (at night, when possible), as the possibility of progeny in the system increases.

5) **Sample each site for juvenile or YOY bull trout.** Typically, sites would be sampled until there is evidence that the patch is occupied, or until all sites are sampled with no evidence of occupancy. However, in our case, we wish to determine which habitats within patches are suitable and being used by juvenile and/or YOY bull trout. We will survey all sample sites identified in the habitat patch, regardless of whether bull trout are detected or not. If electrofishing is used in the surveys, all captured bull trout will be identified with a PIT tag reader (if tagged), measured (to estimate growth), and its location noted.

6) **Estimate probability of presence if all random sites are sampled and bull trout are not found.** If no bull trout are detected, the probability of presence (given no observations) will be estimated using the procedure of Peterson and Dunham (2003). This will help us determine whether or not using juveniles as part of the reintroduction strategy is appropriate, at least during the initial few years that juveniles are translocated.

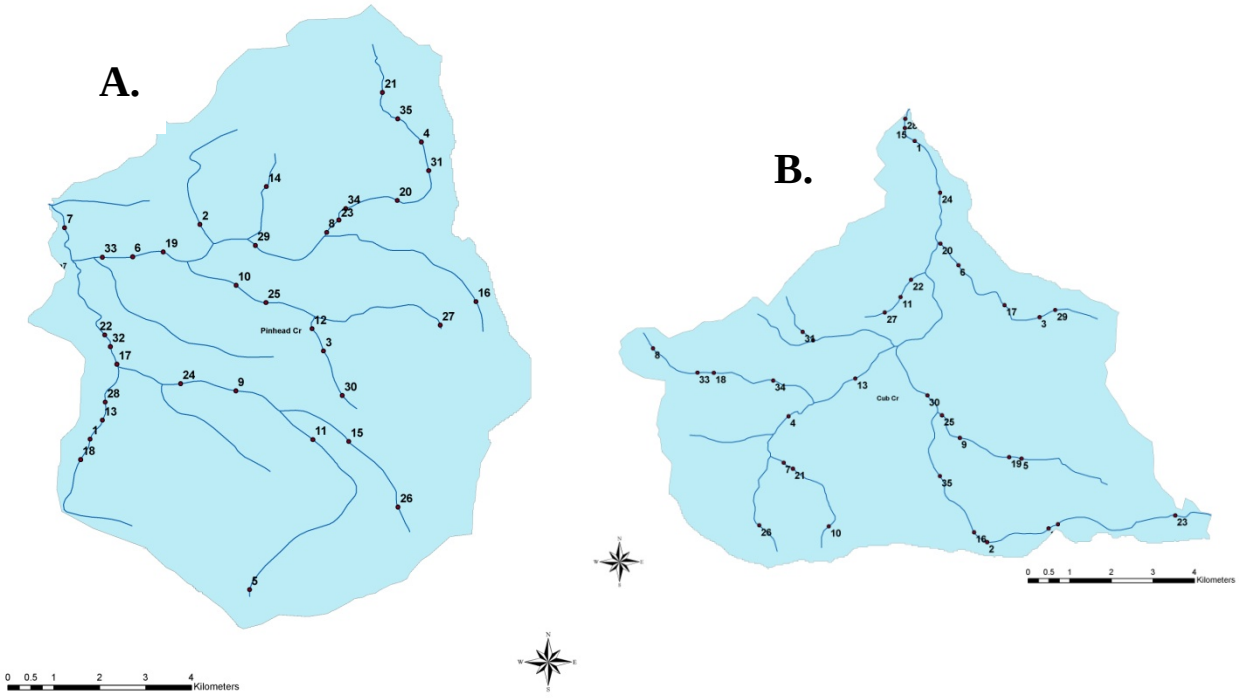

Figure 9. The top 35 GRTS sampling points in A) Patch 2 (Pinhead/Last) and B) Patch 4 (Cub/Berry)

While sampling for presence/absence surveys may detect juvenile bull trout and/or young-of-year progeny in habitat patches, we will also use these surveys to determine where in patch tributaries fish are distributed. Standard habitat characteristics (e.g., water temperature, substrate type, stream width, flow velocity, etc.) at each sampling location will be recorded in order to make inferences about which habitats are preferred for spawning, rearing, and/or migration by fish that remain in the system.

Presence/absence surveys will occur throughout the summers every year in Phase 1. It is likely that presence/absence surveys will occur primarily in the patches to which juveniles are initially translocated. However, if PIT tag data indicates that fish are moving into other patches, additional sampling may be performed in patches that fish are moving to. PIT tag data may also indicate that juvenile bull trout are leaving the upper Clackamas basin habitat batches and moving downstream. In 2011, PIT tag detectors will be installed by PGE at the North Fork Reservoir surface collector, in several locations in the juvenile migrant pipeline, and at the Downstream Migrant Sampling Facility (Figure 10). If juvenile bull trout continue downstream, it is likely that they will be detected at one of these locations; if they are not detected, we will continue to collect PIT tag data to determine if they rear at a location upstream from the PGE hydroproject area then return to the upper basin during seasonal migrations.

3.3-c Bull trout reproduction (B3)

Documenting successful reproduction is a major benchmark in the overall goal of establishing a self-sustaining population of bull trout in the Clackamas River. To inform this and other reintroduction programs, we wish to determine which translocated life stages successfully contribute naturally produced progeny to a re-established bull trout population in the Clackamas River. Documenting potential indicators of reproduction of translocated subadults (when mature) and adults will occur initially (in years 1-4 of Phase 1) by monitoring PIT and radio-tagged individuals to assess upstream movement in the late summer and fall, starting in 2011. Detections of bull trout moving into tributaries would trigger a subsequent effort to document: 1) the existence of redds, and 2) the production of progeny the following spring. Radio telemetry (utilizing both fixed stations and mobile tracking, if appropriate) will be used to track movements of older reintroduced fish into spawning tributaries. Additionally, as described in the previous section, ground crews performing presence/absence surveys in habitat patches will be looking for naturally produced progeny. In the latter half of Phase 1, juveniles that were initially translocated to the Clackamas, survived and matured may produce progeny. Any progeny resulting from translocated fish will not initially be physically marked or tagged, unless the decision is made to mark or tag them upon capture during surveys. Whether these fish remain resident in upper habitat patches, or exhibit fluvial or adfluvial life history strategies will be determined through surveys conducted as described above (i.e., through electrofishing, snorkel surveys or other methods that may be utilized in Phase 2).

Genetic samples (small fin clips 2 mm^2 – 1cm^2) will be collected from all bull trout transferred from the Metolius River. Tissue samples collected from any naturally produced juveniles subsequently collected could be used to conduct genetic parentage analysis. This information may be used to gather additional information on reproduction in the Clackamas River including: which individuals produced offspring, if fish transferred at different life history stages differed in spawning success, and if adults originating in specific Metolius tributaries had higher spawning success. Genetic parentage analysis is only successful when genetic samples from all of the potential parents have been collected. Failure to collect fin clips from all bull trout transferred to the Clackamas River (juveniles, sub-adults, adults) means that parentage analysis will only be possible for a small proportion of naturally produced juveniles and only limited information on which individuals successfully spawned will be available.

3.3-d Genetic diversity (B4)

In 2008, staff from the Service's Conservation Genetics Laboratory, Abernathy Fish Technology Center, conducted an assessment of genetic variation in bull trout in the Metolius River Subbasin (i.e., the donor population). Data from this study indicated that bull trout populations in the Metolius River system had relatively high levels of genetic variation compared with other lower Columbia River bull trout populations. The results also indicated there were three related but distinct population clusters of bull trout in the Metolius River; Whitewater River, Jefferson and Candle Creeks, and one made up of Spring, Canyon, and Jack Creeks as well as Heising Spring.

A long-term goal of the Clackamas reintroduction project is to establish a self-sustaining population of bull trout with levels of genetic variation comparable to the founding donor stock

from the Metolius River. In order to monitor our progress towards this goal, a small fin clip will be taken from all bull trout that are translocated to the Clackamas River by either ODFW, the USFS or USFWS (depending on who is responsible for capturing and translocating bull trout) and in the future, from naturally produced individuals collected during monitoring and evaluation efforts. Fin clips from all samples will be stored in 100% non-denatured ethanol at the Conservation Genetics Lab, Abernathy Fish Technology Center, for later analysis.

Individuals representing different life stages and origins (Metolius vs. Clackamas) will be available for genetic analysis. Naturally produced juvenile bull trout collected in spawning areas within the Clackamas River will provide the most effective means of evaluating the spawning population in the Clackamas River and determining if the level of variation observed in the Metolius is represented in naturally produced Clackamas River fish. Genetic variation may fluctuate from year to year due to changes in population size, habitat availability, the number of spawning adults, and other factors. In order to account for year to year fluctuations in genetic variation, initial genetic sampling should be conducted on a yearly basis. After a successful spawning population has been established and baseline genetic information exists, genetic sampling once every bull trout generation should be sufficient. Typically, sample sizes of 50 individuals per local spawning population provide an accurate assessment of genetic variation. While it is undetermined when the 2008 genetics study will be repeated in the Metolius basin, we anticipate that genetic samples will be collected (by either ODFW, USFS, or USFWS) from bull trout that are captured in the Clackamas basin, whether they are translocated individuals or naturally produced progeny. Genetic samples may be obtained during juvenile surveys (described above) or collected from subadults/adults that are captured in the PGE project area or other locations (see SIRP, addendum to the Biological Assessment, Appendix III).

Estimates of genetic variation including allelic richness, observed and expected heterozygosity, and effective population size will be compared to those observed in the Metolius River following the methods outlined in Schwartz et al. (2006) to determine if levels of variation in the Clackamas population are equivalent to those in the donor population and to document changes in the introduced population over time. Estimates of genetic variation in the Clackamas River may also be helpful for determining how long to continue transferring adults from the Metolius River and for monitoring a self-sustaining population(s) in the future for evidence of genetic bottlenecks, inbreeding, estimating effective population size, etc. For fisheries management purposes it will also be important to determine if multiple genetically distinct local spawning populations evolve within the reintroduction area or if a single panmictic spawning population exists. The methods outlined in Waples and Gaggiotti (2006) will be used to determine if multiple spawning populations exist once a self-sustaining population has been established.

3.4 Impacts to Listed Salmon and Steelhead

The Upper Clackamas Subbasin is currently inhabited by listed salmonids including Coho, Chinook, and steelhead. Thus, we are incorporating aspects in this Plan to specifically assess the interactions between bull trout and listed salmonids. In Phase 1, the main questions that will drive our assessment of potential impacts to salmon and steelhead are:

S1. Do adult and subadult bull trout occupy areas in High Vulnerability Zones (HVZs) during smolt migration periods in which they could consume particularly high numbers of juvenile salmon and steelhead?

a. If yes, does listed salmonid production during the freshwater phase decrease relative to historic estimates of freshwater productivity?
b. If the freshwater productivity of listed salmonids decline, could bull trout be responsible for the magnitude of decline observed (i.e., bioenergetics analysis and life cycle modeling)?

We intend to employ the following strategy of sequential questions to determine what, if any, impacts bull trout may be having on listed salmon and steelhead (see also the Stepwise Impact Reduction Plan, SIRP, amended to the BA on May 13, 2011):

1) To address S1, we will **monitor the distribution and movement of subadult and adult bull trout** using PIT and radio-tag technology as described in Section 3.3-a and Appendix II. We will specifically target the movement of adults and subadults to determine whether they are entering HVZs (specifically, North Fork Reservoir or other areas within PGE's hydro project facilities), and if so, assess the timing into and out of these locations. Data from fixed telemetry stations will be uploaded twice per week (and not less than once per week) during peak juvenile anadromous salmonid migration periods (April 15 – June 15 and October 15 – December 15). We will also evaluate if bull trout are staging and foraging in the vicinity of fish bypass facilities, likely using mobile radio tracking and/or visual observations if possible.

2) If we find that bull trout are regularly entering and residing in (i.e., not just passing through) North Fork Reservoir and the PGE hydroproject area (see trigger details in the SIRP), we will work with PGE to address S1.a; i.e., monitor the survival rates of listed salmon and steelhead after the reintroduction of bull trout. PGE is planning to utilize **PIT and radio tags to conduct juvenile survival studies** of salmon and steelhead in reservoirs (see below). PGE's PIT and radio tag studies will examine survival rates of smolts released at the head of North Fork reservoir to the downstream migrant bypass system to Faraday dam, and then to Rivermill dam. Methods to assess changes in survival rate may include modeling, utilization of previous survival estimates for the hydroproject system, and other approaches. In addition PGE will PIT tag some pre-smolts to evaluate reservoir rearing, emigration behavior and over winter survival.

While the above-mentioned studies will help identify survival rates of salmon and steelhead moving through HVZs (specifically North Fork Reservoir and the rest of the PGE hydroproject area), most of these studies will not be initiated until at least 2016. Additionally, there is moderate uncertainty around existing reservoir survival estimates, which will make detecting mortality due to bull trout difficult. In light of these circumstances, we will work with PGE to analyze outmigrant smolt estimates and returning adult counts in an effort to detect changes in freshwater productivity (i.e., the number of smolts produced per adult) that may be due to increased mortality in the freshwater environment. PGE has a dataset that includes outmigrant smolt estimates and

adult returns for approximately the past 30 years, which we will assess and to which we will compare future counts. We will also compare adult returns to those of any appropriate neighboring populations of salmon and steelhead, so that we can determine whether population trends may be occurring over a broader range, possibly as a result of ocean conditions or other factors, instead of conditions solely in the Clackamas.

3) If it is determined that bull trout are present in HPZs (e.g., North Fork Reservoir or other areas of the hydroproject area) and there is an unexplained decrease in freshwater productivity of juvenile salmon and steelhead compared to the historic record, then we will use **modeling approaches** (bioenergetics and/or population matrices) to determine if bull trout could be the cause for changes in survival (addressing S1.b; see trigger details in the SIRP). Some basic bioenergetics modeling has already been performed for the Biological Opinion using Fish Bioenergetics 3.0 (Hanson et al. 1997) to estimate hypothetical scenarios of bull trout consuming maximum numbers of listed salmonids. We will expand upon our initial bioenergetics modeling by estimating how bull trout predation may or may not be linked to the observed change in survival rate by estimating the maximum amount of fish the estimated number of bull trout in North Fork Reservoir must consume to achieve the observed decreases in survival, and then using life cycle models to determine whether the loss of that number of fish could affect populations to the degree observed.

4) If it appears that bull trout survive and reproduce in the Upper Clackamas River, we may replicate the baseline **food web study** that was conducted in 2009 in Phases 2 or 3. The USGS and University of Washington conducted baseline foodweb investigations in the Clackamas River Subbasin to provide a baseline for future foodweb response monitoring once bull trout have been reintroduced and established in the watershed; however, no studies were conducted in Patch 1 (Big Bottom), where adult bull trout may potentially forage on juvenile listed salmon and steelhead. Prior to repeating the food web study, we will want to demonstrate that bull trout have become established in the upper Clackamas Basin (i.e., they are surviving to maturity and reproducing) and have reached some sort of equilibrium within the local food web. While we are unsure of when this may happen, conducting a food web study prematurely may yield misleading results (e.g., either overestimating or underestimating the role of bull trout in the food web).

As mentioned above in item 2, PGE intends to monitor survival of listed salmonids in their hydro facility project area by collecting data at several locations (Figure 10). We anticipate being able to use these PIT tag and radio telemetry fixed stations to track bull trout and assess their potential effects to listed salmonids within the hydro facility project area when they are installed:

<u>Projects Utilizing PIT Tag Antennae</u>

1. **Juvenile Migrant Pipeline:** Starting in 2011, PIT tag antennas will be included at several locations within the migrant pipe, including at the North Fork surface collector and on the pipeline just upstream of the Downstream Migrant Sampling Facility (at the downstream end of the pipeline). In 2012, a study will be initiated to evaluate the timing, injury and survival of migrants passing downstream through the pipeline.

2. **River Mill Dam and Estacada Lake:** A PIT tag detector will be included in the juvenile sampling facility associated with the River Mill surface collector. A study to evaluate timing, injury, and survival of smolts will be initiated in 2013 at this location.
3. **North Fork Ladder:** A PIT tag detector may also be placed in the ladder; whether this will occur is uncertain as is its exact location and whether it would be half- or full-duplex. This is not likely to occur prior to 2015.
4. **Spillway Net Effectiveness Monitoring:** In 2016, a two-year study will be initiated to verify spillway net effectiveness at preventing spillway passage by spring Chinook, coho, and steelhead smolts during spills of up to 4000 cfs at North Fork Dam (may also use radio-tag technology).
5. **Project Smolt Passage Evaluation:** In 2019, PGE will conduct a comprehensive hydroproject-wide study to evaluate smolt passage from North Fork Reservoir to downstream of River Mill Dam (may also use radio-tag technology).

<u>Projects Utilizing Radio Telemetry and Fixed Stations</u>

A. **North Fork Dam & Reservoir:** Fixed radio telemetry receivers will be monitoring the North Fork Reservoir forebay and tailrace for much of the period of 2013-2020. Fixed monitoring stations may also be present at the head of North Fork Reservoir and/or at Promontory Park (mid-reservoir) during the same time period. Additionally, fixed hydroacoustic monitoring of the forebay is likely to occur at some point in the period of 2016-2020. This study will be designed to observe position and trajectories of fish in relation to the surface collectors and turbine intakes.
B. **Juvenile Migrant Pipeline:** Fixed radio telemetry receivers will also be monitoring the River Mill tailrace (at the downstream end of the 7 mile juvenile migrant pipeline) for much of the period of 2013-2020.
C. **North Fork Ladder:** Dropper-style radio telemetry antennas will be placed at the entrance and exit of the North Fork fish ladder (which extends from the Faraday Diversion Dam up to North Fork Dam over 1.7 miles) to monitor passage of tagged adult salmon, steelhead and lamprey through the ladder between 2013-2019.
D. **Upper Faraday Lake and Faraday Lake:** Intermittent radio telemetry monitoring may occur in the North Fork Dam tailrace, at the Faraday Diversion Dam, and at the Faraday Powerhouse during juvenile migrant studies at North Fork Dam. Monitoring at these stations will be limited and likely to occur between 2016-2021.
E. **River Mill Dam and Estacada Lake:** Fixed radio telemetry receivers will be monitoring the River Mill forebay for much of 2013-2020. A fixed monitoring station may also be present at the head of Estacada Lake or at the Faraday Powerhouse tailrace.
F. **Oak Grove Powerhouse:** Fixed radio telemetry receivers will be monitoring the Oak Grove Powerhouse tailrace for much 2013-2020. Since this site lies between the proposed reintroduction areas and North Fork Reservoir, detection of fish here could provide an early alert for radio-tagged fish migrating towards the hydro project.

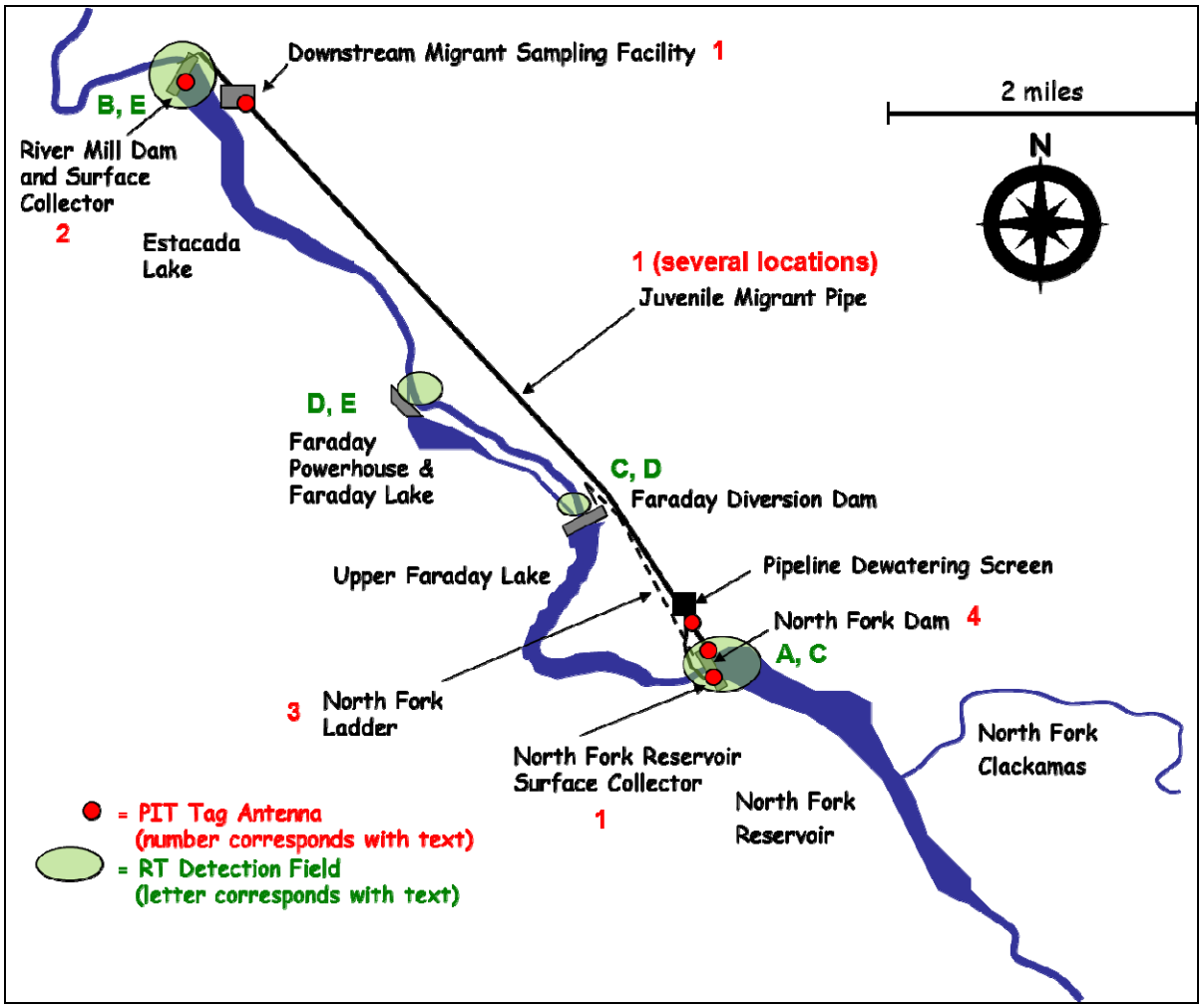

Figure 10. Proposed locations of PGE PIT tag antenna and radio telemetry receivers throughout the PGE Hydroproject area. Red numbers and green letters correspond to the projects listed above.

4. Evaluation Strategy

Evaluation of data gathered through monitoring activities will occur both throughout the year as data is collected and on an annual basis, depending on the type of information gathered (see below). We expect that some very basin questions will be answered during the first two years of the project (e.g., where do bull trout, of each life stage, go after translocation?) that will help inform following years' translocation strategy. Defining measures of success will likely be informed by the first two years of monitoring and related observations, and will require further discussions by the two technical committees (Implementation and Monitoring/Evaluation) and others involved with the monitoring and evaluation component of this project.

Generally, the evaluation of monitoring activities will follow the below steps, but may be revised based on need:

1. Information is gathered from monitoring activities. This can be from focused surveys (e.g., seasonal surveys for juvenile bull trout), or from year-round monitoring (e.g., data uploaded from PIT antennas and telemetry fixed stations).

2. Time sensitive data (i.e., telemetry data collected twice per week during juvenile salmonid migration periods) will be examined immediately to determine if any management action is necessary (see trigger details in the SIRP). If management actions need to occur, they will be executed per the details outlined in the SIRP.

3. After data is gathered, it is entered in a central database. The CRFPO has committed to housing data collection for the project; data will be organized and maintained in a database utilizing GIS technologies so that it can be analyzed as appropriate. Genetic samples will be stored at the Abernathy Fish Technology Center until they are ready to be processed.

4. The agencies collecting the data (i.e., ODFW, USFWS, and USFS) will determine who will analyze the data, depending upon the project component (e.g., distribution of juvenile bull trout, movements of adult bull trout, or measures of freshwater productivity for listed salmonids). Assistance with data analysis may be provided by the USGS, University of Washington, PGE, and others depending on available resources. We anticipate that, outside of time sensitive data, data analysis will occur on a yearly basis.

5. Data analysis for all monitoring components (donor stock, bull trout reintroduction effectiveness, and effects to listed salmonids) will be summarized in a detailed annual report written collaboratively by the lead agencies.

6. The annual report will be submitted to the technical committees for review, and recommendations for the next years' reintroduction strategy will be shaped based on the observations of the current and previous years. A brief schedule and justification for the next years' recommendations will be drafted.

7. The recommendation schedule and justification document for the next years' reintroduction strategy will be provided to the Clackamas Bull Trout Managers Committee for review. If

there is a conflict regarding the direction of the next years' reintroduction strategy, the Managers Committee will review all available information and determine the appropriate course of action.

There are a multitude of questions that could be addressed during the course of the proposed project, but we have chosen to focus on a limited number of questions during the first phase of this project (Appendices 1 and II). Our focus will correspond to the questions outlined in the Monitoring Strategy section above; these high priority questions are consistent with our objectives to learn and share information from this project. The following aspects of the reintroduction will be evaluated on a regular basis to determine if modifications to the implementation strategy are warranted:

1. Donor Population

- Is the donor stock population above the minimum threshold number of spawning adults required to continue donor stock removal? The Implementation subcommittee will ensure that redd counts are being tracked and that estimates of the adult population are above the minimum threshold. The Implementation subcommittee, in addition to providing annual Clackamas project updates to the Deschutes Bull Trout Working Group, will determine if the Donor Stock Advisory Committee needs to review Metolius population data to ensure that the project does not harm the donor population.
- Is the donor population pathogen-free? This question will be answered based on pathogen screening of fry in the spring, and reproductive fluids from mature adults in autumn.
- Do levels of genetic variation in the Metolius spawning tributaries remain relatively unchanged following implementation of the reintroduction program? This analysis will be conducted on a generational basis, likely towards the end of Phase 1 and every 5-7 years after using genetic materials collected and stored at Abernathy.

2. Reintroduced Clackamas Bull Trout Population

- Are adult and subadult bull trout suitable for translocation and reintroduction efforts? This question will be answered by examining distribution of these individuals using radio telemetry and PIT antennas. In determining whether this life stage is appropriate for reintroduction, we will address the following:
  - Do translocated adult and subadult bull trout stay within the Clackamas or leave altogether?
  - What is the seasonal distribution of these life stages? Where is their foraging and overwintering habitat?
  - Based on seasonal distribution, is there evidence of spawning activities?
- Are juvenile bull trout suitable for translocation and reintroduction efforts? This question will be determined by performing ground-based presence/absence surveys and by examining PIT tag data collected at the mouths of tributary streams in the upper Clackamas basin. In determining whether this life stage is appropriate for reintroduction, we will address the following:

  - Do translocated juvenile bull trout stay within the habitat patches they are released in? If not, do they go elsewhere in the upper Clackamas basin or leave the system altogether?
- Beyond survival, which life stages of translocated bull trout successfully contribute naturally produced progeny in the Clackamas? This question will likely be determined by the presence of untagged young bull trout detected during ground-based presence/absence juvenile surveys in upper habitat patches during summer months.
  - Do adults and subadults produce progeny in years 1-3 (and beyond)?
  - Do juveniles mature to produce progeny in years 4-7?
- Can the re-established bull trout population in the Clackamas be self-sustaining given the level of genetic variability in translocated fish? This question will be answered pending analysis of genetic samples taken from translocated individuals; analysis will not occur on a yearly basis, but will likely occur on a generational schedule (every 5-7 years).

3. Impacts to listed salmonids:

- Do older bull trout occur with listed anadromous salmonids in the Clackamas spatially and/or temporally? We will answer this question using radio-telemetry (both fixed stations and mobile tracking), with particular emphasis in tracking bull trout distribution during juvenile salmonid migration periods in the spring and fall.
- If there is overlap in bull trout and listed salmonid distribution in the basin (and in North Fork Reservoir in particular), is there evidence that bull trout decrease the freshwater productivity of listed stocks? While this is a difficult trend to detect, we will examine historic and current migrant and returning adult data to help answer this question. Additionally, we may employ gastric lavage on bull trout collected as a result of actions outlined in the SIRP to gain a better understanding of seasonal diet.
- Given the distribution, overlap with other species, and trends in freshwater productivity, what is the potential contribution of bull trout predation to the mortality of listed anadromous salmonids? We intend to use a combination of bioenergetics modeling and life cycle modeling to answer questions about the level of impact bull trout may have, at the population level, on listed stocks in the Clackamas.

As mentioned above, there are a multitude of questions that could be asked regarding the effectiveness of the Clackamas bull trout reintroduction project. As this project continues and moves into Phases 2 and 3, we may have information sufficient to begin answering questions related to assessing abundance, population trend, and connectivity between habitat patches. Much of the monitoring and evaluation program, including the relevant questions that should be addressed, however, depends upon whether or not bull trout will “stick” in the system and re-establish a population within the ecosystem. Further, it may be years before the re-established population reaches some sort of equilibrium within the food web, so care must be taken when interpreting data for the purpose of implementing management actions.

5. Timeline, Budget, and Responsible Parties

The ODFW and Service will co-lead project implementation and monitoring with assistance from the USFS Mt. Hood National Forest (Figure 11). The Confederated Tribes of the Warm Springs Reservation (CTWSR), Portland General Electric (PGE), and U.S. Geological Survey (USGS) may provide assistance to the project by contributions of equipment and personnel.

A general timeline of events is as follows:

December 2009: Proposed 10(j) Rule and Draft EA submitted for public comment

February 2010: Public comment period closed

September 2010: ODFW Fish and Wildlife Commission Review and modification of Clackamas Subbasin Plan to include bull trout reintroduction
Receive approval from Warm Springs Tribal Council to utilize Metolius fish

Spring 2011: NMFS Section 7 consultation to be concluded
10(j) Final Rule and Final EA/ROD to be published

June 2011: First transfers of juvenile and older life stages of bull trout to the Clackamas will occur

A general timeline for annual monitoring events is as follows:

Early Spring: 150 fry are captured from the Metolius basin for disease testing

Late May/June: Juvenile, subadult, and adult fish are captured from the Metolius River basin, marked and tagged, and transferred to the appropriate habitat patches within the Upper Clackamas Subbasin

July/August: Ground-based surveys (i.e., snorkel surveys and mobile PIT tag tracking; see Section 3.3) to detect juveniles and progeny

Sept./October: Ground-based surveys based on telemetry and PIT detections to assess spawning activities
Annual disease sampling of 60 adults from the Metolius River

Year-round: Mobile radio-tracking and download data from radio receivers and PIT tag antenna arrays 1-2 times per week, depending on season and the level of fish movement

The bulk of project funding will occur through the USFWS, ODFW, and USFS. Sources include both grants and funding programs (e.g., Section 6, Recovery, ServiceFirst, EWEB/PIP, etc.) along with cost sharing for borrowed equipment and staff time (cost sharing is noted in the third category below, where non-cash contributions have been estimated). A general budget for the first two years of Project implementation, monitoring, and evaluation is as follows:

Table 1. General budget for the first two years of the Project.

Personnel	**2011**	**2012**
ODFW Coordinator and seasonals	$113,000	$130,000
Staff Biologist (USFS - 0.5 FTE)	$60,000	
Sub-total	*$173,000*	*$130,000*
Materials/Supplies/Services		
Radio tags, receivers, fixed stations	$60,000	$30,000
PIT tags, readers, antennas	(all equipment)	(radio tags, etc.)
Surgical kit		
Waders/boots		
Vehicle (miles)		
Disease screening	$30,000	
Additional M&E tasks for effectiveness and salmonid monitoring		$50 - $100,000
Sub-total	*$90,000*	*$80 - $130,000*
Cost Share		
Equipment Donation and Personnel (ODFW)	$75,000	
Personnel (USFWS/CRFPO – 0.3 FTE)	$40,500	$40,500
Personnel (USFWS/OFWO – 0.9 FTE)	109,500	$109,500
Sub-total	*$225,000*	*$150,000*
Total	**$488,000**	**$360 - $410,000**

Additionally, genetic samples will be analyzed every 5-7 years. For 250 fish, it currently costs about $18,000 to run all the fish, analyze the data, and write a report. For 500 fish the cost would go up to about $28,000 and for 750 fish the cost goes up to about $36,000 (P. DeHaan, USFWS, pers. comm. 2011).

The Oregon Department of Fish and Wildlife Clackamas Project Coordinator will facilitate much of the field work, beginning in the spring and early summer of 2011 (Figure 11). The USFS has agreed to support ODFW field activities when possible, and the USFWS will also participate in field and analytical activities (Figure 11). We anticipate that the field schedule for 2012 will be similar to 2011, pending information gathered from the first year's monitoring and evaluation activities.

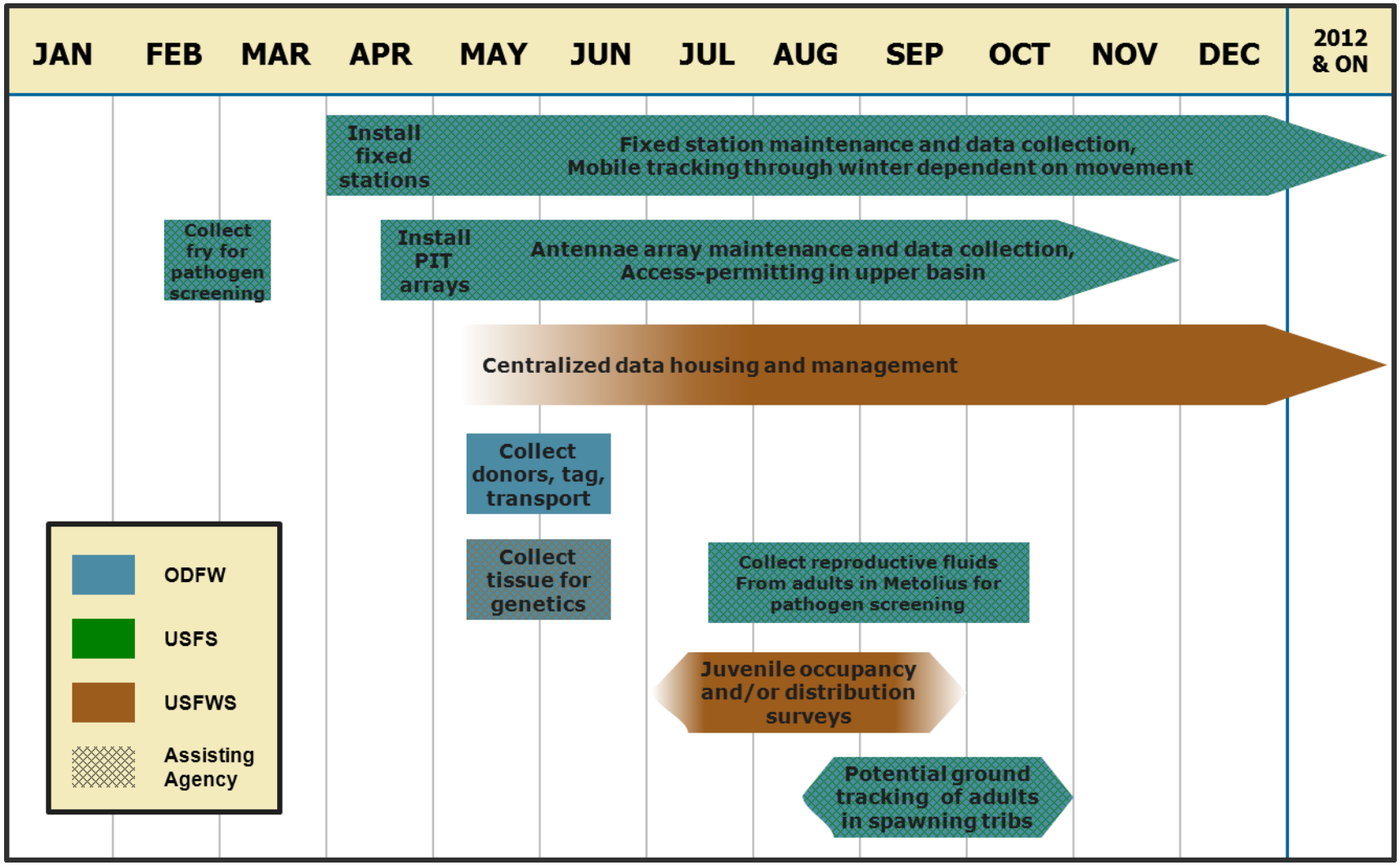

Figure 11. Roles of agencies in collecting fish and performing monitoring activities in 2011.

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7. Appendices

I. Clackamas Bull Trout Reintroduction IM&E Prioritized Questions

II. Summary of Design and Implementation Needs for FY 2011

III. Stepwise Impact Reduction Plan (SIRP), amendment to the Biological Assessment, May 13, 2011

Appendix I. Clackamas Bull Trout Reintroduction IM&E Prioritized Questions

There are three main questions that we will try to assess during the three phases of the reintroduction project:

1) Can the Metolius basin bull trout population continually be an appropriate donor stock for the Clackamas reintroduction;
2) Can a self-sustaining population of Clackamas bull trout be re-established by translocating fish from the Metolius basin; and
3) Does the reintroduction of bull trout have a significant negative impact on the recovery of listed salmonids also in the basin?

	Donor Stock Status (Implementation)	Clackamas Bull Trout Reintroduction Effectiveness (M&E)	Impacts to Listed Salmonids (M&E)
Phase 1: Years 1-7	D1. Does the donor stock population have the minimum threshold number of spawning adults required to continue donor stock removal? D2. Is the donor population disease-free?	B1. Do translocated adult and subadult bull trout remain in the upper Clackamas Basin (above River Mill Dam)? a. If yes, what is their seasonal distribution? b. If yes, is there evidence of spawning activity? If no, does changing the release timing/location provide a different result? B2. Do juveniles remain in the habitat patches they are outplanted to in the short-term or do they move relatively quickly out or into other habitat patches? a. If they stay, how are juveniles distributed within habitat patches? B3. Which translocated life stages are successful in contributing naturally produced progeny in the Clackamas River? a. Do adults and subadults produce progeny in years 1-3 (and beyond)? b. Do translocated juveniles mature to produce progeny in years 4-7? B4. Is the level of genetic variation in the donor population adequately represented by translocated fish (years 4-7)?	S1. Do adult and subadult bull trout occupy High Vulnerability Zones (HVZs) during smolt migration periods in which they could consume particularly high numbers of juvenile salmon and steelhead? a. If yes, does listed salmonid production during the freshwater phase decrease relative to historic estimates of freshwater productivity? b. If the freshwater productivity of listed salmonids decline, could bull trout be responsible for the magnitude of decline observed (i.e., bioenergetics analysis and life cycle modeling)?

	Donor Stock Status (Implementation)	Clackamas Bull Trout Reintroduction Effectiveness (M&E)	Impacts to Listed Salmonids (M&E)
Phase 2: Years 8-15	D3. Does the donor stock population have the minimum threshold number of spawning adults required to continue donor stock removal? D4. Is the donor population disease-free? D5. Are there any indications of deleterious impacts (genetic fitness or population abundance) to the donor population from removing individuals for translocation?	B5. What is the estimated population size of the reintroduced population? B6. Is the level of genetic variation in the donor population adequately represented by the Clackamas population? B7. What habitats do naturally produced and translocated bull trout utilize for spawning and rearing? B8. What life history strategies do naturally produced fish in the Clackamas exhibit? B9. How has the food web changed as a result of reintroducing bull trout into the Clackamas River basin?	S2. Do adult and subadult bull trout occupy areas in the PGE hydroproject during smolt migration periods in which they could consume particularly high numbers of juvenile salmon and steelhead? S3. What is the estimated level of bull trout predation on juvenile salmon and steelhead? S4. Are there potential indirect food-web effects of bull trout on salmon and steelhead?
Phase 3: Years 16 - 21	D6. Does the donor stock population have the minimum threshold number of spawning adults required to continue donor stock removal? D7. Is the donor population disease-free? D8. Were there long-term detrimental impacts (genetic fitness or population abundance) to the donor population from removing individuals for translocation?	B10. Is the level of genetic variation in the donor population adequately represented by the Clackamas population? B11. What is the effective population size and trend? B12. What is the structure of the Clackamas bull trout population?	S5. Do adult and subadult bull trout occupy areas in the PGE hydroproject during smolt migration periods in which they could consume particularly high numbers of juvenile salmon and steelhead? S6. What is the estimated level of bull trout predation on juvenile salmon and steelhead? S7. Are there potential indirect food-web effects of bull trout on salmon and steelhead?

Appendix II. Clackamas Bull Trout Reintroduction Summary of Design and Implementation Needs for FY 2011

PROJECT PHASE 1: Years 2011 – 2017

Project Component	Study Question Addressed	Time Frame
Operations and Logistics		
Monitoring of the donor population - Redd surveys throughout Metolius subbasin - Creel surveys in Lake Billy Chinook - Outmigrant screw-trap in Metolius River at Monty - Juvenile BT density monitoring at index reaches in spawning streams	D1	Ongoing annually, will continue throughout the life of the project
Disease screening for IHNV - Performed by the ODFW Fish Health Services labs in Madras or Corvallis - Will require 60 ripe bull trout adult (nonlethal) and 150 fry (lethal)	D2	Every year starting in 2009; adults – fall prior to translocation, fry – spring of translocation
Adult and subadult (>250 mm) collection from the Metolius basin (see also tagging, below) - Collected from Metolius arm of Lake Billy Chinook - Angling, collection at Round Butte Dam		May and June, starting 2011
Juvenile (<250 mm) collection from the Metolius basin (see also tagging, below) - Collected from the mainstem Metolius and tribs - Snorkel herding, seining, electrofishing		May and June, starting 2011
Hold fish prior to transport to the Clackamas basin - Adults and subadults: holding tanks at Round Butte Fish Isolation Facility - Juveniles: holding tanks at Round Butte Fish Isolation Facility		May and June, starting 2011
Transport fish to the Clackamas basin		May and June, starting 2011
Release fish in Clackamas basin - Adults and subadults: Big Bottom - Juveniles: Big Bottom and upper basin patches (1-6) rotationally, 500 in each of two patches per year		May and June, starting 2011 2011-2012: Pinhead and Cub/Berry 2013-2014: Rhodo and Upper Clack 2015-2016: Hunter and Big Bottom

Project Component	Study Question Addressed	Time Frame
Monitoring and Evaluation		
Half-duplex PIT tag all fish collected from the Metolius - Tag upon catch; use 23 mm tags for fish > 120 mm, use 12 mm tags for fish < 120 mm - Dorsal sinus for fish > 300 mm; body cavity for < 300 mm	B1.a-b, B2.a, S1	May and June, starting 2011 through all translocation years
Radio-tag all adults and subadults collected from the Metolius basin - Tag upon catch from Lake Billy Chinook - Maximize battery duration, using tag size dependent on fish size (2+ years battery life)	B1.a-b, S1	May and June, starting 2011 through 2012
Install fixed-station radio antennas in the Clackamas basin to track movements of adults and subadults (listed in order of priority): - Below River Mill Dam (1) - Head of North Fork Reservoir (2) - North Fork Reservoir collector (3) - Collawash confluence (4) - On Clack at Last Creek (5)	B1.a-b, S1	Install spring 2011, upload data every 7-10 days April – Dec. starting 2011 through life of batteries (may be less in winter depending on movement). During peak migration times (Apr. 15 – June 15 and Oct. 15 – Dec. 15) data will be uploaded 2 x/wk, with a minimum of 1 x/wk.
Install half-duplex PIT tag arrays in the Clackamas basin to track all translocated fish: - At mouths of patches 2-6 tributaries (Fork of Last/Pinhead, Fork at Upper Clack/Cub-Berry, Hunter, Rhodo) and in the downstream bypass of the hydrofacilities	B1.a-b, B2.a, S1	Install spring 2011, upload data every 7-10 days April – Dec. starting 2011 through life of batteries (may be less in winter depending on movement).
Look for evidence of spawning: - Assess radio and PIT tag data that may indicate fish moving to spawning habitat - Mobile tracking: ground and/or aerial tracking during spawning season (opportunistic observation of presence of redds or actively spawning fish)	B1.a-b	Mobile radio tracking: in conjunction with antennae maintenance, dependent on fish movement (aerial if necessary) Mid Aug – Oct, starting Fall 2011 – through end of Phase 1
Ground-based surveys to detect presence (survival) of juveniles and naturally produced progeny (electrofishing and/or night snorkeling and mobile PIT tag tracking) - GRTS (21 surveys of 50 m reaches per patch per RMEG guidelines) or census the two patches that juveniles were released in each year. - Based on locations of adults, may survey additional patches to survey for progeny	B2.a, B3.a-b	Summer of each year that juveniles are reintroduced, starting 2011 through end of Phase 1
Collect tissue samples for genetic analysis: - Fin clip all fish translocated from the Metolius - Collect fin clips from all unmarked BT found (during electrofishing or night snorkeling surveys) in the Clackamas to assess parentage (and determine which translocated life stage successfully reproduced depending on observed/assumed spawning behavior)	B3.a-b, B4	May – June, starting in 2011 with collection of fish to be translocated and during summer juvenile surveys in years 2 – 7 of Phase 1

Appendix III. Stepwise Impact Reduction Plan

May 13, 2011

The U.S. Fish and Wildlife Service (FWS) developed this Stepwise Impact Reduction Plan (SIRP) in collaboration with the National Marine Fisheries Service (NMFS), as part of our Section 7 consultation process on the reintroduction of bull trout (*Salvelinus confluentus*) to the Clackamas River. The SIRP was submitted to NMFS in May 2011 as an amendment to the FWS' December 10, 2010, biological assessment (BA), and thus as part of the Clackamas bull trout reintroduction project.

The purpose of the SIRP is to outline a sequence of management actions that, if necessary, will be taken to minimize impacts to federally listed salmon (*Oncorhynchus spp.*) and steelhead (*O. mykiss*) from the reintroduction of bull trout in the Clackamas River, and the thresholds that would trigger initiation of these actions. Management actions implemented under the SIRP, and the frequency of those actions, will be driven by the population status of the listed Clackamas anadromous salmonid populations and information gathered through the reintroduction project's monitoring and evaluation program, jointly implemented by the FWS, Oregon Department of Fish and Wildlife (ODFW), and the U.S. Forest Service, Mt. Hood National Forest (USFS).

The SIRP is consistent with the adaptive management approach for the project as described in our BA. For the purposes of the SIRP, impacts (whether they can be directly monitored or not) are generally defined as: 1) direct predation on eggs, fry and juveniles of listed anadromous salmonids by bull trout; 2) competition for food and/or shelter between listed anadromous salmonids and bull trout, which could reduce juvenile salmon and steelhead fitness; and 3) predator avoidance behaviors which could reduce passage efficiencies for juvenile salmon and steelhead migrating through Portland General Electric's (PGE) Clackamas River Hydroelectric Project.

While FWS and NMFS believe the SIRP will provide much of the guidance necessary to address potential impacts to listed salmon and steelhead from the reintroduction project, we acknowledge our inability to predict all likely impact scenarios and appropriate management responses. As a result, we anticipate the SIRP will be modified as necessary, consistent with the overall adaptive management strategy of the project, in consultation and coordination with NMFS and ODFW, and based on both the monitoring and evaluation program and the conservation status of threatened salmon and steelhead populations in the Clackamas River.

<u>Sequence of Management Actions:</u>

Actions one and two (Table 1 below) represent triggers and associated management actions for bull trout relocation or removal based on geographic locations of detections within defined areas of high vulnerability for juvenile anadromous salmonids due to bull trout predation or predator avoidance behavior. These areas of high vulnerability exist due to the presence of PGE's Clackamas River Hydroelectric Project, a system of dams, reservoirs, and fish bypass facilities which concentrate juvenile anadromous salmonids during certain times of the year. Actions one and two can be implemented at any time by ODFW, FWS, USFS or PGE personnel. Additional detail, such as guidance on agency coordination and notification prior to relocating or removing

bull trout, agency personnel authorized to carry out actions one and two, locations to release bull trout that are relocated, and a disposition plan for bull trout that are removed from the Clackamas River, will be developed prior to moving bull trout to the Clackamas River in 2011. This additional information will be added to the SIRP (which will also be appended to the Project's Implementation, Monitoring and Evaluation Plan) and shared with all agencies and partners involved in the implementation and monitoring of the reintroduction project.

In the description of actions three through six, NMFS has established specific critical thresholds relating to the population abundance and productivity of Clackamas populations of coho (*O. kisutch*), spring Chinook (*O. tshawytscha*) and steelhead. We acknowledge that the biological opinion (BO) from NMFS will assume that actions will be taken in accordance with this SIRP, including Table 1 below, if the thresholds (i.e., triggers) are reached. We also acknowledge the need for future coordination between the Service, NMFS, ODFW, and where applicable, other project partners, on implementation of the SIRP actions.

Table 1: Bull Trout and Anadromous Salmonid Thresholds Requiring Management Action

Action #	Bull Trout Threshold	Anadromous Salmonid Thresholds	Management Action
1	Subadult or adult bull trout (> 250mm or 10 inches) at any time are found staging (minimum 3 days) in a high vulnerability zone (HVZs) (as opposed to moving through the hydro project area). HVZs include any fish facility of the Clackamas Hydro Project (traps, pipeline, surface collector, dewatering facility, North Fork forebay from the face of the dam to the log-booms (approximately 1000 upstream of the dam), and the River Mill Dam forebay within 1,000 ft of River Mill Dam.	No anadromous salmonid threshold is involved with this action.	**Relocation:** Bull trout at any time may be captured and relocated from HVZs to approved locations (TBD) upstream of N. Fork Reservoir. Efforts to track the presence of bull trout in HVZs, and associated relocation efforts if thresholds are exceeded, will be concentrated during critical time periods for anadromous smolt migration (April 15 to June 15 and October 15 to December 15) and opportunistic outside of these timeframes.
2	Any tagged subadult or adult bull trout, as described above, that was previously relocated from a HVZ area during a peak juvenile anadromous salmonid migration time period (April 15 to June 15, and October 15 to December 15) reappears in an HVZ area within seven days or three times during a single peak migration period.	No anadromous salmonid threshold is involved with this action. However, if all three Clackamas populations (coho, spring Chinook and steelhead) exceed the recovery target for abundance threshold (VSP scenario) for 3 consecutive years (see Table 2) then removal of bull trout would not be warranted and would not occur under any scenario and from any location in the Clackamas River.	**Removal:** Individual bull trout will be removed from the population per the disposition plan (TBD).
3	15 or more subadult or adult bull trout are removed from the population as a result of management action number two above.	Adult returns for coho, spring Chinook or steelhead in the Clackamas River drop below the minimum abundance threshold (MAT) established by LCRTRT (see Table 2) (a single annual occurrence for any population).	**Additional Study:** If the bull trout threshold **and** the MAT are reached (for one or more populations annually), initiate a detailed bioenergetics and life cycle modeling analysis to evaluate the potential contribution of bull trout to the observed population trends of listed anadromous salmonids in the Clackamas. This exercise will include an evaluation of other lower Columbia River anadromous salmonid populations and associated hatchery programs to determine the degree to which ocean conditions and other factors may be responsible for current population trends in the Clackamas River.

4	Same as #3 above. And, bioenergetics analysis and life cycle modeling indicate that bull trout are likely contributing to the observed population-level trends for anadromous salmonids in the Clackamas River.	For one or more populations, the number of juveniles exiting past North Fork Dam drops below the anadromous salmonid critical threshold (see Table 2) and/or For one or more populations, the coho, Chinook or steelhead counts at North Fork Dam drop below the smolts per adult critical threshold (see Table 2).	**Suspension of Subadult and Adult Fish Transfers:** If the bull trout threshold **and** either the anadromous salmonid critical threshold or smolts per adult critical threshold are reached for one or more populations, the transfer of subadult and adult bull trout to the Clackamas will be suspended. Transfers of these life stages may resume in subsequent years if the above thresholds are not triggered for both bull trout and listed anadromous salmonids. If these thresholds are exceeded for two years in a row, a replication and possible expansion of the 2009-2010 baseline foodweb study (Lowery & Beauchamp 2010) may be implemented.
5	Same as #3 above. And, bioenergetics analysis, life cycle modeling, and possibly food web studies indicate that bull trout are likely contributing to the observed population-level trends for anadromous salmonids in the Clackamas River.	Same as #4 above, but either threshold is reached twice for a single population or three times for any combination of populations in four years. (see Table 2)	**Reduce Bull Trout Abundance & Suspend all Fish Transfers:** If the bull trout threshold **and** either the anadromous salmonid critical threshold or smolts per adult critical thresholds for this action level are reached: 1) suspend transfers of all bull trout to the Clackamas River; and, 2) consult and coordinate with ODFW to allow a limited harvest fishery on bull trout in the Clackamas River to reduce subadult and adult abundance. The number of bull trout targeted for harvest will be determined at a later date in coordination with ODFW and NMFS.
6	Bioenergetics analysis, life cycle modeling, food web studies and direct evidence link bull trout to population level impacts to anadromous salmonids in the Clackamas R. at a level that would prevent recovery of these populations.	Same as #4 and 5 above, but either threshold is reached three times for a single population or five times for any combination of populations in five years. (see Table 2)	**Removal of Bull Trout from the Clackamas:** Active pursuit and removal of all life stages (i.e. reversal of action). This action would require that NMFS, ODFW and FWS complete any required administrative process or rule-making necessary to make the change being proposed.

Rationale for Population Indicator Levels: The rationale and Table 2 below were developed by NMFS with data from ODFW, PGE, and the Lower Columbia River Conservation and Recovery Plan for Oregon. NMFS, FWS, and ODFW acknowledge that these numbers may be modified in the future as new data become available and recovery planning progresses. If and when these numbers change, the SIRP will be modified accordingly in coordination with NMFS and ODFW, with input from other project partners). The indicator levels given below in Table 2, focus on two primary concerns:

1. Freshwater survival of anadromous salmonids relative to pre-bull trout introduction: smolts per adult. This threshold, smolts produced per adult, is intended to detect any downturn in freshwater productivity, possibly related to bull trout introduction. We analyzed the smolts produced per adult for each species (coho, Chinook, steelhead) over the last 30 years and established the lower quintile (lowest 20%) of the distribution as a threshold of concern. For example, based on the record for coho salmon, this is reached when smolt outmigration falls below 38.1 smolts per adult. For purposes of this SIRP document, this is referred to as the **smolts per adult critical threshold.**

2. Minimum abundance levels for population persistence: number of smolts outmigrating.
We established 500 adults as an important inflection point in population demographics – it is well below the minimum abundance thresholds and far below the ESA recovery targets for the Clackamas populations of coho, Chinook and steelhead. We then estimated the number of smolts necessary to produce 500 adults given relatively poor conditions. Recognizing that the smolt-to-adult ratio (SAR) can vary considerably depending on the species and the year, we used the lower quintile (lowest 20%) of SARs to set the **anadromous salmonid critical threshold** in order to ensure that if the numbers fall to this crisis level, the necessary actions can be initiated to protect the anadromous population regardless of the cause.

Table 2: Threshold Levels Referred to in Table 1

Adult counts	Coho	Spring Chinook	Steelhead
Minimum Abundance Threshold[1]: **Anadromous salmonid warning indicator**: adults counted at North Fork Dam, three year average for coho, four year average for steelhead and Chinook:	2160	780	600
Recovery Target for adult abundance (VSP Scenario)	Very Low Risk[2] 11,232[2]	Very Low Risk [6] 2314[3]	Low Risk[6] 10,671[4]
Juvenile Counts			
A. **Anadromous salmonid critical threshold:** # of coho, steelhead or spring Chinook juveniles leaving the North Fork Reservoir in any year is at or below the lowest quintile of smolts from the thirty year record.	54,431	6,237	20,374
Smolts per adult critical threshold (based on lowest quintile of smolt to adult survival from the thirty year record)	38.1	3.1 (does not account for smolts spilled)	10.2

[1] LCR Conservation and Recovery Plan for Oregon… August 6, 2010 Table 4-4
[2] LCR Conservation and Recovery Plan for Oregon… August 6, 2010 Figure 6-1
[3] UWR Conservation and Recovery Plan for Oregon… October 2010 Table 6-11

Table 3: Additional Data (as of May, 2010) For Reference on Clackamas Anadromous Populations.

Adult counts	Coho	Spring Chinook	Steelhead
Average of lowest 3 Adult Counts	140	853	420
Minimum Abundance Threshold[4]: Anadromous salmonid warning indicator (adults counted at North Fork Dam: three year average for coho, four year average for steelhead and spring Chinook)):	2160	780	600
Recent Average Adult Count (Source: PGE 2010)	1935	2,381	2346
"Maintain into future" abundance[5]	8630[2]	1896[2]	4692[3]
Current Clackamas population status (risk of extinction)	Moderate	Moderate	Low to Moderate
Current species status (risk of extinction) [6]	Very High	Very High	High
Recovery Target for abundance: (VSP Scenario)	Very Low Risk[7] 11,232[2]	Very Low Risk [6] 2314[8]	Low Risk[6] 10,671[4]
Historic abundance	52,565[2]	27,000[3]	21000[4]
Smolts per Adult (Average)	72.10	8.33	18.39
Smolts per Adult (20%)	38.1	3.1	10.2
Smolts per Adult (Low 3)	26.61	1.00	8.51
Juvenile Counts (based on current methods used by PGE to adjust to account for spill, subject to revision by management committee as appropriate)			
Average Smolt Count	87,523	16,588	32,590
Average Smolt Count (20%)	54,431	6,237	20,374
Average Smolt Count (Low 3)	20,355	1995	8,271
Average Smolt to Adult Survival[9]	3.1%	27.1%	5.7%
SAR (20%)	0.91%	8.34%	2.79%
SAR (Low 3)	0.26%	5.6%	2.0%
Smolts to produce 500 Adults (based on lowest 3 SAR years)	194,611	8,929	25,176
Anadromous salmonid population critical threshold: # of coho, steelhead or spring Chinook juveniles leaving the North Fork Reservoir in any year is at or below the lowest quintile of smolts from the thirty year record,	54,431	6,237	20,374
Smolts per adult critical threshold (based on lowest quintile of smolt to adult survival from the thirty year record)	54,945	5,995	17,921

[4] LCR Conservation and Recovery Plan for Oregon… August 6, 2010 Table 4-4

[5] LCR Conservation and Recovery Plan for Oregon… August 6, 2010 (§ 6.2.2 Population-Specific Scenarios) defines "maintain into future" as doing the minimum amount necessary to achieve only the 20 percent increase in abundance to meet unknown future threats and maintain the current risk class

[6] Ford et al 2010

[7] LCR Conservation and Recovery Plan for Oregon… August 6, 2010 Figure 6-1

[8] UWR Conservation and Recovery Plan for Oregon… October 2010 Table 6-11

[9] SAR for Coho assumed 3 year life cycle, for Steelhead and Chinook salmon a 50:50 split for 4 and 5 year old returning adults.