FP-HCP & Biological Opinions
Abridged for TFW Policy Committee's Electrofishing Workshop

Prepared by Marty Acker, USFWS

January, 2015

Table of Contents

1. Introduction

The state of Washington has developed the Forest Practices Habitat Conservation Plan (FPHCP) in response to the federally threatened and endangered status of certain fish species. Developing the FPHCP is one of the implementation measures resulting from the 1999 Forests and Fish Report, the forestry module of a larger comprehensive statewide effort to protect aquatic species, their habitats and water quality.

The FPHCP is characterized as a "programmatic" habitat conservation plan. Unlike most habitat conservation plans, which cover a defined land base and ownership, the FPHCP is linked to Washington's Forest Practices program, which regulates forest practices activities on primarily non-Federal and non-tribal forestlands in the state. Forest practices activities on these lands must comply with the state's Forest Practices Act (chapter 76.09 RCW) and rules (title 222 WAC). The purpose of the FPHCP is to assure those conducting forest practice activities, covered by or subject to the Forest Practices program, that they will also be in compliance with the Endangered Species Act (ESA) for covered threatened and endangered species. Therefore the term "assurances" is used throughout this document.

The Forests and Fish Report (FFR) was a multi-stakeholder effort that utilized the best available science to guide the direction of aquatic species protection. Completion of the FFR includes obtaining an incidental take permit from each of the Federal agencies responsible for implementation of the ESA. The state is seeking these assurances through the development of the FPHCP as a major step towards achieving the goals of the FFR. The FFR has four goals:

1) To provide compliance with the Endangered Species Act for aquatic and riparian-dependent species on non-Federal forestlands;

2) To restore and maintain riparian habitat on non-Federal forestlands to support a harvestable supply of fish;

3) To meet the requirements of the Clean Water Act for water quality on non-Federal forestlands; and

4) To keep the timber industry economically viable in the state of Washington.

These goals remain the goals of the FPHCP as they relate to the regulation of forest practices on non-Federal and non-tribal forestlands.

The Federal Endangered Species Act (Section 10 (a)(1)(B)) allows applicants—in this case Washington State—to submit a habitat conservation plan to the Services detailing how species included in the plan will be protected. Once the habitat conservation plan is reviewed and approved, a permit may be issued that allows for the incidental take of a listed species while conducting otherwise lawful covered activities. In addition, unlisted

The National Research Council (1996) has provided some generalized observations of salmonid population status over broad areas within the Pacific Northwest, which can help us to better understand the logic behind the current status of species with different life cycle characteristics and different geographical distributions:

- Pacific salmon have disappeared from about 40 percent of their historical breeding ranges in Washington, Oregon, Idaho and California over the last century, and many remaining populations are severely depressed in areas where they were formerly abundant.
- Coastal populations tend to be somewhat better off than populations inhabiting interior drainages. Species such as spring/summer chinook, summer steelhead and sockeye are extinct over a greater percentage of their range than species limited primarily to coastal rivers. Anadromous salmonid species most stable over the greatest percentage of their range (fall chinook, chum, pink and winter steelhead) chiefly inhabit rivers and streams in coastal areas.
- Populations near the southern boundary of the species' ranges tend to be at greater risk than northern populations.
- Species with extended freshwater rearing (such as spring/summer chinook, coho, sockeye, sea-run cutthroat and steelhead) are generally extinct, endangered or threatened over a greater percentage of their ranges than species with abbreviated freshwater residence (such as fall chinook, chum and pink salmon).
- In many cases, populations that are not smaller than they used to be are now composed largely or entirely of fish that originated in a hatchery.

Washington were put into operation on March 1, 2005. DNR is in the process of developing new water type maps for eastern Washington, and plans to implement the new maps in March 2006. Until then, water type maps for eastern Washington continue to use the traditional water typing system (Type 1, Type 2, Type 3, Type 4 and Type 5 streams). Descriptions of both systems are included in this plan, but riparian protection measures are described in relation to the permanent water typing system.

The interim water typing system relies on a physical channel measurement commonly known as “bankfull width” to help define some water types. In addition, some protection measures use bankfull width to guide forest practices rule implementation.

Forest practices rules define “bankfull width” as the lateral extent of the water surface elevation perpendicular to the channel at bankfull depth. “Bankfull depth” is the average vertical distance between the channel bed and the water surface elevation required to completely fill the channel to a point where water would spill onto the floodplain or intersect a terrace or hillslope. When applied to lakes, ponds or impoundments, bankfull width is the line of mean high water. When applied to tidal waters, bankfull width is the line of mean high tide. More information on bankfull width and bankfull depth can be found in WAC 222-16-010.

4b-1.1 Interim Water Typing System

The interim water typing system is a numeric, five-class system. Surface waters are assigned a numeric “type” that gives an indication of the waters’ beneficial use and importance to fish, wildlife and humans (WAC 222-16-031). Waters are referred to as “Type 1,” “Type 2,” “Type 3,” “Type 4,” or “Type 5.” Generally, the lower the numeric value, the greater the beneficial use. Therefore, Type 1 and Type 2 waters have more fish, wildlife and human use than do Type 4 and Type 5 waters.

- **Type 1 waters** are all waters within their ordinary high water marks that have been inventoried as “shorelines of the state” under chapter 90.58 RCW (Shoreline Management Act) and the rules promulgated pursuant to that chapter. However, Type 1 waters do not include those waters’ associated wetlands as defined in chapter 90.58 RCW. Generally, “shorelines of the state” include larger lakes and rivers, as well as tidally influenced areas along Washington’s western coast and within the Strait of Juan de Fuca and Puget Sound. More detail on “shorelines of the state” and “shorelines of statewide significance” can be found in RCW 90.58.030(2).

- **Type 2 waters** are segments of natural waters and periodically inundated areas of their associated wetlands that are not classified as Type 1 waters and that have high fish, wildlife or human use. Under the interim water typing system, “natural waters” excludes water conveyance systems that are artificially constructed and actively maintained for irrigation. Type 2 waters include those diverted for substantial domestic use, used by fish hatcheries, located within campgrounds or used by fish for spawning, rearing, migration or as off-channel habitat. Off-channel habitat includes areas connected to a fish-bearing stream through a

- **Type F waters** are segments of natural waters other than Type S waters, within the bankfull widths of defined channels and periodically inundated areas of associated wetlands or within lakes, ponds or impoundments having a surface area of 0.5 acre or greater at seasonal low water and which in any case contain fish habitat or are diverted for domestic use, use by fish hatcheries, are located within campgrounds or serve as off-channel fish habitat. More detail on Type F waters can be found in WAC 222-16-030(2).

- **Type Np waters** are segments of natural waters within the bankfull width of defined channels that are not fish habitat, but are perennial. Perennial means waters that do not go dry at any time during a year of normal rainfall. However, Type Np waters include the intermittently dry portions of the channel below the uppermost point of perennial flow. In cases where the uppermost point of perennial flow cannot be reliably identified using simple, non-technical observations, Type Np designation begins at a point along the channel where the contributing basin size is:

  1. At least 13 acres in the western Washington coastal zone (i.e., the Sitka spruce zone as defined by Franklin and Dryness 1973)

  2. At least 52 acres in other locations in western Washington

  3. At least 300 acres in eastern Washington

- **Type Ns waters** are segments of natural waters within the bankfull width of defined channels that are not Type S, Type F or Type Np waters. These are seasonal, non-fish habitat waters where surface flow is not present for at least some portion of a year of normal rainfall and are not located downstream from any stream reach that is classified as Type Np water. Type Ns waters must be physically connected to Type S, Type F or Type Np waters by an aboveground channel.

The forest practices rules direct DNR to prepare water type maps showing the location of Type S, Type F, Type Np and Type Ns waters within non-Federal and non-tribal forested areas of the state. The maps must be produced using a GIS-based, multi-parameter, field-verified logistic regression model. The model must be designed to distinguish waters that contain fish habitat (Type F) from those that do not (Type Np and Type Ns) using physical parameters such as basin size, gradient, elevation and other factors.

The original intent from FFR was that once produced, the water type maps would be updated every five years where necessary to better reflect observed field conditions or to further refine the accuracy and reliability of the model. Except for these periodic revisions, on-ground observations of fish or habitat characteristics will generally not be used to adjust mapped water types. However, if an on-site interdisciplinary team using non-lethal methods identifies fish, or finds that habitat is not accessible due to naturally occurring conditions and no fish reside above the blockage, the water type will be changed to reflect the findings of the interdisciplinary team. Field procedures that will be 1 used when investigating water types are currently under development and will be included in the Board Manual as Section 23. In cases where a dispute arises over a mapped water type, DNR is obligated to make informal conferences available to the WDFW and Ecology, affected tribes and those contesting the adopted water type.

Informal conference procedures are described in Section 4a-3.1.3 (Compliance and Enforcement). In light of some ongoing stakeholder concerns about the model produced maps meeting the desired resource protection objective, FF Policy will be considering available options to meet this objective with implementation of the permanent water typing system. 2

4b-2 Channel migration zones

Interactions between sediment, water and woody debris sometimes cause river or stream channels to move or migrate within their valleys. Such channel migration often leaves behind complex habitats that have high ecological value for fish and other aquatic and riparian species. The Riparian Strategy recognizes the importance of these habitats to the long-term conservation of species covered by the FPHCP, and it protects areas of likely channel movement through designated channel migration zones.

A channel migration zone is an area where the active channel of a stream or river is prone to move and the movement results in a potential near-term loss of riparian function and associated habitat adjacent to the stream (WAC 222-16-010). “Near-term” in this context means the time required to grow a mature forest. CMZs apply to all fish-bearing waters (including Type 1, Type 2, and Type 3 waters under the interim water typing system and Type S and Type F waters under the permanent water typing system) and most often are associated with low-gradient, unconfined channels that have well-developed floodplains. Section 2 of the Board Manual provides guidance for identifying and delineating CMZs.

No timber harvest, road construction or salvage is permitted within CMZs except for the construction and maintenance of road crossings and the creation and use of yarding corridors in accordance with applicable rules (WAC 222-30-020(12)).

4b-3 Riparian protection measures for typed waters

Riparian areas directly influence the quality and quantity of habitat available to aquatic and riparian-dependent species (Gregory et al. 1987). The physical and biological attributes of riparian landforms, soils and vegetation shape—and are shaped by—the geomorphic processes at work within a watershed (Sullivan et al. 1987; Featherston et al. 1995). Forest practices activities such as timber harvesting and road construction may alter these processes, potentially affecting the character of riparian and in-stream habitat (Gregory and Bisson 1997).

The Riparian Strategy recognizes that certain ecological functions, such as providing LWD and shade, are important for creating, restoring and maintaining aquatic and riparian habitats. The strategy protects these and other functions along typed waters by restricting forest practices activities from the most sensitive parts of riparian areas and by limiting activities in other areas.

4a-4 Forest Practices program refinement/adaptive management

The Services define adaptive management as a method for examining alternative strategies for meeting measurable biological goals and objectives and then, if necessary, adjusting future conservation management actions according to what is learned. The Services require an adaptive management strategy for habitat conservation plans that pose a significant risk to covered species at the time an Incidental Take Permit is issued due to significant data or information gaps. The adaptive management strategy should 1) identify the uncertainty and the questions that need to be addressed to resolve the uncertainty; 2) develop alternative strategies and determine which experimental strategies to implement; 3) integrate a monitoring program that is capable of detecting the necessary information for strategy evaluation; and 4) incorporate feedback loops that link implementation and monitoring to a decision-making process that results in appropriate changes in management. The FPHCP includes a formal, structured Adaptive Management program that includes each of these components. The framework of the AM program is described in the forest practices rules (WAC 222-12-045).

A series of key questions guides adaptive management research and monitoring priorities. These key questions represent the most significant scientific uncertainties facing developers of the Forests and Fish Report in 1999. Some FFR recommendations—later adopted as forest practices rules—were developed based on limited scientific data. Recognizing this, FFR authors recommended these areas be the focus of the AM program. Key questions were developed for environmental variables potentially affected by forest practices. Questions relate to sediment, large woody debris (LWD), stream temperature, hydrologic change, and forest chemicals; they can be found in Schedule L-1 (Appendix N). Schedule L-1, part of the FFR and later adopted by the Forest Practices Board in February 2001 with minor revisions, includes a description of the three overall performance goals, resource objectives as defined by the functional objectives and performance targets, and three key questions concerning compliance, effectiveness, and validation monitoring. Schedule L-1 serves as the foundation for the AM program, and more specifically guides the development of research and monitoring projects described in the CMER Workplan (Appendix H). Key questions—and therefore research and monitoring priorities—are likely to change over time as Adaptive Management proceeds and new information becomes available. Changes to resource objectives, performance targets and research and monitoring priorities, while at the discretion of the Forest Practices Board, would typically be reviewed and agreed to by the Forests and Fish Policy Committee. Upon approval of the FPHCP by the Services, any future substantive changes to these AM program elements would require concurrence by the Services.

The AM program was created for three reasons:

1) To ensure programmatic changes will occur as needed to protect covered resources

2) To ensure predictability and stability in the process of change so that forest landowners, regulators and interested members of the public can anticipate and prepare for change

Measures	Performance Targets	Time-Frame
Road run-off	Same targets as road-related sediment.	
Peak flows	West side: Do not cause a significant increase in peak flow recurrence intervals resulting in scour that disturbs stream channel substrates providing actual or potential habitat for salmonids, attributable to forest management activities.	
Wetlands	No net loss in the hydrologic functions of wetlands	

Chemical Inputs

Functional objective: Provide for clean water and native vegetation (in the core and inner zones) by using forest chemicals in a manner that meets or exceeds water quality standards and label requirements by buffering surface water and otherwise using best management practices.

Measures*	Performance targets	Time-Frame
Entry to water	No entry to water[7] for medium and large droplets; minimized for small droplets (drift).	
Entry in RMZs	Core and inner zone: levels cause no significant harm to native vegetation.	

Stream Typing and Fish Passage

Functional objective (stream typing): Type "fish habitat" streams to include habitat which is used by fish at any life stage at any time of the year, including potential habitat likely to be used by fish which could be recovered by restoration or management, and including off-channel habitat, by using a multi-parameter, field-verified, peer reviewed, GIS logistic regression model using geomorphic parameters such as basin size, gradient, elevation and other indicators.

Functional objective (fish passage): Maintain or restore passage for fish in all life stages and provide for the passage of some woody debris by building and maintaining roads with adequate stream crossings.

Measures	Performance targets	Time-Frame
Accuracy of predictive models	Fish habitat model: statistical accuracy of +/- 5%, with line between fish and non-fish habitat waters equally likely to be over and under inclusive.	
Access barriers	Eliminate road-related access barriers over the time-frame for road management plans.	

---

[7] Targets are for forest chemicals other than Bt and fertilizer. BMPs for both are not priorities for adaptive management.

* These measures and performance targets are not intended to override label requirements.

using a variety of methods. First, the work area is isolated by installing block nets at up and downstream locations to isolate the entire affected stream reach. This is done to prevent fish and other aquatic wildlife from moving into the work area. Block nets require leaf and debris removal to ensure proper function. Block nets are installed securely along both banks and in channel to prevent failure during unforeseen rain events or debris accumulation and are checked frequently to ensure they remain functional. Some locations may require additional block net support. Block nets are normally left in place throughout the fish removal activity and not removed until flow has been bypassed around the work area.

Drag netting or seining is a technique to remove fish from the isolated area with less potential for adverse effects to fish compared to electroshocking. Other possible techniques include collecting aquatic life by hand or with dip nets as the site is slowly de-watered, trapping using minnow traps, or by electrofishing. Electrofishing in stream channels is normally done only where other means of fish exclusion and removal are not feasible (s**ee Electrofishing**).

When removing fish out of the isolated stream reach, attempts would be made to remove fish from of the existing stream-crossing structure. Often, a connecting rod snake is inserted and wiggled through the pipe or other structure, creating noise and turbulence to get the fish to move out so they can be captured and removed out of the stream reach.

Pumps used to temporarily bypass water around work sites are normally fitted with mesh screens to prevent aquatic life from entering the pump hose. The mesh screens are installed as a precautionary measure to exclude any fish and other wildlife which may have been missed in the fish exclusion process, or may have entered the work area through a failed block net. Screens are generally located several feet from the inlet of the pump hose to avoid subjecting fish to the suction of the pump.

Captured fish are immediately either released or put in dark colored 5-gallon buckets or other suitable containers filled with clean stream water. Frequent monitoring of container temperature and well-being of the specimens ensures that specimens are released unharmed. Any injuries or mortalities to ESA-listed species usually require the event to be documented and reported to the one of the Federal Services (e.g., NMFS or USFWS); and, any listed fish that are inadvertently killed are provided to the appropriate Service. Captured fish would be released upstream of the isolated stream reach in a pool or area which provides some cover and flow refuge.

7.4.5.10 Electrofishing

Backpack electrofishing surveys are used to gather fish distribution and abundance data to inform operational decisions and for the aquatic monitoring and adaptive management commitments in the FPHCP. The surveys are used for three main purposes.

The first and most-widespread use is for verification of fish presence or absence in streams to test the water typing model. This use of electrofishing would be covered by the proposed Permit and typically involves electrofishing in smaller headwater streams, at or near the upstream limit of fish distribution. Standard methods would be used with any supplementary protocols described in the appropriate CMER Project Description and provided to the FWS for approval. When electrofishing is used for this purpose, it is applied in consideration of likely fish habitat and it ceases upon the first identified fish and as a result, only a small fraction of the stream is surveyed by electrofishing. Electrofishing is only used as needed and fish are not often encountered when it is used. The need for these surveys has diminished due to historical surveys. Use of electrofishing merely to determine fish presence on a given stream as an

elective activity by a landowner is not related to the proposed permit issuance and is not a covered activity.

The second purpose of electrofishing surveys covered by the Permit is to conduct monitoring and research. For instance, in conjunction with certain other investigations (e.g., fish-passage effectiveness), it may be necessary to collect information about covered species. Such work may be conducted annually during certain years or may be conducted only periodically (e.g., every 10 years). Surveys may be conducted using standard multiple-pass removal electrofishing techniques, with block nets, or using modified procedures provided by the Services. Habitat surveys generally would be conducted concurrently.

The third purpose for electrofishing is to move fish during stream-channel diversion projects. This use of eletrofishing would be addressed through section 10(a)(1)(A) of the ESA and may require individual permits when bull trout are present. These types of projects are not very frequent, but may occur during culvert replacements and in-channel work (**see Fish Salvage**).

7.5 EFFECTS OF THE ACTION

7.5.1 Introduction

The activities that are the effects of this Federal action have been discussed earlier in the section entitled **Description of Activities that are Effects of the Permit**. In this section of the Opinion, we assess those primary activities (as well as related, interrelated, and interdependent activities) and their effects on aquatic and riparian resources. These activities would affect aquatic and riparian resources directly and indirectly. Indirect effects "are caused by or result from the proposed action, are later in time, and are reasonably certain to occur". These activities could affect inputs to streams directly, or indirectly, through the effects to riparian conditions. Lisle (1999) identified five types of inputs to watersheds: wood, sediment, water, heat, and detritus. Activities could also affect how inputs are transported and the level of connectivity within the fluvial system. For each of the resource topics regarding aquatic inputs and transport, we discuss the sources of effects, and discuss the level of effects. Changes to inputs and transport processes would also manifest themselves as changes to instream habitat which is discussed. The conditions that are expected to occur from these potential changes in riparian conditions, aquatic inputs, transport factors, and instream responses are compared to the range of variability expected under natural-disturbance regimes. Finally, some activities would affect habitat or animals in ways that are not readily captured within the above framework. We discuss the effects to individuals (of the collective covered species) that would be expected from activities such as work-site-isolation techniques (fish salvage), related to road-stream crossings, designed to minimize effects on fish; handling associated with fish salvage, monitoring, or research; and other sources of potential injury not stemming from habitat alteration.

Fish habitat includes the physical, chemical, and biological components of riverine, lacustrine, and estuarine/near-shore environments. Spence et al. (1996) suggested four general principles for consideration when determining habitat requirements for salmonids, and presumably for other aquatic species as well: (1) watersheds and streams differ in their flow, temperature, sedimentation, nutrients, physical structure, and biological components; (2) fish populations adapt and have adapted – biochemically, physiologically, morphologically, and behaviorally – to the natural environmental fluctuations that they experience and to the biota with which they share the stream, lake, or estuary; (3)

upstream of the project area. The fish and water temperature should be monitored to ensure the health and condition of the fish until they are released. Given the low level of effect of these capture and relocation techniques, few fish are expected to be injured using these capture methods. Nonetheless, fish would be temporarily disrupted from their normal behavior during the capture and relocation activities.

Electrofishing for Fish Salvage

Where listed species are not likely to be affected, operators may decide to proceed without further authorization from Federal agencies. Methods used and requirements for operators are developed in discussions between WDFW and landowners. Where electrofishing is used during fish salvage, and listed species may be affected, operators may require authorization from FWS and/or NMFS.

Where listed species are present or likely to be affected, electrofishing has the potential to harm and kill fish even when used according to Agency-approved protocols. Regardless of whether a project may affect NMFS and/or FWS listed species, we currently anticipate similar requirements. Electrofishing for fish salvage (even when conducted under NMFS Limit #3 for fish salvage) must comply with the NMFS guidelines of June 2000, or as they may be revised from time-to-time. Protocols used, including requirements for pre-work notification, must also comply with any such direction from WDFW. Electrofishing shall be attempted only after less harmful methods of fish removal have been used. See the discussion on **Electrofishing Conservation Measures where Listed Species may be Affected** within this section (below).

Based on studies conducted by Nielson (1998), we estimate that up to 25 percent of the salmonids remaining in the stream following stream-reach isolation would not be collected by the use of seining, trapping, and/or dip-netting, and therefore could be exposed to effects from electrofishing. This estimate may be conservative, yet reasonable, for adult and juvenile salmonids and other large species given the wide range of water bodies and habitats where projects could occur. For other smaller species, fewer individuals may be captured using those methods and therefore proportionately larger number of individuals may be subjected to electrofishing. Fewer fish of all types would be captured by these methods in larger streams with deep pools and abundant complexity (e.g., large wood pieces and large substrates). Based on our experience, sculpins are often the most-numerous type of fish in forested streams, and capturing a large proportion of sculpins may be difficult.

Instream work at road crossings that require stream diversion would likely be conducted no more than once or twice during the life of the permit and would affect a short reach of stream for each crossing. Dewatering for instream work therefore would affect a very small portion of the total stream system. Some of the effects (stress, displacement, disruption of behaviors) of actual capture and handling of fish using electrofishing during culvert removal and/or replacement would be short term in nature, typically occurring intermittently over the period of one to two days. Fish may be subjected to stress, temporarily disrupted from their normal behavior patterns, and temporarily displaced from preferred habitats. However, electrofishing may result in permanent, adverse effects to individual fish such as injury. Where agency protocols are not followed, effects may be more frequent and/or more severe.

It should be noted that use of electrofishing as part of this activity is a minimization measure to avoid death of fish from stranding. While some proportion of fish not caught by other methods may be affected, they would be stranded and likely die if not caught through the use of electrofishing. The use of electrofishing, in conjunction with the other capture methods, thereby reduces the negative effects of stream diversion for instream work. It is expected that most, if not all, adult fish of larger species would be removed using other methods of capture and release, because they are easier to see and capture that

Effects of the Action

Riparian timber harvest is only expected to have minor effects to thermal refugia, and even these effects are expected to be short in duration (e.g., less than 2 to 5 years). Riparian timber harvest is not expected to change flow regimes, increase sediment delivery or routing, increased turbidity, decreased dissolved oxygen, or have other effects that would rise to a level that could degrade refugia or interfere with connectivity.

Road management may have effects upon sediment delivery, although in general, we expect the proposed FPHCP to contribute to improvement in the baseline of sedimentation. Sediment effects from instream work at road crossings may have localized effects, but are not expected to persist for long periods of time (e.g., not greater than 2 years on average) and we do not anticipate that these effects would rise to the level of degrading refugia or interfering with connectivity. We also expect that ongoing sediment inputs at road crossings would occur at generally low levels if crossings are properly maintained, however, short-term effects to reach-level refugia habitats may occur from road-generated sediment in proximity to road crossings (e.g., on the order of a hundred or several hundred feet downstream).

7.5.10.5 Summary: Effects of Proposed FPHCP on Refugia and Connectivity

Considering all of the actions that would occur under the proposed FPHCP, the refugia and connectivity for covered species should continue at the landscape level. Riparian timber harvest may have minor effects to temperature and sediment regimes that would be short term. Delivery of sediment from roads may be locally high during instream work, but is expected to subside following such work and subsequent flushing flows and exposed soil revegetation. Road-management standards under the FPHCP are expected to improve baseline conditions beyond the current conditions. Although passage barriers would likely persist in major rivers and in streams crossing non-forest lands, the FPHCP is expected to have a significant beneficial effect on access and connectivity through accelerated identification and remediation of fish-passage barriers. Improved access and connectivity across FPHCP lands is expected to benefit migrations as well as allow re-occupancy of extirpated locations. In addition, improved connectivity on FPHCP lands would reduce the threat of stochastic events to local population extirpations.

7.5.11 Direct Disturbance, Injury, and Death

This section addresses research, monitoring, and validation efforts (which may include species capture and handling); fish salvage in preparation for stream dewatering, electrofishing (which can be a component of any of the above activities); as well as emergency and routine work within and adjacent to streams. Research, monitoring, and model validation are components of the conservation measures of the FPHCP and would be authorized by the proposed Permit. The salvage activities involving species capture and handling are not directly addressed by the FPHCP, but have little independent utility and are therefore considered to be interrelated with or interdependent upon the proposed FPHCP. Fish salvage activities include a series of steps to minimize the potential for take of listed species related to certain road activities, but these salvage activities are not regulated by WDNR. Although such salvage activities could require future section 7 consultation regarding the issuance of a section 10(a)(1)(A) permit, the effects of these activities are analyzed herein as interrelated actions of the proposed section 10(a)(1)(B) permit. Where these actions would rely on Federal authorization, certain standards and constraints are anticipated and are described herein. Where these actions would not require Federal authorization, such standards might not be followed. These applications of electrofishing are analyzed in this Opinion. Operational stream typing using electrofishing (e.g., a landowner wishing to survey his streams for fish) is not addressed by the proposed action and is not analyzed herein. Such operational surveys would

proposed electrofishing would likely include reductions in growth rate and/or body condition in individual fish during variable periods of time after electrofishing (Gatz et al. 1986; Taube 1992; Dwyer and White 1995).

We estimate that up to 50 percent of fish exposed to electrofishing could be injured or killed. With respect to stream-typing model validation, our estimate is that up to 50 percent of the fish in the immediate area or reach that is checked could be injured or killed. For research, we estimate that up to 50 percent of the fish in an area addressed in an approved study plan could be injured or killed. Requests of this nature would be scrutinized based on need, as well as sensitivity of the species in the area and their population status. For fish salvage, we estimate that 75 percent of the fish in a stream reach would escape during isolation or be removed prior to use of electrofishing. We estimate that 20 percent would be removed by the use of electrofishing and the remaining 5 percent would be stranded and killed. Therefore, we estimate that up to 50 percent of the 20 percent removed via electrofishing would be injured or killed as a result of electrofishing during fish salvage.

Electrofishing Conservation Measures Where Listed Species May Be Affected

Where electrofishing for fish-salvage operations may affect listed species and Federal authorization is necessary, all such operations must be conducted in accordance with guidelines developed by NMFS (NMFS 2000, or as revised), and all applicable State and Federal permits shall be obtained. Procedures required by WDFW, whether under an HPA or a scientific-collection permit, must be followed, and in case of conflict, such conflicting guidance must be resolved by the agencies prior to conducting work. Operators must also follow WDFW direction regarding pre-work notification. Where FWS listed species may be affected by fish salvage, operators would require authorization from FWS. Electrofishing for research, monitoring, or stream-type model validation would require a study plan and approval by the Federal Services, and we expect that such plans would generally comport with the NMFS guidelines. In either case, whether a section 10(a)(1)(A) recovery permit is issued or whether work is conducted under the proposed section 10(a)(1)(B) incidental take permit, we would utilize the opportunity to assess the effects upon listed species and further condition such activities – see below.

Generally, there would be no electrofishing in anadromous waters from October 15th to May 15th and no electrofishing in resident waters from November 1st to May 15th. Sampling shall only occur at times and locations that avoid disturbing spawning native salmonids, incubating eggs, or newly emerged fry, unless specifically approved by the Services as part of a necessary research project. Only trained and experienced professionals may perform electrofishing surveys under Federal permits. Personnel conducting electrofishing would carefully survey the area to be sampled before beginning electrofishing. This pre-electrofishing survey should ensure that they do not contact spawning adult salmonids or active redds. To be compliant with the NMFS guidelines, equipment must be in good working condition and operators shall go through the manufacturer's pre-season checks, adhere to all provisions, and record major maintenance work in a logbook. Operators must also ensure that an adequate number of trained personnel are available.

Operators shall measure conductivity in the stream to be sampled and shall set voltage accordingly. Only Direct Current (DC) or Pulsed Direct Current (PDC) shall be used, unless otherwise approved. Each session shall begin with pulse width and rate set to the minimum needed to capture fish. If needed, these settings would be gradually increased only to the point where fish are immobilized and captured.

Electrofishing shall be performed in a manner that minimizes harm to fish. Operators shall not allow fish to come in contact with the anode. The zone of potential fish injury is within 0.5 m of the anode. Care

FINAL

FOREST PRACTICES

HABITAT CONSERVATION PLAN

December 2005

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

HCP Planning Context: Whose plan is the HCP?

1. Introduction

The state of Washington has developed the Forest Practices Habitat Conservation Plan (FPHCP) in response to the federally threatened and endangered status of certain fish species. Developing the FPHCP is one of the implementation measures resulting from the 1999 Forests and Fish Report, the forestry module of a larger comprehensive statewide effort to protect aquatic species, their habitats and water quality.

The FPHCP is characterized as a "programmatic" habitat conservation plan. Unlike most habitat conservation plans, which cover a defined land base and ownership, the FPHCP is linked to Washington's Forest Practices program, which regulates forest practices activities on primarily non-Federal and non-tribal forestlands in the state. Forest practices activities on these lands must comply with the state's Forest Practices Act (chapter 76.09 RCW) and rules (title 222 WAC). The purpose of the FPHCP is to assure those conducting forest practice activities, covered by or subject to the Forest Practices program, that they will also be in compliance with the Endangered Species Act (ESA) for covered threatened and endangered species. Therefore the term "assurances" is used throughout this document.

The Forests and Fish Report (FFR) was a multi-stakeholder effort that utilized the best available science to guide the direction of aquatic species protection. Completion of the FFR includes obtaining an incidental take permit from each of the Federal agencies responsible for implementation of the ESA. The state is seeking these assurances through the development of the FPHCP as a major step towards achieving the goals of the FFR. The FFR has four goals:

1) To provide compliance with the Endangered Species Act for aquatic and riparian-dependent species on non-Federal forestlands;

2) To restore and maintain riparian habitat on non-Federal forestlands to support a harvestable supply of fish;

3) To meet the requirements of the Clean Water Act for water quality on non-Federal forestlands; and

4) To keep the timber industry economically viable in the state of Washington.

These goals remain the goals of the FPHCP as they relate to the regulation of forest practices on non-Federal and non-tribal forestlands.

The Federal Endangered Species Act (Section 10 (a)(1)(B)) allows applicants—in this case Washington State—to submit a habitat conservation plan to the Services detailing how species included in the plan will be protected. Once the habitat conservation plan is reviewed and approved, a permit may be issued that allows for the incidental take of a listed species while conducting otherwise lawful covered activities. In addition, unlisted

The Northwest Regional Administrator can provide NOAA Fisheries' findings in a response letter to the submittal, and may either approve or disapprove the submittal. Before NOAA Fisheries issues an approving letter or makes the included findings, notification must be given in the *Federal Register* for public review with a 30-day (minimum) comment period. The 4(d) process currently only applies to threatened salmonids under NOAA Fisheries jurisdiction. A 4(d) rule Limit 13 approval would remain in place unless NOAA Fisheries at some time in the future finds the forest practices regulations inadequate. Threatened bull trout would not be covered by the 4(d) process unless USFWS promulgates a 4(d) rule for bull trout.

1-2.1 Forest Practices Habitat Conservation Plan

The state of Washington has initiated a process seeking coverage for incidental take, under Section 10 of the ESA. This process requires preparation of a conservation plan that must satisfy requirements under this section of the ESA. A habitat conservation plan under Section 10 must include the following (16 U.S.C. 1539(a)(2)(A)):

- The impact which will likely result from the take;
- What steps the applicant will take to monitor, minimize and mitigate such impacts; the funding available to implement such steps; and as well as the procedures to be used to deal with changed and unforeseen circumstances;
- What alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and
- Other measures that the secretary of the Interior and/or Commerce may require as being necessary or appropriate for purposes of the plan.

1-2.2 Issuance Criteria

HABITAT CONSERVATION PLAN

When the Services determine that all criteria for a habitat conservation plan have been met, and after an opportunity for public comment, an Incidental Take Permit (ITP) must be issued if the applicant meets the following criteria (16 U.S.C. 1539(a)(2)(B)):

1) The taking will be incidental;
2) The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;
3) The applicant will ensure that adequate funding for the plan will be provided;
4) The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and
5) Such measures that the secretaries of the Interior and Commerce may require as being necessary or appropriate for the purposes of the plan will be met.

An ITP allows a permit holder to conduct otherwise lawful covered activities in the presence of listed species without being liable for the criminal or civil penalties that may

Biology:
What did the HCP tell the Services about fish biology?

through autumn and winter, generally requiring additional development time due to the colder headwater stream temperatures. Adult summer chinook enter freshwater streams as early as June and spawn from September through October. Fall chinook populations spawn from late September through December. Fall chinook eggs incubate in the gravel until January through early March.

After emerging from the gravel, juveniles rear in fresh water for two months to two years. Two life history types—ocean and stream—are recognized in chinook salmon, based upon the length of time the juvenile fish spend rearing in streams and rivers. Ocean-type chinook move relatively quickly into saltwater following emergence. Some fry enter marine environments almost immediately, but most inhabit the shallow side margins and side sloughs for up to two months. Most fall chinook are ocean-type. Stream-type chinook overwinter in fresh water, typically migrating to the ocean the following spring. However, in very cold, unproductive systems, young stream-type chinook may rear for two years before smolting. Spring and summer chinook populations are more likely than fall chinook populations to be stream-type (Marshall et al. 1995).

Outmigration of smolts to the marine environment occurs over a broad period—typically January through August (Smith 1999)—and varies between spring, summer and fall chinook. Smolts spend time within estuarine and nearshore environments before they enter the ocean.

Chum *(Oncorhynchus keta)*

Chum salmon—also known as dog salmon and/or calico salmon—are distinguished by the reddish purple vertical markings along the sides of spawning adults. In the Pacific Northwest, freshwater migration is typically short in distance (<50 miles). Chum salmon utilize the low-gradient (–between one and two percent), sometimes tidally-influenced reaches of streams for spawning. Chum fry typically spend less than 30 days in the fresh water after emergence, but remain in the estuary and nearshore environments as juveniles. In these environments, juveniles feed primarily on copepods, tunicates and euphausiids prior to migrating out to the ocean (Lichatowich 1993b). Chum return to fresh water in three to five years to spawn, with each female accompanied by one or more males. The average weight of spawning adults is nine pounds (range 3 to 45 pounds; Wydoski and Whitney 2003). Post-spawned chum carcasses provide high nutrient values for juvenile salmonids and numerous wildlife species. In Washington, the abundance of chum salmon tends to fluctuate during even and odd years, suggesting a possible competitive interaction with pink salmon in estuary or nearshore habitats (Salo 1991).

Chum salmon have three distinct run times: summer, fall and winter. Summer chum begin their upstream migration and spawning during low summer flows in mid-August through mid-October, with fry emergence ranging from the beginning of February through mid-April, depending on water temperatures (WDFW and Point-No-Point Treaty Tribes 2000). Fall chum adults enter the rivers in late October through November and spawn in November and December. Winter chum adults migrate upstream from December through January and spawn from January through February. Fall and winter chum fry emerge from the gravels in March and April, and quickly outmigrate to the estuary for rearing (Smith 1999).

Pink *(Oncorhynchus gorbuscha*)

Pink salmon—also known as humpback salmon—are distinguished by oblong spots on the dorsal and caudal fins, as well as white ventral and green dorsal surfaces in spawning adults. The males develop a distinctive dorsal hump when returning to the spawning grounds. Pinks typically begin their upstream migration in mid-July during low summer flows and spawn in September and October. They typically spawn in large groups, usually near tidewater (Spence et al. 1996). Fry emerge from their redds in late February to early May, depending on water temperature, and migrate downstream to the estuary within a month. Juveniles remain in estuarine/nearshore waters for several months and then move offshore as they migrate to the Pacific Ocean, where they remain a little over a year until the next spawning cycle. The average weight of spawning adults is four pounds (range two to nine pounds; Wydoski and Whitney 2003). Preferred foods include euphausiids, amphipods, fish, squid, copepods and pteropods (Lichatowich 1993b). Most pink salmon populations in Washington return to their natal streams only in odd years. The exception is the Snohomish Basin, which supports both even and odd year pink salmon populations (Smith 1999).

Coho *(Oncorhynchus kisutch)*

Coho—also known as silver salmon—are distinguished by black spots on the upper part of the caudal fin and a white mouth. Coho adults begin their upstream migration between September and December, penetrate deep into the upper watersheds, spawn from October through February and fry emerge in early March to late July. Most juvenile coho remain at least one year in fresh water, although recent studies have shown that some populations spend time in estuaries prior to smoltification. Those that remain in fresh water rear in shallow gravel areas near the stream bank, keeping to pools and side channels and away from severe winter flows. They school at first, but later disperse and become aggressive and territorial (Smith 1999). Coho smolt and migrate to sea in the spring (Lichatowich 1993b). They typically spend two years at sea and return as three-year-old adults. Most adult coho salmon weigh between 8 and 12 pounds; however, they have been known to reach 31 pounds (Wydoski and Whitney 2003).

In the autumn, as water temperatures decrease, juvenile coho move into available side channels, spring-fed ponds and other off-channel sites to avoid winter floods. Streams with more structure (logs/rootwads, boulders, undercut banks) support more coho, not only because they provide more territories/usable habitat, but they also provide more food and cover (Scrivener and Andersen 1982). There is a positive correlation between their primary diet of insect material and the extent to which the stream is overgrown with vegetation (Chapman 1965). During the winter, coho often feed on the adult salmonid carcasses (Bilby et al. 1996). As coho juveniles grow into yearlings, they become more predatory on other salmonids. Coho use estuaries primarily for interim feeding while they adjust physiologically to saltwater and then move offshore to deeper waters (Smith 1999).

Sockeye and Kokanee *(Oncorhynchus nerka)*

Sockeye—also known as red salmon—are distinguished by their lack of spots on the back or caudal fin and, as spawning adults, by their red bodies and green heads. Sockeye enter fresh water for upstream migration during the summer months, spend time resting in deep pools or lakes and enter the spawning grounds when ready to spawn (usually from late summer to fall; Spence et al. 1996). Sockeye are unique in that they exhibit three types of the anadromous life history strategy. One type spawns in rivers but rears in lakes for one to three years to complete their freshwater life cycle prior to migrating out to sea. Another type spawns along lakeshores and rears in lakes for one to three years prior to migrating out to sea. Three-year migrants are uncommon in Washington State (J. Sneva, pers. comm., 2004). The third type spawns and rears in rivers and streams for one year (J. Sneva, pers. comm., 2004) prior to migrating to the sea.

Incubation time varies from 50 days to 5 months, depending on water temperature, after which emerging fry either remain in the river or find their way to a nursery lake for rearing, where they feed on larval and adult insects and zooplankton. Juvenile sockeye spend up to three years in fresh water prior to smoltification in spring, although some strains outmigrate immediately upon emergence and others become residual (Kokanee). Migrating sockeye juveniles remain within the estuarine/nearshore environment throughout the summer, feeding on insects, crustaceans and small fish and their larvae. Sockeye grow and develop two to four years in the ocean prior to returning to their natal stream or lake to spawn (Wydoski and Whitney 2003). Although adult sockeye salmon may reach a weight of 15.5 pounds, most adult fish weigh between 3.5 and 8 pounds.

Kokanee are either landlocked or residualized sockeye salmon. Populations occur in many lakes in northern Washington on both sides of the Cascade mountains. Typically, kokanee populations are maintained by stocking hatchery fish; however, self-sustaining populations also occur. Kokanee spawn where groundwater upwelling occurs along the shoreline of lakes or in tributaries. Juveniles rear in lakes, feeding on zooplankton and aquatic insect larvae (Wydoski and Whitney 2003).

Steelhead, Rainbow and Interior Redband Trout *(Oncorhynchus mykiss)*

Steelhead trout are distinguished by their uniform silvery color up until spawning time, when they darken in color. They are the anadromous form of this species, with a unique and complex life history. Unlike Pacific salmon, steelhead may return to sea after spawning and migrate again to fresh water to spawn again another year. There are two runs of steelhead: summer and winter. While there is some overlap, winter run steelhead typically enter streams for spawning between November and April, and summer steelhead enter streams between May and October (Wydoski and Whitney 2003). Summer steelhead usually spawn farther upstream than winter populations and dominate inland areas such as the Columbia Basin. The coastal westside streams typically support more winter steelhead populations (Smith 1999).

Steelhead fry emerge April through June and spend one to two years—and rarely three years—in fresh water (T. Johnson, pers. comm., 2002), preferring riffle areas in the summer and occupying pools during the rest of the year (Wydoski and Whitney 2003). Most steelhead returning to Washington streams after spending two years in saltwater weigh five to ten pounds (Wydoski and Whitney 2003). During the winter, they often feed on the carcasses of adult salmon (Bilby et al. 1996). Steelhead migrate to sea in the spring, spending two to four years in the open ocean (Wydoski and Whitney 2003) feeding on crustaceans, squid, herring and other fish (Lichatowich 1993b).

Rainbow trout, the non-anadromous form of the species, are distinguished by a reddish stripe that is usually present along the sides of adults. Two subspecies of rainbow trout occur in Washington: coastal rainbow (*Oncorhynchus mykiss irideus*) and Columbia redband trout (*Oncorhynchus mykiss gairdneri*). Native coastal rainbow inhabit streams and lakes in western Washington and inland into the Columbia River basin. They can exhibit the fluvial, adfluvial or resident life history strategies. Growth tends to be faster in eastside waters, where temperatures are higher and streams and lakes are typically richer in nutrients (Wydoski and Whitney 2003). Rainbow trout usually spawn between February and June, but there is also a fall spawning population. All spawning takes place in streams. Like steelhead, not all rainbow die after spawning. Fish mature between one and five years, depending on growth rate, and feed primarily on bottom-dwelling aquatic insects, amphipods, aquatic worms and fish eggs (Wydoski and Whitney 2003).

Native redband trout are the non-anadromous inland (east of the Cascade Range) subspecies of rainbow trout. Although redband trout appear to be widely distributed within the Columbia River Basin, their status is clouded by the uncertainty over taxonomic classification within the species, and by more than a century of stocking hatchery rainbow trout and steelhead. Interior redband trout are a Federal species of concern. Little published information exists for redband trout in Washington State, but Oregon status reports have described some life history traits. In some basins, fluvial and adfluvial redband trout migrate upstream in the spring and spawn in their respective basins from April to July depending upon elevation. Most stream-resident fish spawn in the spring and summer (ODFW 1999).

Coastal *(Oncorhynchus clarki clarki)* and Westslope *(Oncorhynchus clarki lewisi)* Cutthroat Trout

Cutthroat trout, in general, are distinguished by having a large mouth, which extends beyond the posterior eye margin, and a red/orange slit under the jaw. The two subspecies—coastal and westslope—are mainly distinguished by their spotting patterns. Coastal cutthroat have numerous dark spots present over their entire body, while the westslope cutthroat spotting occurs primarily above the lateral line and are most numerous on the caudal peduncle (directly anterior to the tail) (Wydoski and Whitney 2003).

The coastal cutthroat trout is the only subspecies of cutthroat exhibiting the anadromous life history strategy in addition to the other three life history strategies (i.e., adfluvial, fluvial, and resident). Cutthroat with different life history strategies often occupy the same areas without interbreeding. In Washington, the anadromous cutthroat trout (typically known as “searun” cutthroat) is widely distributed in the lower Columbia River and the Coastal and Puget Sound drainages. The searun cutthroat generally spawns between December and February in small headwater streams accessible to the ocean. They may outmigrate as young juveniles and take up residence in estuaries, feeding on smaller fish, amphibians and crustaceans. Growth is variable, but more rapid in marine waters with maturity typically reached at three or four years of age. Mature searun cutthroat may reach an average of two pounds (Wydoski and Whitney 2003).

Native freshwater (non-anadromous) cutthroat trout occur in many of Washington’s lakes and streams as one of two subspecies (i.e., Coastal and Westslope). Freshwater coastal cutthroat are primarily found in headwater streams of western Washington and tributaries of the Columbia River. Westslope cutthroat are found in the mid- and upper-Columbia tributaries, as well as throughout northeastern Washington. Spawning generally takes place from March through July in smaller headwater tributaries. The headwater tributaries used by resident cutthroat are typically cold, nutrient-poor waters that result in slow growth. Fluvial and adfluvial forms can exhibit more growth due to warmer water temperatures and nutrient availability. (Wydoski and Whitney 2003).

Bull Trout *(Salvelinus confluentus)* and Dolly Varden *(Salvelinus malma)*

Bull trout and Dolly Varden, both native char, were long considered to be the same species. The two native char have strong biological similarities (i.e., morphology, habits, habitat and life history; Wydoski and Whitney 2003). However, in 1978 bull trout and Dolly Varden became two species based on anatomical measurements and characteristics, as well as embryological development (Cavender 1978). Bull trout inhabit both eastern and western Washington, while Dolly Varden are only present in the Puget Sound and coastal rivers west of the Cascade Range. Bull trout exhibit four life history strategies: anadromous, adfluvial, fluvial and resident. Dolly Varden are often anadromous, but also exhibit the other life history strategies.

Bull trout and Dolly Varden move upstream (i.e., migratory forms such as anadromous, adfluvial and fluvial) in late summer and early fall to spawn in September and October—or in November at higher elevations (Wydoski and Whitney 2003). Both species prefer clean, cold water (50 °F) for spawning (Oregon Department of Environmental Quality 1995) and even colder water (36-39 °F) for incubation (Rieman and McIntyre 1993). Preferred spawning areas often include groundwater infiltration (Spence et al. 1996). Extended incubation periods (up to 220 days) make eggs and fry particularly susceptible to increases in fine sediments (USFWS 1998). Fry are typically found in shallow, backwater side channels and eddies in proximity to instream cover (Pratt 1984). Juveniles are typically found in interstitial spaces in the substrate, and subadults in deeper pools of streams or in the deep water of lakes with temperatures less than 59 °F (Pratt 1992). Both species mature at approximately 5 years and live for 12 or more years. Bull trout (and presumably Dolly Varden) typically reproduce in alternate years (Armstrong and Morrow 1980; USFWS 1998). While in marine waters (i.e., estuarine and nearshore habitats), bull trout have been observed to forage on surf smelt and other small schooling fish (e.g., sandlance, herring) (Kraemer 1994; Brenkman and Corbett 2003). They have also been observed to move through marine areas to independent tributaries, looking for foraging opportunities (Olympic Peninsula Management Unit Bull Trout Technical Guidance, *draft*, 2004). Bull trout often extend their time in estuaries into the fall, when they can follow adult migrating salmon upstream in order to feed upon their eggs.

Non-anadromous bull trout and Dolly Varden exhibit three life history strategies, each with unique habitat requirements: adfluvial, fluvial and resident. Adfluvial forms rear as juveniles in tributaries, migrate to lakes where most of their growth occurs, then return to the tributaries as adults to spawn. Spawning for fluvial forms occurs in smaller tributaries with major growth and maturation occurring in river mainstems. Resident forms complete all life stages (spawning, rearing, overwintering) in small headwater streams, often upstream of barriers to other salmonids (Brown 1994; Goetz 1989).

Pygmy Whitefish *(Prosopium coulteri)*

Pygmy whitefish are members of the trout and salmon family (Salmonidae) and are typically between five and six inches in length when mature, reaching a maximum length of about 11 inches. The pygmy whitefish is a remnant species from the last ice age, with a spotty distribution across northern North America and in the Columbia River drainage in Washington. The pygmy whitefish has been eliminated from a minimum of 40 percent of its range in the state. Historically, pygmy whitefish were known to have occupied 15 lakes; however, today they are currently found in only 9 (Hallock and Mongillo 1998). The future of pygmy whitefish populations is dependent upon maintaining water quality and spawning habitat, and preventing introduction of new predator species. Additionally,

Olympic Mudminnow *(Novumbra hubbsi)*

Olympic mudminnows are members of the Umbridae family—which includes only five species worldwide—and are the only known fish species endemic to Washington. They are small fish, generally about two inches long, and are found only in slow-moving streams, wetlands and ponds with soft mud-bottom substrate, little or no water flow and abundant aquatic vegetation (Harris 1974; Mongillo and Hallock 1999; Wydoski and Whitney 2003). Species distribution is limited to low gradients, low elevations (95 percent are below 328 feet elevation) in the coastal lowlands of the Olympic Peninsula, the rivers of the Chehalis and lower Deschutes drainages, and the south Puget Sound lowlands west of the Nisqually River (Mongillo and Hallock 1999; Wydoski and Whitney 2003). It is possible that observations of Olympic mudminnows in King and Snohomish counties are the result of illegal introductions from aquariums (Mongillo and Hallock 1999). The Olympic mudminnow is listed as a Washington State Sensitive species. The species is considered vulnerable due to its limited distribution and its dependence on healthy wetland habitat (Mongillo and Hallock 1999).

Wydoski and Whitney (2003) observe that mudminnows are usually found under overhanging banks or shore vegetation, preferring areas with low light and the brownish water of bogs and swamps. Meldrim (1968) found a wide tolerance for temperature extremes and low oxygen levels, but a restricted tolerance range for salinity and water current. Most of the sites where mudminnows occur are classified as wetlands, a habitat type that has been significantly diminished in quantity and quality over the last century and a half (Mongillo and Hallock 1999). Adults spawn between November and June (peaking in April and May) and females deposit eggs amidst clumps of vegetation to which fry remain firmly attached for approximately one week after hatching (Meldrim 1968 and Hagen et al. 1972; *in* Mongillo and Hallock 1999).

Columbia Tui Chub *(Siphateles columbianus gila bicolor)*

Tui chub, a member of the Cyprindae or “minnow” family, are typically long-lived small individuals, with some populations composed almost entirely of fish less than 5 inches long; however, they may attain lengths up to 16 inches over a lifespan of 20 years or more (Moyle et al. 1995; Wydoski and Whitney 2003). In Washington, tui chub are found in the central part of the state, east of the Columbia River (Wydoski and Whitney 2003). Lee et al. (1997) show records of tui chub only from the Lower Crab Creek and Lower Snake/Tucannon River drainages of eastern Washington. The tui chub currently has no listing status in Washington.

Tui chub inhabit lakes—alkaline lakes in particular—and the deep, quiet waters of large streams (Wydoski and Whitney 2003). For most of the year, adults gather in schools in deep water, moving to shallow, nearshore areas to spawn between May and June or July, when water temperatures are between 55 and 60 °F (Moyle et al. 1995; Wydoski and Whitney 2003). Algal beds in shallow, inshore areas appear to be necessary for successful spawning, egg hatching and larval survival (Moyle et al. 1995). Adults, in spawning aggregations, mill around dense algal beds in about three-foot-deep water and deposit adhesive eggs that stick to aquatic plants. Eggs hatch after about two weeks, and young remain in the nearshore environment until winter, when they migrate into deeper water offshore (Moyle et al. 1995, Wydoski and Whitney 2003). Generally, tui chub first spawn in their third year of life (Wydoski and Whitney 2003). Wydoski and Whitney (2003) noted that tui chub populations can become very dense, sometimes competing

The National Research Council (1996) has provided some generalized observations of salmonid population status over broad areas within the Pacific Northwest, which can help us to better understand the logic behind the current status of species with different life cycle characteristics and different geographical distributions:

- Pacific salmon have disappeared from about 40 percent of their historical breeding ranges in Washington, Oregon, Idaho and California over the last century, and many remaining populations are severely depressed in areas where they were formerly abundant.

- Coastal populations tend to be somewhat better off than populations inhabiting interior drainages. Species such as spring/summer chinook, summer steelhead and sockeye are extinct over a greater percentage of their range than species limited primarily to coastal rivers. Anadromous salmonid species most stable over the greatest percentage of their range (fall chinook, chum, pink and winter steelhead) chiefly inhabit rivers and streams in coastal areas.

- Populations near the southern boundary of the species' ranges tend to be at greater risk than northern populations.

- Species with extended freshwater rearing (such as spring/summer chinook, coho, sockeye, sea-run cutthroat and steelhead) are generally extinct, endangered or threatened over a greater percentage of their ranges than species with abbreviated freshwater residence (such as fall chinook, chum and pink salmon).

- In many cases, populations that are not smaller than they used to be are now composed largely or entirely of fish that originated in a hatchery.

Anticipated Water Typing Methods:
How did the HCP describe water typing methods to inform the Services' analyses?

NOTE: "protocol survey" is not mentioned in the HCP.

that forest practices – either singularly or cumulatively – are intended to be conducted in a manner that will not significantly impair the capacity of aquatic habitat to:

1. support harvestable levels of salmonids,

2. support the long-term viability of other covered species, and

3. meet or exceed water quality standards (including protection of designated uses, narrative and numeric criteria and antidegradation).

Riparian functions include large woody debris recruitment, sediment filtration, stream bank stability, shade, litterfall and nutrients, in addition to other processes important to riparian and aquatic systems. The approach to restoring riparian function differs for different parts of the state:

- In western Washington, protection measures are designed to place riparian forests on growth trajectories toward a “desired future condition” (DFC). DFC is defined as the condition of a riparian forest stand at 140 years of age. This age is assumed to be representative of a mature forest stand that provides the full range of ecological functions important for the survival and recovery of covered species.

- In eastern Washington, protection measures are intended to provide for stand conditions that vary over time. Varying stand conditions are designed to mimic natural disturbance regimes within a range that meets resource objectives and maintains general forest health.

Classification of Surface Waters and Wetlands

The Riparian Strategy includes two separate systems for classifying aquatic habitats. The first is a “water typing” system that classifies surface waters, including rivers, streams, lakes, ponds, impoundments and tidal waters. The second is a “wetland typing” system that applies to both forested and non-forested wetlands, including bogs. The water or wetland type governs the level of protection for FPHCP-covered species and their habitats. These typing systems are the foundation for many riparian-related protection measures, some of which include riparian and wetland management zones, channel migration zones, equipment limitation zones, and operational restrictions to minimize soil, channel and stream bank disturbance.

These and other riparian protection measures are described below. A discussion of the rationale behind the Riparian Strategy is included in Section 4d.

4b-1 Water typing systems

As of the writing of this document, the permanent water typing system described in the FFR and forest practices rules is still under development. Until that system is completed and adopted by the Board, forest practices are regulated under a modified interim water typing system. At the February 2005 Forest Practices Board meeting, the Board agreed to continue to follow the provisions of the original interim rule (WAC 222-16-031) while using new water type maps (based on the permanent water typing system - Type S, Type F, Type Np and Type Ns streams. See Section 4b-1.2). The new maps for western

Washington were put into operation on March 1, 2005. DNR is in the process of developing new water type maps for eastern Washington, and plans to implement the new maps in March 2006. Until then, water type maps for eastern Washington continue to use the traditional water typing system (Type 1, Type 2, Type 3, Type 4 and Type 5 streams). Descriptions of both systems are included in this plan, but riparian protection measures are described in relation to the permanent water typing system.

The interim water typing system relies on a physical channel measurement commonly known as "bankfull width" to help define some water types. In addition, some protection measures use bankfull width to guide forest practices rule implementation.

Forest practices rules define "bankfull width" as the lateral extent of the water surface elevation perpendicular to the channel at bankfull depth. "Bankfull depth" is the average vertical distance between the channel bed and the water surface elevation required to completely fill the channel to a point where water would spill onto the floodplain or intersect a terrace or hillslope. When applied to lakes, ponds or impoundments, bankfull width is the line of mean high water. When applied to tidal waters, bankfull width is the line of mean high tide. More information on bankfull width and bankfull depth can be found in WAC 222-16-010.

4b-1.1 Interim Water Typing System

The interim water typing system is a numeric, five-class system. Surface waters are assigned a numeric "type" that gives an indication of the waters' beneficial use and importance to fish, wildlife and humans (WAC 222-16-031). Waters are referred to as "Type 1," "Type 2," "Type 3," "Type 4," or "Type 5." Generally, the lower the numeric value, the greater the beneficial use. Therefore, Type 1 and Type 2 waters have more fish, wildlife and human use than do Type 4 and Type 5 waters.

- **Type 1 waters** are all waters within their ordinary high water marks that have been inventoried as "shorelines of the state" under chapter 90.58 RCW (Shoreline Management Act) and the rules promulgated pursuant to that chapter. However, Type 1 waters do not include those waters' associated wetlands as defined in chapter 90.58 RCW. Generally, "shorelines of the state" include larger lakes and rivers, as well as tidally influenced areas along Washington's western coast and within the Strait of Juan de Fuca and Puget Sound. More detail on "shorelines of the state" and "shorelines of statewide significance" can be found in RCW 90.58.030(2).

- **Type 2 waters** are segments of natural waters and periodically inundated areas of their associated wetlands that are not classified as Type 1 waters and that have high fish, wildlife or human use. Under the interim water typing system, "natural waters" excludes water conveyance systems that are artificially constructed and actively maintained for irrigation. Type 2 waters include those diverted for substantial domestic use, used by fish hatcheries, located within campgrounds or used by fish for spawning, rearing, migration or as off-channel habitat. Off-channel habitat includes areas connected to a fish-bearing stream through a drainage way that has a gradient of less than five percent and that is accessible during some period of the year.

Waters presumed to have highly significant fish populations—and therefore Type 2 status—include:

1. Streams with bankfull widths of at least 20 feet and gradients of less than four percent.

2. Lakes, ponds or impoundments that have surface areas of at least one acre at seasonal low water.

More detail on Type 2 waters can be found in WAC 222-16-031(2).

- **Type 3 waters** are segments of natural waters and periodically inundated areas of their associated wetlands that are not classified as Type 1 or Type 2 waters and have moderate to slight fish, wildlife or human use. Type 3 waters include those diverted for minor domestic use and those used by fish for spawning, rearing or migration. In cases where fish use has not been evaluated, waters with the following characteristics are presumed to have fish:

  1. Defined stream channels with a bankfull width of at least two feet in western Washington or three feet in eastern Washington and a gradient of 16 percent or less

  2. Defined stream channels with a bankfull width of at least two feet in western Washington or three feet in eastern Washington, a gradient greater than 16 percent and less than or equal to 20 percent and a contributing basin size of more than 50 acres in western Washington and more than 175 acres in eastern Washington

  3. Ponds or impoundments having a surface area of less than one acre at seasonal low water and having an outlet to a fish-bearing stream

  4. Ponds or impoundments having a surface area greater than 0.5 acre at seasonal low water

  More detail on Type 3 waters can be found in WAC 222-16-031(3).

- **Type 4 waters** are segments of natural waters within the bankfull width of defined channels that are not fish habitat and are perennial. Perennial means waters that do not go dry at any time during a year of normal rainfall. However, Type 4 waters include the intermittently dry portions of a channel below the uppermost point of perennial flow. In cases where the uppermost point of perennial flow cannot be identified using simple, non-technical observations, Type 4 designation begins at a point along the channel where the contributing basin size is:

1. At least 13 acres in the western Washington coastal zone (i.e., the Sitka spruce zone as defined by Franklin and Dryness 1973)
2. At least 52 acres in other locations in western Washington
3. At least 300 acres in eastern Washington

- **Type 5 waters** are segments of natural waters within the bankfull width of defined channels that are not Type 1, Type 2, Type 3, or Type 4 waters. These are seasonal, non-fish habitat waters where surface flow is not present for at least some portion of a year of normal rainfall and are not located downstream from any stream reach that is classified as a Type 4 water. Type 5 waters must be physically connected to Type 1, Type 2, Type 3, or Type 4 waters by an above-ground channel.

In cases where a dispute arises over a water type, DNR is required to make informal conferences available to the WDFW and Ecology, affected tribes and those contesting the adopted water type. Informal conference procedures are described in Section 4a-3.1.3 (Compliance and Enforcement).

4b-1.2 Permanent Water Typing System

The permanent water typing system described in the FFR and forest practices rules is similar to the interim water typing system in that water types are largely based on beneficial use. However, unlike the interim system that has five classes, the permanent water typing system has four classes: Type S, Type F, Type Np, and Type Ns (WAC 222-16-030):

- Type S includes "shorelines of the state"
- Type F includes "fish habitat" waters
- Type Np includes "non-fish, perennial" waters
- Type Ns includes "non-fish, seasonal" waters

These four classes are related to the five classes of the interim system in that Type S waters closely coincide with Type 1 waters, the Type F class includes both Type 2 and Type 3 waters and Type Np and Type Ns waters are the same as Type 4 and Type 5 waters, respectively. The forest practices rules direct DNR to work cooperatively with WDFW and Ecology and to consult with affected tribes when classifying streams, lakes and ponds throughout the state.

- **Type S waters** are all waters—within their bankfull width—inventoried as "shorelines of the state" under chapter 90.58 RCW and the rules promulgated pursuant to chapter 90.58 RCW. Type S waters also include periodically inundated areas of associated wetlands. Generally, "shorelines of the state" include larger lakes and rivers as well as tidally influenced areas along Washington's western coast and within the Strait of Juan de Fuca and Puget Sound. More detail on "shorelines of the state" can be found in RCW 90.58.030(2).

- **Type F waters** are segments of natural waters other than Type S waters, within the bankfull widths of defined channels and periodically inundated areas of associated wetlands or within lakes, ponds or impoundments having a surface area of 0.5 acre or greater at seasonal low water and which in any case contain fish habitat or are diverted for domestic use, use by fish hatcheries, are located within campgrounds or serve as off-channel fish habitat. More detail on Type F waters can be found in WAC 222-16-030(2).

- **Type Np waters** are segments of natural waters within the bankfull width of defined channels that are not fish habitat, but are perennial. Perennial means waters that do not go dry at any time during a year of normal rainfall. However, Type Np waters include the intermittently dry portions of the channel below the uppermost point of perennial flow. In cases where the uppermost point of perennial flow cannot be reliably identified using simple, non-technical observations, Type Np designation begins at a point along the channel where the contributing basin size is:

    1. At least 13 acres in the western Washington coastal zone (i.e., the Sitka spruce zone as defined by Franklin and Dryness 1973)
    2. At least 52 acres in other locations in western Washington
    3. At least 300 acres in eastern Washington

- **Type Ns waters** are segments of natural waters within the bankfull width of defined channels that are not Type S, Type F or Type Np waters. These are seasonal, non-fish habitat waters where surface flow is not present for at least some portion of a year of normal rainfall and are not located downstream from any stream reach that is classified as Type Np water. Type Ns waters must be physically connected to Type S, Type F or Type Np waters by an aboveground channel.

The forest practices rules direct DNR to prepare water type maps showing the location of Type S, Type F, Type Np and Type Ns waters within non-Federal and non-tribal forested areas of the state. The maps must be produced using a GIS-based, multi-parameter, field-verified logistic regression model. The model must be designed to distinguish waters that contain fish habitat (Type F) from those that do not (Type Np and Type Ns) using physical parameters such as basin size, gradient, elevation and other factors.

The original intent from FFR was that once produced, the water type maps would be updated every five years where necessary to better reflect observed field conditions or to further refine the accuracy and reliability of the model. Except for these periodic revisions, on-ground observations of fish or habitat characteristics will generally not be used to adjust mapped water types. However, if an on-site interdisciplinary team using non-lethal methods identifies fish, or finds that habitat is not accessible due to naturally occurring conditions and no fish reside above the blockage, the water type will be changed to reflect the findings of the interdisciplinary team. Field procedures that will be 1 used when investigating water types are currently under development and will be included in the Board Manual as Section 23. In cases where a dispute arises over a mapped water type, DNR is obligated to make informal conferences available to the WDFW and Ecology, affected tribes and those contesting the adopted water type.

Informal conference procedures are described in Section 4a-3.1.3 (Compliance and Enforcement). In light of some ongoing stakeholder concerns about the model produced maps meeting the desired resource protection objective, FF Policy will be considering available options to meet this objective with implementation of the permanent water typing system. 2

4b-2 Channel migration zones

Interactions between sediment, water and woody debris sometimes cause river or stream channels to move or migrate within their valleys. Such channel migration often leaves behind complex habitats that have high ecological value for fish and other aquatic and riparian species. The Riparian Strategy recognizes the importance of these habitats to the long-term conservation of species covered by the FPHCP, and it protects areas of likely channel movement through designated channel migration zones.

A channel migration zone is an area where the active channel of a stream or river is prone to move and the movement results in a potential near-term loss of riparian function and associated habitat adjacent to the stream (WAC 222-16-010). “Near-term” in this context means the time required to grow a mature forest. CMZs apply to all fish-bearing waters (including Type 1, Type 2, and Type 3 waters under the interim water typing system and Type S and Type F waters under the permanent water typing system) and most often are associated with low-gradient, unconfined channels that have well-developed floodplains. Section 2 of the Board Manual provides guidance for identifying and delineating CMZs.

No timber harvest, road construction or salvage is permitted within CMZs except for the construction and maintenance of road crossings and the creation and use of yarding corridors in accordance with applicable rules (WAC 222-30-020(12)).

4b-3 Riparian protection measures for typed waters

Riparian areas directly influence the quality and quantity of habitat available to aquatic and riparian-dependent species (Gregory et al. 1987). The physical and biological attributes of riparian landforms, soils and vegetation shape—and are shaped by—the geomorphic processes at work within a watershed (Sullivan et al. 1987; Featherston et al. 1995). Forest practices activities such as timber harvesting and road construction may alter these processes, potentially affecting the character of riparian and in-stream habitat (Gregory and Bisson 1997).

The Riparian Strategy recognizes that certain ecological functions, such as providing LWD and shade, are important for creating, restoring and maintaining aquatic and riparian habitats. The strategy protects these and other functions along typed waters by restricting forest practices activities from the most sensitive parts of riparian areas and by limiting activities in other areas.

Adaptive Management:
What does the HCP tell the Services that Adaptive Management will do?

4a-4 Forest Practices program refinement/adaptive management

The Services define adaptive management as a method for examining alternative strategies for meeting measurable biological goals and objectives and then, if necessary, adjusting future conservation management actions according to what is learned. The Services require an adaptive management strategy for habitat conservation plans that pose a significant risk to covered species at the time an Incidental Take Permit is issued due to significant data or information gaps. The adaptive management strategy should 1) identify the uncertainty and the questions that need to be addressed to resolve the uncertainty; 2) develop alternative strategies and determine which experimental strategies to implement; 3) integrate a monitoring program that is capable of detecting the necessary information for strategy evaluation; and 4) incorporate feedback loops that link implementation and monitoring to a decision-making process that results in appropriate changes in management. The FPHCP includes a formal, structured Adaptive Management program that includes each of these components. The framework of the AM program is described in the forest practices rules (WAC 222-12-045).

A series of key questions guides adaptive management research and monitoring priorities. These key questions represent the most significant scientific uncertainties facing developers of the Forests and Fish Report in 1999. Some FFR recommendations—later adopted as forest practices rules—were developed based on limited scientific data. Recognizing this, FFR authors recommended these areas be the focus of the AM program. Key questions were developed for environmental variables potentially affected by forest practices. Questions relate to sediment, large woody debris (LWD), stream temperature, hydrologic change, and forest chemicals; they can be found in Schedule L-1 (Appendix N). Schedule L-1, part of the FFR and later adopted by the Forest Practices Board in February 2001 with minor revisions, includes a description of the three overall performance goals, resource objectives as defined by the functional objectives and performance targets, and three key questions concerning compliance, effectiveness, and validation monitoring. Schedule L-1 serves as the foundation for the AM program, and more specifically guides the development of research and monitoring projects described in the CMER Workplan (Appendix H). Key questions—and therefore research and monitoring priorities—are likely to change over time as Adaptive Management proceeds and new information becomes available. Changes to resource objectives, performance targets and research and monitoring priorities, while at the discretion of the Forest Practices Board, would typically be reviewed and agreed to by the Forests and Fish Policy Committee. Upon approval of the FPHCP by the Services, any future substantive changes to these AM program elements would require concurrence by the Services.

The AM program was created for three reasons:

1) To ensure programmatic changes will occur as needed to protect covered resources

2) To ensure predictability and stability in the process of change so that forest landowners, regulators and interested members of the public can anticipate and prepare for change

N. Schedule L-1

Key Questions, Resource Objectives, and Performance Targets for Adaptive Management

Schedule L-1, part of the original Forests and Fish Report and later adopted by the Forest Practices Board in February 2001 with minor revisions, includes a description of the three overall performance goals, resource objectives as defined by the functional objectives and performance targets, and three key questions concerning compliance, effectiveness, and validation monitoring. Schedule L-1 serves as the foundation for the Adaptive Management program, and more specifically guides the development of research and monitoring projects described in the Cooperative Monitoring Evaluation and Research Committee's workplan.

Measures	Performance Targets	Time-Frame
Road run-off	Same targets as road-related sediment.	
Peak flows	West side: Do not cause a significant increase in peak flow recurrence intervals resulting in scour that disturbs stream channel substrates providing actual or potential habitat for salmonids, attributable to forest management activities.	
Wetlands	No net loss in the hydrologic functions of wetlands	

Chemical Inputs

Functional objective: Provide for clean water and native vegetation (in the core and inner zones) by using forest chemicals in a manner that meets or exceeds water quality standards and label requirements by buffering surface water and otherwise using best management practices.

Measures*	Performance targets	Time-Frame
Entry to water	No entry to water[7] for medium and large droplets; minimized for small droplets (drift).	
Entry in RMZs	Core and inner zone: levels cause no significant harm to native vegetation.	

Stream Typing and Fish Passage

Functional objective (stream typing): Type "fish habitat" streams to include habitat which is used by fish at any life stage at any time of the year, including potential habitat likely to be used by fish which could be recovered by restoration or management, and including off-channel habitat, by using a multi-parameter, field-verified, peer reviewed, GIS logistic regression model using geomorphic parameters such as basin size, gradient, elevation and other indicators.

Functional objective (fish passage): Maintain or restore passage for fish in all life stages and provide for the passage of some woody debris by building and maintaining roads with adequate stream crossings.

Measures	Performance targets	Time-Frame
Accuracy of predictive models	Fish habitat model: statistical accuracy of +/- 5%, with line between fish and non-fish habitat waters equally likely to be over and under inclusive.	
Access barriers	Eliminate road-related access barriers over the time-frame for road management plans.	

[7] Targets are for forest chemicals other than Bt and fertilizer. BMPs for both are not priorities for adaptive management.
* These measures and performance targets are not intended to override label requirements.

U.S. FISH and WILDLIFE SERVICE'S

BIOLOGICAL and CONFERENCE OPINION

for the

PROPOSED ISSUANCE

of a

SECTION 10(a)(1)(B) INCIDENTAL TAKE PERMIT

(PRT-TE-X121202-0)

to the

STATE OF WASHINGTON

for the

FOREST PRACTICES HABITAT CONSERVATION PLAN

May 2006

using a variety of methods. First, the work area is isolated by installing block nets at up and downstream locations to isolate the entire affected stream reach. This is done to prevent fish and other aquatic wildlife from moving into the work area. Block nets require leaf and debris removal to ensure proper function. Block nets are installed securely along both banks and in channel to prevent failure during unforeseen rain events or debris accumulation and are checked frequently to ensure they remain functional. Some locations may require additional block net support. Block nets are normally left in place throughout the fish removal activity and not removed until flow has been bypassed around the work area.

Drag netting or seining is a technique to remove fish from the isolated area with less potential for adverse effects to fish compared to electroshocking. Other possible techniques include collecting aquatic life by hand or with dip nets as the site is slowly de-watered, trapping using minnow traps, or by electrofishing. Electrofishing in stream channels is normally done only where other means of fish exclusion and removal are not feasible (s**ee Electrofishing**).

When removing fish out of the isolated stream reach, attempts would be made to remove fish from of the existing stream-crossing structure. Often, a connecting rod snake is inserted and wiggled through the pipe or other structure, creating noise and turbulence to get the fish to move out so they can be captured and removed out of the stream reach.

Pumps used to temporarily bypass water around work sites are normally fitted with mesh screens to prevent aquatic life from entering the pump hose. The mesh screens are installed as a precautionary measure to exclude any fish and other wildlife which may have been missed in the fish exclusion process, or may have entered the work area through a failed block net. Screens are generally located several feet from the inlet of the pump hose to avoid subjecting fish to the suction of the pump.

Captured fish are immediately either released or put in dark colored 5-gallon buckets or other suitable containers filled with clean stream water. Frequent monitoring of container temperature and well-being of the specimens ensures that specimens are released unharmed. Any injuries or mortalities to ESA-listed species usually require the event to be documented and reported to the one of the Federal Services (e.g., NMFS or USFWS); and, any listed fish that are inadvertently killed are provided to the appropriate Service. Captured fish would be released upstream of the isolated stream reach in a pool or area which provides some cover and flow refuge.

7.4.5.10 Electrofishing

Backpack electrofishing surveys are used to gather fish distribution and abundance data to inform operational decisions and for the aquatic monitoring and adaptive management commitments in the FPHCP. The surveys are used for three main purposes.

The first and most-widespread use is for verification of fish presence or absence in streams to test the water typing model. This use of electrofishing would be covered by the proposed Permit and typically involves electrofishing in smaller headwater streams, at or near the upstream limit of fish distribution. Standard methods would be used with any supplementary protocols described in the appropriate CMER Project Description and provided to the FWS for approval. When electrofishing is used for this purpose, it is applied in consideration of likely fish habitat and it ceases upon the first identified fish and as a result, only a small fraction of the stream is surveyed by electrofishing. Electrofishing is only used as needed and fish are not often encountered when it is used. The need for these surveys has diminished due to historical surveys. Use of electrofishing merely to determine fish presence on a given stream as an

elective activity by a landowner is not related to the proposed permit issuance and is not a covered activity.

The second purpose of electrofishing surveys covered by the Permit is to conduct monitoring and research. For instance, in conjunction with certain other investigations (e.g., fish-passage effectiveness), it may be necessary to collect information about covered species. Such work may be conducted annually during certain years or may be conducted only periodically (e.g., every 10 years). Surveys may be conducted using standard multiple-pass removal electrofishing techniques, with block nets, or using modified procedures provided by the Services. Habitat surveys generally would be conducted concurrently.

The third purpose for electrofishing is to move fish during stream-channel diversion projects. This use of eletrofishing would be addressed through section 10(a)(1)(A) of the ESA and may require individual permits when bull trout are present. These types of projects are not very frequent, but may occur during culvert replacements and in-channel work (**see Fish Salvage**).

7.5 EFFECTS OF THE ACTION

7.5.1 Introduction

The activities that are the effects of this Federal action have been discussed earlier in the section entitled **Description of Activities that are Effects of the Permit**. In this section of the Opinion, we assess those primary activities (as well as related, interrelated, and interdependent activities) and their effects on aquatic and riparian resources. These activities would affect aquatic and riparian resources directly and indirectly. Indirect effects "are caused by or result from the proposed action, are later in time, and are reasonably certain to occur". These activities could affect inputs to streams directly, or indirectly, through the effects to riparian conditions. Lisle (1999) identified five types of inputs to watersheds: wood, sediment, water, heat, and detritus. Activities could also affect how inputs are transported and the level of connectivity within the fluvial system. For each of the resource topics regarding aquatic inputs and transport, we discuss the sources of effects, and discuss the level of effects. Changes to inputs and transport processes would also manifest themselves as changes to instream habitat which is discussed. The conditions that are expected to occur from these potential changes in riparian conditions, aquatic inputs, transport factors, and instream responses are compared to the range of variability expected under natural-disturbance regimes. Finally, some activities would affect habitat or animals in ways that are not readily captured within the above framework. We discuss the effects to individuals (of the collective covered species) that would be expected from activities such as work-site-isolation techniques (fish salvage), related to road-stream crossings, designed to minimize effects on fish; handling associated with fish salvage, monitoring, or research; and other sources of potential injury not stemming from habitat alteration.

Fish habitat includes the physical, chemical, and biological components of riverine, lacustrine, and estuarine/near-shore environments. Spence et al. (1996) suggested four general principles for consideration when determining habitat requirements for salmonids, and presumably for other aquatic species as well: (1) watersheds and streams differ in their flow, temperature, sedimentation, nutrients, physical structure, and biological components; (2) fish populations adapt and have adapted – biochemically, physiologically, morphologically, and behaviorally – to the natural environmental fluctuations that they experience and to the biota with which they share the stream, lake, or estuary; (3)

upstream of the project area. The fish and water temperature should be monitored to ensure the health and condition of the fish until they are released. Given the low level of effect of these capture and relocation techniques, few fish are expected to be injured using these capture methods. Nonetheless, fish would be temporarily disrupted from their normal behavior during the capture and relocation activities.

Electrofishing for Fish Salvage

Where listed species are not likely to be affected, operators may decide to proceed without further authorization from Federal agencies. Methods used and requirements for operators are developed in discussions between WDFW and landowners. Where electrofishing is used during fish salvage, and listed species may be affected, operators may require authorization from FWS and/or NMFS.

Where listed species are present or likely to be affected, electrofishing has the potential to harm and kill fish even when used according to Agency-approved protocols. Regardless of whether a project may affect NMFS and/or FWS listed species, we currently anticipate similar requirements. Electrofishing for fish salvage (even when conducted under NMFS Limit #3 for fish salvage) must comply with the NMFS guidelines of June 2000, or as they may be revised from time-to-time. Protocols used, including requirements for pre-work notification, must also comply with any such direction from WDFW. Electrofishing shall be attempted only after less harmful methods of fish removal have been used. See the discussion on **Electrofishing Conservation Measures where Listed Species may be Affected** within this section (below).

Based on studies conducted by Nielson (1998), we estimate that up to 25 percent of the salmonids remaining in the stream following stream-reach isolation would not be collected by the use of seining, trapping, and/or dip-netting, and therefore could be exposed to effects from electrofishing. This estimate may be conservative, yet reasonable, for adult and juvenile salmonids and other large species given the wide range of water bodies and habitats where projects could occur. For other smaller species, fewer individuals may be captured using those methods and therefore proportionately larger number of individuals may be subjected to electrofishing. Fewer fish of all types would be captured by these methods in larger streams with deep pools and abundant complexity (e.g., large wood pieces and large substrates). Based on our experience, sculpins are often the most-numerous type of fish in forested streams, and capturing a large proportion of sculpins may be difficult.

Instream work at road crossings that require stream diversion would likely be conducted no more than once or twice during the life of the permit and would affect a short reach of stream for each crossing. Dewatering for instream work therefore would affect a very small portion of the total stream system. Some of the effects (stress, displacement, disruption of behaviors) of actual capture and handling of fish using electrofishing during culvert removal and/or replacement would be short term in nature, typically occurring intermittently over the period of one to two days. Fish may be subjected to stress, temporarily disrupted from their normal behavior patterns, and temporarily displaced from preferred habitats. However, electrofishing may result in permanent, adverse effects to individual fish such as injury. Where agency protocols are not followed, effects may be more frequent and/or more severe.

It should be noted that use of electrofishing as part of this activity is a minimization measure to avoid death of fish from stranding. While some proportion of fish not caught by other methods may be affected, they would be stranded and likely die if not caught through the use of electrofishing. The use of electrofishing, in conjunction with the other capture methods, thereby reduces the negative effects of stream diversion for instream work. It is expected that most, if not all, adult fish of larger species would be removed using other methods of capture and release, because they are easier to see and capture that juveniles. For such species, most fish remaining following netting and thus subjected to electrofishing and/or stranding would therefore be juveniles. In some species, adult fish can be relatively small and, therefore, not readily seen or captured, e.g., sculpin and dace. For these species, adult fish may also be subjected to electrofishing or stranding.

Stream Dewatering and Stranding

Once fish capture has ceased, dewatering would be completed. The installation of the water diversion and retention structures and the dewatering of the stream could result in the stranding of fry or juvenile fish. However, sequential dewatering may allow for fish to move downstream as the water in the channel recedes, rather than be trapped in the work area.

During stream dewatering, including when sandbags are used to focus stream flows, there is a potential that some juvenile or small salmonids may avoid being captured and relocated, and thus may die because they remain undetected in stream margins under vegetation, rocks, or gravels. In a programmatic assessment of culvert replacements in eastern Oregon and Washington, we (USFWS 2004c) estimated that up to 5 percent of juvenile bull trout may avoid capture and be stranded. The portion of the fish that would be affected in this way may be considerably higher for smaller species of fish. A gradual dewatering approach should enhance the efficacy of fish removal and thus reduce, but not eliminate this risk. Large salmonids are also wary and likely to use cover (Grant and Noakes 1987). Yet, we continue to estimate that the capture methods applied to such projects would typically remove approximately 95 percent of the individual fish of salmonid species or other larger species prior to dewatering. In addition, due to the timing of the activities, the risk to adults of some fish species should be minimized because of the reduced likelihood of migratory and/or spawning fish being present in the stream reach during the construction period. Nonetheless, resident fish may be present and a lower proportion of smaller species may be removed.

For larger species, mortality is expected to be primarily limited to juvenile fish which, because of their small size (less than 120 mm), may avoid capture, become stranded, remain undetected on the dewatered streambed, or may be killed due to electrofishing or impingement on block nets. Because of their size, adults are relatively easy to detect and capture using seines or dip nets during the slow dewatering process, thereby reducing the exposure of adult fish to electrofishing procedures. However, large salmonids are more difficult to catch, and are harder to handle, therefore more likely to get injured during capture and handling. There may also be a high post-release mortality with larger fish. For smaller fish species, adults may also elude capture and become stranded.

7.5.11.4 Potential for Injury or Mortality from Electrofishing

Electrofishing can result in mortality and/or direct injuries to fish, including spinal hemorrhages, internal hemorrhages, fractured vertebra, spinal misalignment, and separated spinal columns (Hollender and Carline 1994; Dalbey et al. 1996; Thomspon et al. 1997). Even though 60 Hertz (Hz) would seldom be used in Washington, we utilize these data regarding injury that were collected from fish captured under these frequencies because they represent the maximum expected use, and because of the availability of data regarding these collection methods. For additional and more-detailed information on potential injury as a result of electrofishing see Snyder (2003). The following discussions of injury reports are often from studies using backpack style 60 Hertz (Hz) direct current (DC) pulse electrofishing equipment.

Thompson et al. (1997) found an average of 22 percent of the rainbow trout and an average of 32 percent of the brown trout sustained spinal injuries from electrofishing. Dalbey et al. (1996) found 37 percent of rainbow trout sustained spinal injuries from electrofishing. Hollendar and Carline (1994) found 22 percent of brook trout sustained injuries from electrofishing, of which 13 percent were spinal injuries, 4 percent had both spinal and hemorrhage injuries, and 11 percent had a spinal injury but no hemorrhage. Hollendar and Carline (1994) found most spinal injuries were rating class 2 (40 percent) or 3 (40 percent) (Table 7-1), involved on average 7 vertebrae, and were usually located in the region of the spinal column between the dorsal and anal fins. Thompson et al. (1997) found more than half of the injured fish were judged to have the lowest severity of spinal injury and 2.1 percent or less sustained the most severe class of injury.

Table 7-1. Injury rating system used to identify and rate the severity of electrofishing injuries (Thompson et al. 1997).

Rating Class	Internal hemorrhage	Spinal Damage
0	None apparent	None apparent
1	Mild hemorrhage with 1 or more wounds in the muscle, separate from the spine	Compression (distortion) of vertebrae only
2	Moderate hemorrhage with 1 or more small wounds on the spine (<= width of 2 vertebrae)	Misalignment of vertebrae, including compression
3	Severe hemorrhage with 1 or more large wounds on the spine (> width of 2 vertebrae)	Fracture of 1 or more vertebrae or complete separation of 2 or more vertebrae

Thompson et al. (1997) found an average of 34 percent of the rainbow trout and average of 24 percent of brown trout sustained hemorrhage injuries from electrofishing. Hollender and Carline (1994) found 13 percent of brook trout sustained hemorrhages, 10 percent had a hemorrhage but no spinal injury, and rating class 2 hemorrhages were the most common (71 percent).

Dalbey et al. (1996), Thompson et al. (1997), and Hollender and Carline (1994) all found longer fish had a higher probability of being injured. Incidence and severity of injury were positively correlated with fish length, in that 40 percent of rainbow trout longer than 8 inches sustained injury compared to 27 percent in smaller fish (Dalbey et al. 1996). The injury rate was lowest (12 percent) for brook trout smaller than 5 inches, intermediate (26 percent) for the 5- to 7-inch- length group, and was highest (43 percent) for the 7-inch-and-longer-length group (Hollender and Carline 1994). Snyder (2003) in a comprehensive review of harmful effects from electrofishing reported that importance of size remains questionable. Thompson et al. (1997) speculated that fish in better condition may be more likely to be injured because of more powerful muscle contractions. Snyder (2003) reports that such claims are based upon supposition. He notes that fish in poor health may respond less strongly, but may also be less able to withstand the stress. Dalbey et al. (1996) found a higher and more-severe incidence of spinal injury to rainbow trout from pulsed DC (40-54 percent) than smooth DC (12 percent). Therefore, they recommend using smooth DC or pulse frequencies of 30 Hz or less to reduce the overall injury rate, especially among larger fish.

Rainbow trout with moderate to severe injuries had markedly lower growth and body condition after 335 days than fish with no or low spinal injuries (Dalbey et al. 1996). Dalbey et al. (1996) speculate that in a dynamic stream environment (rather than a pond) skeletal damage could possibly have an even greater negative effect on growth and survival.

Very few of the fish collected by Thompson et al. (1997) exhibited external signs of injury although a higher percentage of rainbow and brown trout were injured by electrofishing than would have been suspected from external examination. Dalbey et al. (1996) found that rainbow trout X-rayed soon after capture, exhibited no detectable signs of spinal injury, but later showed calcification indicative of old injuries when X-rayed again after 335 days in a pond. Hollender and Carline (1994) found hemorrhages and spinal compressions in the smallest fish were small and difficult to see and might have been overlooked. Therefore, their reported injury rate (average of 22 percent) may be a conservative estimate. In addition, most studies have focused on injuries exhibited by adults, but stress from electrofishing can be the main problem for juveniles (P. Bisson, USDA Forest Service; S. Parmenter, California Department of Fish and Game, Personal Communications as cited in Nielson 1998).

Snyder (2003) noted that evidence to date strongly indicates that salmonids seem especially susceptible to brands, spinal injuries, associated hemorrhages, and probably mortality during electrofishing than most other fishes. Data on the harmful effects of electrofishing on fishes other than the salmonids are limited and seldom comparable, but among species included in such reports, and under at least some environmental and electrical-field conditions, burbot and sculpins may be particularly sensitive to electrofishing mortality and some suckers may be sensitive to electrofishing-induced spinal injuries and associated hemorrhages. However, according to Barrett and Grossman (1998), sculpins do not appear to be readily affected by electrofishing. Mountain whitefish are at least sometimes especially susceptible to bleeding at the gills when subjected to electrofishing fields (Snyder 2003). Most investigators addressing the matter reported little or no electrofishing mortality among non-salmonids. However, differences in rates and degree of injury, especially between investigations, are often difficult to attribute to species, fish size or condition, environment (including water conductivity and temperature), field intensity, or other current or field characteristics. Fredenberg (Personal Communication as cited in Snyder 2003) found spinal injuries in 2 to 20 percent of rainbow trout captured with DC, 15-Hz PDC, or CPS, but only 0 to 2 percent of mountain whitefish, white sucker, or longnose sucker captured with the same currents. When specimens with only hemorrhages along the spine or associated musculature (all minor) were added to these figures, the percentages of injured fish increased to 6 to 42 percent for rainbow trout, 2 to 29 percent for mountain whitefish, and 4 to 18 percent for the suckers. However, results for smaller species should be considered with caution because injuries in small fish are difficult to detect. The Chondrostei, sturgeon, have electroreceptors, but whether these fish are also more susceptible to electric fields has not been reported. Snyder (2003) summarizes information regarding paddlefish (*Polyodon spathula*) indicating they may be highly susceptible to spinal injuries including ruptured notochords. Catfish (Order: *Siluriformes*) which also have electroreceptors are easy to catch with extremely simple low-voltage devices.

Summary of Potential Injury and Mortality from Electrofishing

This information indicates that, while the data is not conclusive, assuming other fish species are equally susceptive to injury and mortality as salmonids would be a conservative assumption. Although often not externally obvious or fatal, spinal injuries and associated hemorrhages sometimes have been documented in up to and over 50 percent of fish examined internally (Snyder 2003). Other harmful effects, such as bleeding at gills or vent and excessive physiological stress, are also of concern. Mortality, usually by asphyxiation, is a common result of excessive exposure to tetanizing intensities near electrodes or poor handling of captured specimens. Reported effects on reproduction are contradictory, but electrofishing over spawning grounds can harm embryos.

Snyder (2003) noted significantly fewer spinal injuries are reported when direct current, low-frequency pulsed direct current (no more than 30Hz), or specifically designed pulse trains are used. Zeigenfuss (1995) found injuries were lower for fish shocked in colder temperatures. Long-term effects from

proposed electrofishing would likely include reductions in growth rate and/or body condition in individual fish during variable periods of time after electrofishing (Gatz et al. 1986; Taube 1992; Dwyer and White 1995).

We estimate that up to 50 percent of fish exposed to electrofishing could be injured or killed. With respect to stream-typing model validation, our estimate is that up to 50 percent of the fish in the immediate area or reach that is checked could be injured or killed. For research, we estimate that up to 50 percent of the fish in an area addressed in an approved study plan could be injured or killed. Requests of this nature would be scrutinized based on need, as well as sensitivity of the species in the area and their population status. For fish salvage, we estimate that 75 percent of the fish in a stream reach would escape during isolation or be removed prior to use of electrofishing. We estimate that 20 percent would be removed by the use of electrofishing and the remaining 5 percent would be stranded and killed. Therefore, we estimate that up to 50 percent of the 20 percent removed via electrofishing would be injured or killed as a result of electrofishing during fish salvage.

Electrofishing Conservation Measures Where Listed Species May Be Affected

Where electrofishing for fish-salvage operations may affect listed species and Federal authorization is necessary, all such operations must be conducted in accordance with guidelines developed by NMFS (NMFS 2000, or as revised), and all applicable State and Federal permits shall be obtained. Procedures required by WDFW, whether under an HPA or a scientific-collection permit, must be followed, and in case of conflict, such conflicting guidance must be resolved by the agencies prior to conducting work. Operators must also follow WDFW direction regarding pre-work notification. Where FWS listed species may be affected by fish salvage, operators would require authorization from FWS. Electrofishing for research, monitoring, or stream-type model validation would require a study plan and approval by the Federal Services, and we expect that such plans would generally comport with the NMFS guidelines. In either case, whether a section 10(a)(1)(A) recovery permit is issued or whether work is conducted under the proposed section 10(a)(1)(B) incidental take permit, we would utilize the opportunity to assess the effects upon listed species and further condition such activities – see below.

Generally, there would be no electrofishing in anadromous waters from October 15th to May 15th and no electrofishing in resident waters from November 1st to May 15th. Sampling shall only occur at times and locations that avoid disturbing spawning native salmonids, incubating eggs, or newly emerged fry, unless specifically approved by the Services as part of a necessary research project. Only trained and experienced professionals may perform electrofishing surveys under Federal permits. Personnel conducting electrofishing would carefully survey the area to be sampled before beginning electrofishing. This pre-electrofishing survey should ensure that they do not contact spawning adult salmonids or active redds. To be compliant with the NMFS guidelines, equipment must be in good working condition and operators shall go through the manufacturer's pre-season checks, adhere to all provisions, and record major maintenance work in a logbook. Operators must also ensure that an adequate number of trained personnel are available.

Operators shall measure conductivity in the stream to be sampled and shall set voltage accordingly. Only Direct Current (DC) or Pulsed Direct Current (PDC) shall be used, unless otherwise approved. Each session shall begin with pulse width and rate set to the minimum needed to capture fish. If needed, these settings would be gradually increased only to the point where fish are immobilized and captured.

Electrofishing shall be performed in a manner that minimizes harm to fish. Operators shall not allow fish to come in contact with the anode. The zone of potential fish injury is within 0.5 m of the anode. Care

Most take of all covered species is expected to be in the form of harass as a result of habitat degradation caused by permit-covered activities that create the likelihood of sub-lethal injury by significantly disrupting their breeding, feeding, or sheltering behavior. A lesser amount of take of all covered species is expected to be in the form of sub-lethal harm as a result of habitat degradation caused by permit-covered activities that actually injures covered species by significantly disrupting their breeding, feeding, or sheltering behavior. The least amount of take is expected to be in the form of harm as a result of habitat degradation caused by permit-covered activities that actually kills covered species by significantly disrupting their breeding, feeding, or sheltering behavior. Direct take from capture, dewatering, instream large wood placement, and instream use of heavy equipment related to culvert and bridge repair, maintenance, and installation is expected to be in the form of sub-lethal or lethal "harm" take.

We estimate that about 2.5 percent of all habitat degradation in riparian management areas caused by permit-covered activities is expected to occur in association with 20-acre exempt parcels (Appendix F). This degradation is expected to cause incidental take of covered species in the form of harm.

9.1 INDIVIDUAL SPECIES INCIDENTAL TAKE STATEMENTS

9.1.1 Amphibians

9.1.1.1 Cascade Torrent Salamander

Amount and Extent of Take

The Cascade torrent salamander is known to occur in parts or all of the following Water Resource Inventory Areas (WRIAs): 11, 23, 26, 27, 28, and 29 (USFWS and NMFS 2006; Appendix A Regional Summaries). We anticipate that take of Cascade torrent salamanders would occur within Type Np and Ns streams on covered lands within these WRIAs over the 50-year Permit term. The conservation measures in the FPHCP provide protection for the highest quality habitat for Cascade torrent salamanders. However, up to 50 percent of Type Np streams and up to 100 percent of Type Ns streams may not receive riparian buffers.

Most take of Cascade torrent salamanders would be from habitat degradation from non-buffered stream margin habitat of Type Np and Ns streams that would impair breeding, feeding, and sheltering behaviors. It is estimated that harvest of riparian timber for up to 42,170 acres along Type Np streams and 275,140 acres along Type Ns streams would result in take of Cascade torrent salamanders over the life of the proposed 50-year Permit term.

A limited amount of take from stress, wounding, or actually killing salamanders is expected as a result of: (1) electrofishing related to adaptive management research and stream type model validation, (2) culvert and bridge maintenance and installation, and (3) heavy equipment use related to harvesting timber in riparian areas or emergency road repairs. Take from electrofishing and heavy equipment use is expected to be minimal. However, take from culvert and bridge maintenance and installation is expected to result during and immediately following instream work as sediment from the work site may degrade downstream habitat for Cascade torrent salamanders impairing breeding, feeding, and sheltering behavioral patterns; upstream habitat could also be degraded from erosional-headcutting as the upstream channel adjusts to the new stream crossing. Also, sediment from hydrologically-connected roads would also occur at culvert and bridge crossings on Type Np and Ns streams causing further degradation of habitat. Therefore, it is estimated that culvert and bridge maintenance and installation, and sediment from hydrologically-connected roads, would result in take of Cascade torrent salamanders for up to 2,829 Type Np stream crossings and 41,174 Type Ns stream crossings, and 289 miles of Type Np stream-adjacent roads, over the life of the proposed 50-year Permit term.

Effect of Take

For the reasons discussed in the "conclusion" section of this Opinion, we determined that the level of anticipated take from the action is not likely to result in jeopardy to the Cascade torrent salamander.

9.1.1.2 Columbia Torrent Salamander

Amount and Extent of Take

The Columbia torrent salamander is known to occur in parts or all of the following Water Resource Inventory Areas (WRIAs): 22, 23, 24, 25, and 26 (USFWS and NMFS 2006; Appendix A Regional Summaries). We anticipate that take of Columbia torrent salamanders would occur within Type Np and Ns streams on covered lands within these WRIAs over the 50-year Permit term. The conservation measures in the FPHCP provide protection for the highest-quality habitat for Columbia torrent salamanders. However, up to 50 percent of Type Np streams and up to 100 percent of Type Ns streams may not receive riparian buffers.

Most take of Columbia torrent salamanders would be from habitat degradation from non-buffered stream margin habitat of Type Np and Ns streams that would impair breeding, feeding, and sheltering behaviors. It is estimated that harvest of riparian timber for up to 49,881 acres along Type Np streams and 399,843 acres along Type Ns streams would result in take of Columbia torrent salamanders over the life of the proposed 50-year Permit term.

A limited amount of take from stress, wounding, or actually killing salamanders is expected as a result of: (1) electrofishing related to adaptive management research and stream type model validation, (2) culvert and bridge maintenance and installation, and (3) heavy equipment use related to harvesting timber in riparian areas or emergency road repairs. Take from electrofishing and heavy equipment use is expected to be minimal. However, take from culvert and bridge maintenance and installation is expected to result during and immediately following instream work as sediment from the work site may degrade downstream habitat for Columbia torrent salamanders impairing breeding, feeding, and sheltering behavioral patterns; upstream habitat could also be degraded from erosional-headcutting as the upstream channel adjusts to the new stream crossing. Also, sediment from hydrologically-connected roads would also occur at culvert and bridge crossings on Type Np and Ns streams causing further degradation of habitat. Therefore, it is estimated that culvert and bridge maintenance and installation, and sediment from hydrologically-connected roads, would result in take of Columbia torrent salamanders for up to 2,673 Type Np stream crossings and 44,994 Type Ns stream crossings, and 265 miles of Type Np stream-adjacent roads, over the life of the proposed 50-year Permit term.

Effect of Take

For the reasons discussed in the "conclusion" section of this Opinion, we determined that the level of anticipated take from the action is not likely to result in jeopardy to the Columbia torrent salamander.

Incidental Take Statement

9.1.1.3 Olympic Torrent Salamander

Amount and Extent of Take

The Olympic torrent salamander is known to occur in parts or all of the following Water Resource Inventory Areas (WRIAs): 16, 17, 18, 19, 20, 21, 22, 23, and 24 (USFWS and NMFS 2006; Appendix A Regional Summaries). We anticipate that take of Olympic torrent salamanders would occur within Type Np and Ns streams on covered lands within these WRIAs over the 50-year Permit term. The conservation measures in the FPHCP provide protection for the highest quality habitat for Olympic torrent salamanders. However, up to 50 percent of Type Np streams and up to 100 percent of Type Ns streams may not receive riparian buffers.

Most take of Olympic torrent salamanders would be from habitat degradation from non-buffered stream margin habitat of Type Np and Ns streams that would impair breeding, feeding, and sheltering behaviors. It is estimated that harvest of riparian timber for up to 41,002 acres along Type Np streams and 317,720 acres along Type Ns streams would result in take of Olympic torrent salamanders over the life of the proposed 50-year Permit term.

A limited amount of take from stress, wounding, or actually killing salamanders is expected as a result of: (1) electrofishing related to adaptive management research and stream type model validation, (2) culvert and bridge maintenance and installation, and (3) heavy equipment use related to harvesting timber in riparian areas or emergency road repairs. Take from electrofishing and heavy equipment use is expected to be minimal. However, take from culvert and bridge maintenance and installation is expected to result during and immediately following instream work as sediment from the work site may degrade downstream habitat for Olympic torrent salamanders impairing breeding, feeding, and sheltering behavioral patterns; upstream habitat could also be degraded from erosional-headcutting as the upstream channel adjusts to the new stream crossing. Also, sediment from hydrologically-connected roads would also occur at culvert and bridge crossings on Type Np and Ns streams causing further degradation of habitat. Therefore, it is estimated that culvert and bridge maintenance and installation, and sediment from hydrologically-connected roads, would result in take of Olympic torrent salamanders for up to 1,938 Type Np stream crossings and 29,107 Type Ns stream crossings, and 187 miles of Type Np stream-adjacent roads, over the life of the proposed 50-year Permit term.

Effect of Take

For the reasons discussed in the "conclusion" section of this Opinion, we determined that the level of anticipated take from the action is not likely to result in jeopardy to the Olympic torrent salamander.

9.1.1.4 Dunn's Salamander

Amount and Extent of Take

The Dunn's salamander is known to occur in parts or all of the following Water Resource Inventory Areas (WRIAs): 22, 23, 24, 25, and 26 (USFWS and NMFS 2006; Appendix A Regional Summaries). We anticipate that take of Dunn's salamanders would occur adjacent to Type S, F, Np, and Ns streams on covered lands within these WRIAs over the 50-year Permit term. The conservation measures in the FPHCP provide protection for the highest quality habitat for Dunn's salamanders. However, up to 50 percent of Type Np streams and up to 100 percent of Type Ns streams may not receive riparian buffers.

A limited amount of take from stress, wounding, or actually killing salamanders is expected with culvert and bridge maintenance and installation, as these activities can degrade riparian habitat immediately adjacent to work sites during the maintenance and installation operations. Therefore, it is estimated that culvert and bridge maintenance and installation would result in take of Van Dyke's salamanders for up to 4,794 Type Np stream crossings and 62,693 Type Ns stream crossings over the life of the proposed 50-year Permit term. Because Van Dyke's salamanders may also occur along Type S or F waters, up to 962 stream crossings on Type S waters and 9,283 stream crossings on Type F waters would also cause a limited amount of take during culvert and bridge maintenance and installation operations. Further, it is estimated that road construction and maintenance would result in take of Dunn's salamanders from up to 793 miles of road along Type S streams, 1,507 miles of road along Type F streams, and 468 miles of road along Type Np streams.

Although riparian prescriptions along Type S and F waters are expected to adequately protect habitat for Van Dyke's salamanders that may occur within these riparian areas, the operation of heavy equipment to harvest riparian timber may cause a limited amount of take from stress, wounding, or actually killing salamanders. Therefore, up to 88,519 acres of Type S riparian harvest and up to 193,530 acres of Type F riparian harvest may take Van Dyke's salamanders.

Effect of Take

For the reasons discussed in the "conclusion" section of this Opinion, we determined that the level of anticipated take from the action is not likely to result in jeopardy to the Van Dyke's salamander.

9.1.1.6 Coastal Tailed Frog

Amount and Extent of Take

The Coastal tailed frog is known to occur in parts or all of the following Water Resource Inventory Areas (WRIAs): 1, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 38, 39, 45, 46, 47, and 48 (USFWS and NMFS 2006; Appendix A Regional Summaries). We anticipate that take of Coastal tailed frog would occur within Type Np and Ns streams on covered lands within these WRIAs over the 50-year Permit term. The conservation measures in the FPHCP provide protection for the highest quality habitat for Coastal tailed frogs. However, up to 50 percent of Type Np streams and up to 100 percent of Type Ns streams may not receive riparian buffers.

Most take of Coastal tailed frogs would be from habitat degradation from non-buffered riparian habitat that would impair breeding, feeding, and sheltering behaviors. It is estimated that harvest of riparian timber for up to 132,907 acres along Type Np streams and 717,686 acres along Type Ns streams would result in take of Coastal tailed frogs over the life of the proposed 50-year Permit term.

A limited amount of take from stress, wounding, or actually killing frogs is expected with: (1) electrofishing related to adaptive management research and stream typing; (2) culvert and bridge maintenance and installation; and (3) instream heavy equipment use related to harvesting timber in riparian areas. Take from electrofishing and instream heavy equipment use is expected to be minimal. However, take from culvert and bridge maintenance and installation may also cause take during and immediately following instream work as sediment from the work site may degrade downstream habitat for Coastal tailed frogs impairing essential breeding, feeding, and sheltering behaviors; upstream habitat could also be degraded from erosional-headcutting as the upstream channel adjusts to the new stream crossing. Also, sediment from hydrologically-connected roads could also occur at culvert and bridge

Incidental Take
Statement

crossings on Type Np and Ns streams causing further degradation of habitat. Therefore, it is estimated that culvert and bridge maintenance and installation, and sediment from hydrologically-connected roads, would result in take of Coastal tailed frogs for up to 7,575 Type Np stream crossings and 89,837 Type Ns stream crossings, and 872 miles of Type Np stream-adjacent roads, over the life of the proposed 50-year Permit term.

Effect of Take

For the reasons discussed in the "conclusion" section of this Opinion, we determined that the level of anticipated take from the action is not likely to result in jeopardy to the Coastal tailed frog.

9.1.1.7 Rocky Mountain Tailed Frog

Amount and Extent of Take

The Rocky Mountain tailed frog is known to occur in parts or all of the following Water Resource Inventory Areas (WRIAs): 32 and 35 (USFWS and NMFS 2006; Appendix A Regional Summaries). Additionally, they are suspected to occur in other WRIAs because of their adjacent occupancy in British Columbia and Idaho. Therefore, it is assumed that Rocky Mountain tailed frogs may also occur in WRIAs 51 to 62 (USFWS and NMFS 2006; Appendix A Regional Summaries). The following estimates for take include all known and suspected WRIAs with Rocky Mountain tailed frog occurrence. We anticipate that take of Rocky Mountain tailed frog would occur within Type Np and Ns streams on covered lands within these WRIAs over the 50-year Permit term. The conservation measures in the FPHCP provide protection for the highest quality habitat for Rocky Mountain tailed frogs. However, up to 50 percent of Type Np streams and up to 100 percent of Type Ns streams may not receive riparian buffers.

Most take of Rocky Mountain tailed frogs would be from habitat degradation from non-buffered riparian habitat degrading Type Np and Ns instream habitat that would impair breeding, feeding, and sheltering behaviors. It is estimated that harvest of riparian timber for up to 27,111 acres along Type Np streams and 101,768 acres along Type Ns streams would result in take of Rocky Mountain tailed frogs over the life of the proposed 50-year Permit term.

A limited amount of take from stress, wounding, or actually killing frogs is expected with: (1) electrofishing related to adaptive management research and stream typing; (2) culvert and bridge maintenance and installation; and (3) instream heavy equipment use related to harvesting timber in riparian areas. Take from electrofishing and instream heavy equipment use is expected to be minimal. However, take from culvert and bridge maintenance and installation may also cause take during and immediately following instream work as sediment from the work site may degrade downstream habitat for Rocky Mountain tailed frogs impairing breeding, feeding, and sheltering behaviors; upstream habitat could also be degraded from erosional-headcutting as the upstream channel adjusts to the new stream crossing. Also, sediment from hydrologically-connected roads would also occur at culvert and bridge crossings on Type Np and Ns streams causing further degradation of habitat. Therefore, it is estimated that culvert and bridge maintenance and installation, and sediment from hydrologically-connected roads, would result in take of Rocky Mountain tailed frogs for up to 1,341 Type Np stream crossings and 15,473 Type Ns stream crossings, and 255 miles of Type Np stream-adjacent roads, over the life of the proposed 50-year Permit term.

water temperatures, and are used seasonally by bull trout life stages (adult and subadult) that have less sensitive or less restrictive habitat requirements. Life-history forms that may be taken by elevated temperature levels in FMO habitat as a result of the implementation of the FPHCP consist of only adult and subadult bull trout.

3. Take of bull trout may occur through the impairment of foraging, rearing, and spawning behaviors associated with the loss of large wood recruitment potential. Riparian harvest adjacent to fish- and nonfish-bearing streams has the potential to reduce the amount of large wood available over the 50-year permit term. A reduction in large wood in bull trout streams has the potential to result in reduced pool formation, increased sediment loads, the loss of cover, and a reduction in stream diversity and complexity. Take associated with the reduction of large wood would be more acute in headwater (Np and Ns) streams with steep hill slopes adjacent to or immediately upstream of bull trout spawning and rearing habitat. Adverse effects from the reduction of large wood that may lead to the take of bull trout are not anticipated to occur in all streams that support bull trout spawning and rearing, especially streams that derive most of their large wood from near-stream sources. Life-history forms that may be taken by the reduction of large wood are primarily eggs and alevins, but may also include fry, juveniles, and, in some instances, subadult and adult bull trout. Although we anticipate some take, the reduction of large wood as a result of implementation of the FPHCP is not expected to affect bull trout in FMO habitat to the same degree as bull trout in spawning and rearing habitat. Life-history forms that may be taken by reduction in large wood in FMO habitat as a result of the implementation of the FPHPC consist of only adult and subadult bull trout.

   Spawning and rearing streams in Core Areas, FMO habitat within Core Areas and FMO habitat outside of Core Areas vary in the amount of stream-adjacent road miles and adjacent FPHCP covered lands. These stream miles would be subject to adverse effects from covered activities and some of these adverse effects could result in the take of bull trout. Take associated with increases in temperature and sediment, and decreases in amounts of large wood may occur on portions of the 295.7 stream miles of spawning and rearing habitat adjacent to FPHCP covered lands, but we do not expect such take to occur on all 295.7 stream miles. Take associated with effects to FMO habitats both inside and outside of Core Areas is even more difficult to ascertain as FMO habitats typically consist of larger bodies of water; generally contain streams with warmer water temperatures; and are typically used seasonally by bull trout life stages that are more mobile, less sensitive to changes in habitat parameters, and have less restrictive habitat requirements. Twenty Core Areas have some amount of stream-adjacent roads or FPHCP covered lands that are adjacent to spawning and rearing habitat (Table 9-1). All Core Areas expect Chester Morse contain some FMO habitat adjacent to FPHCP covered lands or stream-adjacent roads (Table 9-2). In addition, FPHCP lands and FPHCP stream-adjacent roads are found adjacent to FMO areas outside of Core Areas (Table 9-3).

4. Direct take of bull trout may occur as a result CMER research and fish capture and handling activities including the use of seines, dipnets, blocknets, electrofishing or other methods used to capture bull trout. However, fish-salvage operations (as authorized through future section 10(a)(1)(A) permits or equivalent process), if necessary, would minimize the stranding of fish prior to stream channels being dewatered and stream crossing structures replaced. The capture of bull trout is expected to be minimized by avoiding periods of the year when bull trout are present in significant numbers. While it is possible that adverse effects may be avoided in some instances

Incidental Take Statement

Table 9-1. Quantification of take in bull trout core areas.

Core Area	Number of Stream Crossings	Miles of Stream Adjacent Roads Type S Streams	Miles of Stream Adjacent Roads Type F Streams	Miles of Stream Adjacent Roads Type Np Streams	Spawning and Rearing Stream Miles Adjacent to FPHCP Lands (equivalent acres of RMZs)
			Columbia River DPS		
Asotin Creek	0	.10	.06	.92	0.8 (11.64)
Entiat	2	.56	1.56	2.48	7.3 (106.18)
Grande Ronde	0	0	0	0	0
Klickitat	0	0	0	0	0
Lewis	15	.60	4.75	4.39	15.4 (326.67)
Methow	0	1.07	.30	0	0
Pend Oreille	26	1.87	3.13	1.16	35.5 (516.36)
Priest Lakes	0	0	0	.10	0.9 (14.18)
Tucannon	1	0	.34	.06	1.5 (21.82)
Walla Walla	20	2.55	10.8	4.07	19.8 (288.00)
Wenatchee	7	8.99	6.63	5.22	12.9 (187.64)
Yakima	36	10.28	23.98	20.21	55.2 (802.91)
			Coastal-Puget Sound DPS		
Chester Morse	0	0	0	0	0
Chilliwack	0	0	0	0	0
Dungeness	0	0	.81	.07	1.6 (33.94)
Elwha	3	0	0	0	0
Hoh	1	.86	0	0	2.7 (57.27)
Lower Skagit	5	1.19	1.42	4.72	7.7 (163.33)
Nooksack	44	16.84	14.41	25.46	57.1 (1211.21)
Puyallup	14	8.84	8.66	13.18	40 (848.49)
Queets	0	0	0	0	0
Quinault	0	0	0	0	0
Skokomish	0	0	.05	0	0.3 (6.36)
Snohomish/Skykomish	5	4.25	3.56	2.19	8.3 (176.01)
Stillaguamish	12	5.74	3.45	1.95	22.2 (470.91)
Upper Skagit	0	0	0.55	0	0.5 (10.61)

due to the low likelihood of the species being present during project implementation, bull trout are still being discovered at times and locations where they were not expected to occur. If bull trout are present in the reach of stream being dewatered, they would be captured using the methods described above and placed back into the flowing stream. The actual numbers of fish taken by capture and handling methods is difficult to estimate because bull trout may not be present when the work occurs and most bull trout would not likely be injured and would be released. It is anticipated that less lethal methods of capture would be used first, and if necessary, other methods such as electro fishing may be used. The take authorized by this incidental take statement is for an undeterminable, but small number of bull trout captured during fish-salvage operations prior to the replacement of a stream-crossing structure. Life-history forms that may be directly taken include alevins, fry, juveniles, and, in some instances, subadult and adult bull trout. Fourteen Core Areas have at least one stream crossing structure that crosses known spawning and rearing habitat (Table 9-1). We also expect that of the amount of stream surveys or electrofishing activities to be conducted and an estimate of the number of listed fish (or miles of listed-species habitat) to be affected by these activities. The permittee shall also provide the names and qualifications of the staff, contractors, or cooperators who will be supervising the field work. The permittee shall provide the FWS with a copy of the operating protocols designed to reduce effects to listed fish while maintaining the efficiency of the surveys and monitoring. This incidental take permit does not apply to operational water typing by individual landowners or to fish-salvage operations; these activities would need incidental take authorization through other means.

Following the conclusion of the field season and prior to the next field season, the permittee shall provide a report to the Project Leader, U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, 510 Desmond Drive SE, Suite 102, Lacey, Washington 98503, documenting the level of stream-survey and electrofishing activity and describing any listed fish encounters. This report shall document any effects that may rise to the level of incidental take (including mortality) and shall include the apparent condition of all listed fish specimens encountered. Results of surveys and monitoring shall be incorporated into the appropriate FPHCP periodic reports. The permittee shall obtain all needed Federal and State permits and shall abide by the conditions of each. This includes following the guidelines provided by NMFS (NMFS 2000). If the NMFS guidelines are subsequently revised, the permittee shall follow the revised guidelines. The permittee shall follow the guidelines unless proposed operating protocols described above are otherwise approved by FWS and NMFS, or additional restrictions are imposed by the FWS.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FWS's Western Washington Fish and Wildlife Office must immediately provide an explanation of the causes of the taking and review the need for possible modification of the reasonable and prudent measures.

9.4 CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the ESA direct Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on covered species or critical habitat, to help implement recovery plans, or to develop information. The FWS offers the following conservation recommendations:

1. The FWS should continue to work with WDNR, WDFW, forest landowners, and other TFW/FFR stakeholders to increase awareness regarding listed species associated with forested habitats that are not covered by the FPHCP, and to promote education regarding: (1) recognizing signs of listed species use and important habitat features; (2) utilizing methods to reduce impacts from forest activities; and (3) implementing measures to benefit listed species.

What does the USFWS biological opinion say about electrofishing for operational water-typing surveys?

Activity Description

using a variety of methods. First, the work area is isolated by installing block nets at up and downstream locations to isolate the entire affected stream reach. This is done to prevent fish and other aquatic wildlife from moving into the work area. Block nets require leaf and debris removal to ensure proper function. Block nets are installed securely along both banks and in channel to prevent failure during unforeseen rain events or debris accumulation and are checked frequently to ensure they remain functional. Some locations may require additional block net support. Block nets are normally left in place throughout the fish removal activity and not removed until flow has been bypassed around the work area.

Drag netting or seining is a technique to remove fish from the isolated area with less potential for adverse effects to fish compared to electroshocking. Other possible techniques include collecting aquatic life by hand or with dip nets as the site is slowly de-watered, trapping using minnow traps, or by electrofishing. Electrofishing in stream channels is normally done only where other means of fish exclusion and removal are not feasible (s**ee Electrofishing**).

When removing fish out of the isolated stream reach, attempts would be made to remove fish from of the existing stream-crossing structure. Often, a connecting rod snake is inserted and wiggled through the pipe or other structure, creating noise and turbulence to get the fish to move out so they can be captured and removed out of the stream reach.

Pumps used to temporarily bypass water around work sites are normally fitted with mesh screens to prevent aquatic life from entering the pump hose. The mesh screens are installed as a precautionary measure to exclude any fish and other wildlife which may have been missed in the fish exclusion process, or may have entered the work area through a failed block net. Screens are generally located several feet from the inlet of the pump hose to avoid subjecting fish to the suction of the pump.

Captured fish are immediately either released or put in dark colored 5-gallon buckets or other suitable containers filled with clean stream water. Frequent monitoring of container temperature and well-being of the specimens ensures that specimens are released unharmed. Any injuries or mortalities to ESA-listed species usually require the event to be documented and reported to the one of the Federal Services (e.g., NMFS or USFWS); and, any listed fish that are inadvertently killed are provided to the appropriate Service. Captured fish would be released upstream of the isolated stream reach in a pool or area which provides some cover and flow refuge.

7.4.5.10 Electrofishing

Backpack electrofishing surveys are used to gather fish distribution and abundance data to inform operational decisions and for the aquatic monitoring and adaptive management commitments in the FPHCP. The surveys are used for three main purposes.

The first and most-widespread use is for verification of fish presence or absence in streams to test the water typing model. This use of electrofishing would be covered by the proposed Permit and typically involves electrofishing in smaller headwater streams, at or near the upstream limit of fish distribution. Standard methods would be used with any supplementary protocols described in the appropriate CMER Project Description and provided to the FWS for approval. When electrofishing is used for this purpose, it is applied in consideration of likely fish habitat and it ceases upon the first identified fish and as a result, only a small fraction of the stream is surveyed by electrofishing. Electrofishing is only used as needed and fish are not often encountered when it is used. The need for these surveys has diminished due to historical surveys. Use of electrofishing merely to determine fish presence on a given stream as an

elective activity by a landowner is not related to the proposed permit issuance and is not a covered activity.

The second purpose of electrofishing surveys covered by the Permit is to conduct monitoring and research. For instance, in conjunction with certain other investigations (e.g., fish-passage effectiveness), it may be necessary to collect information about covered species. Such work may be conducted annually during certain years or may be conducted only periodically (e.g., every 10 years). Surveys may be conducted using standard multiple-pass removal electrofishing techniques, with block nets, or using modified procedures provided by the Services. Habitat surveys generally would be conducted concurrently.

The third purpose for electrofishing is to move fish during stream-channel diversion projects. This use of eletrofishing would be addressed through section 10(a)(1)(A) of the ESA and may require individual permits when bull trout are present. These types of projects are not very frequent, but may occur during culvert replacements and in-channel work (**see Fish Salvage**).

7.5 EFFECTS OF THE ACTION

7.5.1 Introduction

The activities that are the effects of this Federal action have been discussed earlier in the section entitled **Description of Activities that are Effects of the Permit**. In this section of the Opinion, we assess those primary activities (as well as related, interrelated, and interdependent activities) and their effects on aquatic and riparian resources. These activities would affect aquatic and riparian resources directly and indirectly. Indirect effects "are caused by or result from the proposed action, are later in time, and are reasonably certain to occur". These activities could affect inputs to streams directly, or indirectly, through the effects to riparian conditions. Lisle (1999) identified five types of inputs to watersheds: wood, sediment, water, heat, and detritus. Activities could also affect how inputs are transported and the level of connectivity within the fluvial system. For each of the resource topics regarding aquatic inputs and transport, we discuss the sources of effects, and discuss the level of effects. Changes to inputs and transport processes would also manifest themselves as changes to instream habitat which is discussed. The conditions that are expected to occur from these potential changes in riparian conditions, aquatic inputs, transport factors, and instream responses are compared to the range of variability expected under natural-disturbance regimes. Finally, some activities would affect habitat or animals in ways that are not readily captured within the above framework. We discuss the effects to individuals (of the collective covered species) that would be expected from activities such as work-site-isolation techniques (fish salvage), related to road-stream crossings, designed to minimize effects on fish; handling associated with fish salvage, monitoring, or research; and other sources of potential injury not stemming from habitat alteration.

Fish habitat includes the physical, chemical, and biological components of riverine, lacustrine, and estuarine/near-shore environments. Spence et al. (1996) suggested four general principles for consideration when determining habitat requirements for salmonids, and presumably for other aquatic species as well: (1) watersheds and streams differ in their flow, temperature, sedimentation, nutrients, physical structure, and biological components; (2) fish populations adapt and have adapted – biochemically, physiologically, morphologically, and behaviorally – to the natural environmental fluctuations that they experience and to the biota with which they share the stream, lake, or estuary; (3)

Effects of the Action

Riparian timber harvest is only expected to have minor effects to thermal refugia, and even these effects are expected to be short in duration (e.g., less than 2 to 5 years). Riparian timber harvest is not expected to change flow regimes, increase sediment delivery or routing, increased turbidity, decreased dissolved oxygen, or have other effects that would rise to a level that could degrade refugia or interfere with connectivity.

Road management may have effects upon sediment delivery, although in general, we expect the proposed FPHCP to contribute to improvement in the baseline of sedimentation. Sediment effects from instream work at road crossings may have localized effects, but are not expected to persist for long periods of time (e.g., not greater than 2 years on average) and we do not anticipate that these effects would rise to the level of degrading refugia or interfering with connectivity. We also expect that ongoing sediment inputs at road crossings would occur at generally low levels if crossings are properly maintained, however, short-term effects to reach-level refugia habitats may occur from road-generated sediment in proximity to road crossings (e.g., on the order of a hundred or several hundred feet downstream).

7.5.10.5 Summary: Effects of Proposed FPHCP on Refugia and Connectivity

Considering all of the actions that would occur under the proposed FPHCP, the refugia and connectivity for covered species should continue at the landscape level. Riparian timber harvest may have minor effects to temperature and sediment regimes that would be short term. Delivery of sediment from roads may be locally high during instream work, but is expected to subside following such work and subsequent flushing flows and exposed soil revegetation. Road-management standards under the FPHCP are expected to improve baseline conditions beyond the current conditions. Although passage barriers would likely persist in major rivers and in streams crossing non-forest lands, the FPHCP is expected to have a significant beneficial effect on access and connectivity through accelerated identification and remediation of fish-passage barriers. Improved access and connectivity across FPHCP lands is expected to benefit migrations as well as allow re-occupancy of extirpated locations. In addition, improved connectivity on FPHCP lands would reduce the threat of stochastic events to local population extirpations.

7.5.11 Direct Disturbance, Injury, and Death

This section addresses research, monitoring, and validation efforts (which may include species capture and handling); fish salvage in preparation for stream dewatering, electrofishing (which can be a component of any of the above activities); as well as emergency and routine work within and adjacent to streams. Research, monitoring, and model validation are components of the conservation measures of the FPHCP and would be authorized by the proposed Permit. The salvage activities involving species capture and handling are not directly addressed by the FPHCP, but have little independent utility and are therefore considered to be interrelated with or interdependent upon the proposed FPHCP. Fish salvage activities include a series of steps to minimize the potential for take of listed species related to certain road activities, but these salvage activities are not regulated by WDNR. Although such salvage activities could require future section 7 consultation regarding the issuance of a section 10(a)(1)(A) permit, the effects of these activities are analyzed herein as interrelated actions of the proposed section 10(a)(1)(B) permit. Where these actions would rely on Federal authorization, certain standards and constraints are anticipated and are described herein. Where these actions would not require Federal authorization, such standards might not be followed. These applications of electrofishing are analyzed in this Opinion. Operational stream typing using electrofishing (e.g., a landowner wishing to survey his streams for fish) is not addressed by the proposed action and is not analyzed herein. Such operational surveys would

proposed electrofishing would likely include reductions in growth rate and/or body condition in individual fish during variable periods of time after electrofishing (Gatz et al. 1986; Taube 1992; Dwyer and White 1995).

We estimate that up to 50 percent of fish exposed to electrofishing could be injured or killed. With respect to stream-typing model validation, our estimate is that up to 50 percent of the fish in the immediate area or reach that is checked could be injured or killed. For research, we estimate that up to 50 percent of the fish in an area addressed in an approved study plan could be injured or killed. Requests of this nature would be scrutinized based on need, as well as sensitivity of the species in the area and their population status. For fish salvage, we estimate that 75 percent of the fish in a stream reach would escape during isolation or be removed prior to use of electrofishing. We estimate that 20 percent would be removed by the use of electrofishing and the remaining 5 percent would be stranded and killed. Therefore, we estimate that up to 50 percent of the 20 percent removed via electrofishing would be injured or killed as a result of electrofishing during fish salvage.

Electrofishing Conservation Measures Where Listed Species May Be Affected

Where electrofishing for fish-salvage operations may affect listed species and Federal authorization is necessary, all such operations must be conducted in accordance with guidelines developed by NMFS (NMFS 2000, or as revised), and all applicable State and Federal permits shall be obtained. Procedures required by WDFW, whether under an HPA or a scientific-collection permit, must be followed, and in case of conflict, such conflicting guidance must be resolved by the agencies prior to conducting work. Operators must also follow WDFW direction regarding pre-work notification. Where FWS listed species may be affected by fish salvage, operators would require authorization from FWS. Electrofishing for research, monitoring, or stream-type model validation would require a study plan and approval by the Federal Services, and we expect that such plans would generally comport with the NMFS guidelines. In either case, whether a section 10(a)(1)(A) recovery permit is issued or whether work is conducted under the proposed section 10(a)(1)(B) incidental take permit, we would utilize the opportunity to assess the effects upon listed species and further condition such activities – see below.

Generally, there would be no electrofishing in anadromous waters from October 15th to May 15th and no electrofishing in resident waters from November 1st to May 15th. Sampling shall only occur at times and locations that avoid disturbing spawning native salmonids, incubating eggs, or newly emerged fry, unless specifically approved by the Services as part of a necessary research project. Only trained and experienced professionals may perform electrofishing surveys under Federal permits. Personnel conducting electrofishing would carefully survey the area to be sampled before beginning electrofishing. This pre-electrofishing survey should ensure that they do not contact spawning adult salmonids or active redds. To be compliant with the NMFS guidelines, equipment must be in good working condition and operators shall go through the manufacturer's pre-season checks, adhere to all provisions, and record major maintenance work in a logbook. Operators must also ensure that an adequate number of trained personnel are available.

Operators shall measure conductivity in the stream to be sampled and shall set voltage accordingly. Only Direct Current (DC) or Pulsed Direct Current (PDC) shall be used, unless otherwise approved. Each session shall begin with pulse width and rate set to the minimum needed to capture fish. If needed, these settings would be gradually increased only to the point where fish are immobilized and captured.

Electrofishing shall be performed in a manner that minimizes harm to fish. Operators shall not allow fish to come in contact with the anode. The zone of potential fish injury is within 0.5 m of the anode. Care

of the amount of stream surveys or electrofishing activities to be conducted and an estimate of the number of listed fish (or miles of listed-species habitat) to be affected by these activities. The permittee shall also provide the names and qualifications of the staff, contractors, or cooperators who will be supervising the field work. The permittee shall provide the FWS with a copy of the operating protocols designed to reduce effects to listed fish while maintaining the efficiency of the surveys and monitoring. This incidental take permit does not apply to operational water typing by individual landowners or to fish-salvage operations; these activities would need incidental take authorization through other means.

Following the conclusion of the field season and prior to the next field season, the permittee shall provide a report to the Project Leader, U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, 510 Desmond Drive SE, Suite 102, Lacey, Washington 98503, documenting the level of stream-survey and electrofishing activity and describing any listed fish encounters. This report shall document any effects that may rise to the level of incidental take (including mortality) and shall include the apparent condition of all listed fish specimens encountered. Results of surveys and monitoring shall be incorporated into the appropriate FPHCP periodic reports. The permittee shall obtain all needed Federal and State permits and shall abide by the conditions of each. This includes following the guidelines provided by NMFS (NMFS 2000). If the NMFS guidelines are subsequently revised, the permittee shall follow the revised guidelines. The permittee shall follow the guidelines unless proposed operating protocols described above are otherwise approved by FWS and NMFS, or additional restrictions are imposed by the FWS.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FWS's Western Washington Fish and Wildlife Office must immediately provide an explanation of the causes of the taking and review the need for possible modification of the reasonable and prudent measures.

9.4 CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the ESA direct Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on covered species or critical habitat, to help implement recovery plans, or to develop information. The FWS offers the following conservation recommendations:

1. The FWS should continue to work with WDNR, WDFW, forest landowners, and other TFW/FFR stakeholders to increase awareness regarding listed species associated with forested habitats that are not covered by the FPHCP, and to promote education regarding: (1) recognizing signs of listed species use and important habitat features; (2) utilizing methods to reduce impacts from forest activities; and (3) implementing measures to benefit listed species.

Endangered Species Act
Section 7 Consultation Biological Opinion
and Section 10 Statement of Findings

And

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Washington State Forest Practices Habitat Conservation Plan

Lead Action Agency:	National Marine Fisheries Service; United States Fish and Wildlife Service
Consultation Conducted By:	National Marine Fisheries Service, Northwest Region
Date Issued:	June 5, 2006
Issued by:	D. Robert Lohn Regional Administrator
NMFS Tracking No.:	2005/07225

Effects of the Action

- A summary of the environmental baseline condition of the parameter at the time activities will be conducted (based on the assumptions stated below);
- A summary of the FPCHP activities that would influence the functional condition of the parameter;
- The reasonably likely change in the condition of the parameter from the activity and how that change relates to the creation and maintenance of aquatic habitat.

While the analysis focuses on habitat effects, some actions will affect habitat or animals in ways that are not readily captured within that framework. For example, worksite isolation using electrofishing designed to minimize effects on salmonids has the potential to wound or kill them. These effects are analyzed within the sections describing road construction and maintenance, and within the fine sediment inputs section since these effects occur during the construction and removal of road-stream crossings.

The next step of the effects analysis is to relate the environmental effects identified in the preceding step to the covered species and to the designated critical habitat. In focusing on the functions in watersheds that create and maintain riparian and aquatic habitat, NMFS assumed that, for time frames relevant to each given effect, individual covered fish would be present to experience the effects, creating exposure of those animals to the identified environmental effects. This is a conservative assumption as some of the effects will be either transitory or distant enough that exposure might not occur at all. Furthermore, in some instances, the FPHCP practice will be sufficient to avoid exposure. However, the scope of the FPHCP and proposed ITP are too large and enduring to derive precise exposure with any specificity. Therefore, NMFS cautiously assumed that covered species would be exposed, wherever the forest practices effects analyzed during this consultation occurred.

Having assumed that individual animals would be exposed to these habitat effects at the scale of individual FPHCP activities (sometimes referred to herein as the "operational unit" scale), NMFS must determine whether animal exposure to effects would cause animal responses to those effects. If species respond to environmental effects, then NMFS must determine whether those responses equate to increased risk of extinction of the affected covered species.

For salmonids, NMFS can conduct this analysis by first examining whether habitat effects in the action area will cause physical or behavioral responses in individual fish will adversely influence certain measures of viable populations including abundance, spatial structure, diversity, and productivity (McElhany et al., 2000). Since the action area for this consultation is far too large to provide a useful level of resolution for analysis of effects on individual animals, NMFS focused the analysis on the operational unit scale. For this consultation, the operational unit represents the size of an average individual harvest unit corresponding to a single Forest Practices Approval. For non-harvest activities (road maintenance, crossing, and abandonment activities), the operational unit represents a reach-length analysis. Using this scale of analysis, NMFS is able to determine the extent of effects on individual fish and assess whether, that extent has any bearing on the populations of fish exposed to those effects.

Effects of the Action

need to be relocated during each fish-salvage operation, some deaths may occur during the handling and transfer process.

While avoiding and minimizing exposure is desirable for minimization of effects, removing fish from work areas has the potential to injure or kill fish, even under Service-approved protocols. Approximately 75 percent of the fish present at the time of worksite isolation will be removed by coarse measures aimed at manually locating and removing fish from the worksite (Nielson 1998). These methods include the use of seines and other nets walked through the worksite. Fish visually observed can be hand netted and moved to stream portions outside of the worksite. Thereafter, electrofishing is used to locate and remove remaining fish. In most, if not all circumstances, capture of fish by electrofishing is attempted only after less harmful methods of fish removal have been used. The FPCHP covers the use of electrofishing for this purpose and the effects are discussed in more detail below.

Electrofishing. Electrofishing is used to move fish during instream projects that require worksite isolation to avoid and minimize exposure of fish to the effects of instream work. Example projects that might require worksite isolation include culvert replacements and stream channel relocation. After isolating and dewatering the work area, workers commonly use electroshocking to locate fish left in the isolated area, remove them to outside the isolated are, and thus minimize construction effects on those fish by eliminating exposure.

Electrofishing is also used to support monitoring and research efforts to quantify fish population abundance and other trends in selected monitoring reaches. Fish population monitoring reaches may be distributed throughout the FPHCP lands. Estimates of fish populations in these reaches may be conducted annually during certain years or may be conducted only periodically (e.g., every 10 years). Surveys may be conducted using standard multiple-pass removal electrofishing techniques, with block nets, or using modified procedures approved by the Services. Densities for each species likely would be calculated in addition to population estimates. Habitat surveys generally would be conducted concurrently.

While avoiding and minimizing exposure is desirable for minimization of effects, removing fish from work areas has the potential to result in permanent, adverse effects to fish, even under Service-approved protocols. In addition to mortality, electrofishing may cause spinal hemorrhages, fractured vertebra, spinal misalignment, and separated spinal column (Hollender and Carline 1994; Dalbey et al., 1996; Thompson et al., 1997; Kocovsky et al., 1997). Differences in injury and mortality rates may be due to the size and/or age of the fish (Habera et al., 1996; Thompson et al., 1997a). Adult fish seem most prone to these injuries. Juvenile fish, on the other hand, may only experience stress from electrofishing. (Nielsen, 1998). Fish injury rates vary due to voltage level used, experience and skill of samplers, duration of capture sequence (i.e. the amount of time taken to complete electrofishing within a sample area), and frequency of sampling through time (years) (Kocovsky et al., 1997). Sublethal effects are not always externally evident in electrofished populations; external examinations may greatly underestimate spinal injuries. Dalbey et al., (1966) indicated that only 2 percent of the captive wild rainbow trout they surveyed had externally visible deformities, but X-ray analysis used to

Effects of the Action

quantify sublethal injuries after nearly one year in captivity indicated 37 percent of the population had been injured. Long-term effects from proposed electrofishing would likely include differences in growth rate and/or body condition in individual fish during variable periods of time after electrofishing (Gatz et al., 1986; Taube 1992; Dwyer and White 1995).

Regardless of the purpose, standard procedures will be followed when electrofishing is conducted to minimize injury to fish or other aquatic organisms. Only trained and experienced professionals will perform electrofishing surveys in the project area. All electrofishing will be conducted in accordance with guidelines developed by NMFS (NMFS 2000, or as they may be revised in the future), and all applicable State and Federal permits will be attained.

Hardwood Conversion. Before no-harvest zones were applied along streams, hardwood (e.g., red alder) or brush stands often replaced harvested conifers in the riparian zone, especially when natural regeneration was common practice. A recent study reported that 30 to 52 percent of the riparian forests along Westside streams currently supporting fish are dominated by red alder (Washington Hardwood Commission 2000).

Hardwoods play a variety of ecological roles in riparian forests. Red alder, for example, is a nitrogen-fixing species. Alders within a stand can contribute to the soil-nitrogen pool and may in some cases improve general tree growth. Alder are also resistant to certain tree diseases. Big-leaf maple (*Acer macrophylum*) and other hardwoods have been implicated in improved nutrient cycling in conifer forests. The easily decomposed litter of these species mixes with and hastens the decomposition of conifer litter, thus increasing the rate of nutrient cycling. Hardwood stands often support a different understory community compared to conifer stands.

Red alder is the dominant hardwood species in western Washington riparian forests, but is short-lived. Stands of alder often begin to senesce at about 60- to 80-years of age. Where riparian stands are dominated by red alder and there is little or no conifer understory, achieving DFC is likely to be delayed for many years beyond the 140-year mature stand target age. Many hardwoods, such as red alder, decay and break up relatively rapidly after falling into channels (Harmon et al., 1986; Newton et al., 1996).

Stand conversion may be employed to restore riparian management zones to more natural functional conditions for riparian and in-stream habitat. Conversion of riparian hardwood or brush stands to conifer stands is often conducted with the intent of enabling more rapid development of stands of mature conifers. Conifers, unlike hardwood sources of woody debris, provide more persistent, LWD once delivered to the stream, enabling longer in-stream function of that LWD in the creation and maintenance of fish habitat.

Generally, stand conversion from hardwood to conifer would only occur in sites that historically, naturally supported mature conifers prior to previous management. Lands that are best-suited for hardwoods will generally remain hardwood stands because they are difficult to convert physically or biologically. Such stands typically occur in western Washington. In western Washington, red alder has proliferated in stands once dominated by conifer, and conversion back to conifer is often considered desirable. In contrast, hardwoods are often a preferred species for will be further minimized by following NMFS and WDFW protocols. The short-term (less than one week) impacts will be offset by the immediate and long-term benefits provided from providing upstream fish passage.

2.1.7.3.7 Worksite Isolation and Fish Locating and Handling. Culvert replacements and in-channel work are not frequent, but they have overall positive benefits. However, removing fish from work areas has the potential to harm and kill fish, even under Service-approved protocols. Dewatering of the work area and removing the fish are common practices used to minimize these impacts. Seines and dip nets will be used as the first method of capture to remove any fish which may be trapped when a stream is dewatered for instream work. The use of seines and dip nets are expected to capture approximately 75 percent of the fish within the section of stream to be dewatered. In most cases, fish will not be injured using this method, although it may disrupt foraging temporarily. In most cases, salmonids are unlikely to be present as projects would be timed and located of to avoid exposure of the most vulnerable life histories. However, salmon and steelhead may in some cases be present as the allowable work windows primarily only limit the work to when listed fish are least likely to be present.

Electrofishing has the potential to harm and kill fish even under Service-approved protocols. In most, if not all circumstances, electrofishing would be attempted only after less harmful methods of fish removal have been used. The actual impact of the capture and handling of salmonids using electrofishing is short-term in nature, occurring intermittently over one to several days. However, it may result in permanent, adverse impacts (i.e., death and injury). Not all flow diversions are likely to result in electrofishing impacts as it may be used only when listed species are least likely to be present in the affected area.

2.1.7.3.8 Relating Environmental Effects to Habitat and Life History. In general, the proposed action will provide for the development of higher functioning in-stream, nearshore, and riparian zone conditions (i.e., suitable substrates, sufficient shade, bank stability, litter inputs, and a continual source of LWD) when effects of the proposed action area added to the environmental baseline. The proposed action will promote a shift in the distribution of habitat conditions towards one of increasing complexity. This will occur principally due to a decrease in the average long-term delivery rate of sediment from roads and timber harvest activities, and from a substantial improvement in riparian buffer requirements. Although the action area is recovering from a long legacy of intensive timber harvest that predates current forest practice rules, the implementation of the proposed FPHCP will promote improvements in habitat conditions from baseline conditions. These improvements will eventually meet the ecological needs of listed species. This continued recovery is vital to fishes in the action area where some populations are severely depressed.

However, the rate of these improvements is likely very different from the rate at which the degraded conditions were created. In essence, there is likely a lag time for attaining certain habitat functions when sediment supply is decreased because of the gradual transport of stored sediment out of the channel. Likewise, a delay in attaining adequate shade and functional LWD inputs is expected, as trees grow to sizes large enough to provide these functions, especially

Incidental Take Statement

from dewatering and worksite isolation is low because herding and restricting re-entry removes most fish prior to dewatering. Eggs and alevins are not expected to be present during work windows associated with this type of in-water work.

20-acre Exemption Parcels. Quantifying incidental take under the 20-acre exemption rule is difficult because of the lack of consistent statewide data on forested parcel ownership. However, the Services performed a coarse analysis (Appendix B) to compare the number of acres harvested annually on 20-acre-exemptiom parcels to all covered FPHCP lands. Based on this analysis, 2.5 percent of the total annual incidental take on FPHCP lands can be attributed to the 20-acre exemption rule.

Injury or Death. Take in the form of injury or death is expected from electrofishing during worksite isolation activities. As stated above, worksite isolation is prescribed for certain in-water work. Worksite isolation reduces the number of fish exposed to construction effects, thus minimizing the effects of the action. Electrofishing isolated water as sites are dewatered is prescribed to identify residual fish in the isolated area so that they can be captured and released outside of the isolated worksite. While this technique is prescribed to minimize the effects of the action, the process can injure or kill fish.

Electrofishing. When electrofishing occurs in type S and type F streams, either as a work-area isolation technique, or in the context of monitoring, injury or death is expected. Spinal and/or hemorrhage injuries from electofishing could affect up to 37 percent of fish found in dewatered stream segments (Thompson et al., 1997; Hollender and Carline 1994). Mortality, either instant or delayed, normally occurs in one to two percent of all fish shocked during electrofishing. Numbers of fish that are anticipated to be electrofished for worksite isolation at the approximately 18,000 stream crossings is expected to be very low at all locations because the routine isolation techniques include herding fish out of, and blocking re-entry to work areas before electrofishing takes place. Only juvenile steelhead, river-type Chinook, and coho are expected to be present in the reaches where in-water work will require electrofishing, as authorized work windows are designed to accommodate outmigration of juvenile ocean-type Chinook and chum. Electrofishing associated with model validation will occur in less than one percent of streams. When fish are discovered, model-validation work would cease; and, therefore, electrofishing would be expected to occur on those streams only once during the life of the permit (50 years). When fish are not discovered, model validation or updating may occur at five-year intervals throughout the term of the HCP.

Not all species present in a WRIA will suffer take. A species must be present, and the specific life history stage must be vulnerable, in a given locale for take from harm, injury and/or death to occur. The most vulnerable lifestages are eggs and alevins, which are not mobile and cannot avoid take-causing conditions. Because authorized work windows are primarily designed to protect the most vulnerable lifestages, and because adult fish have the capacity to swim to alternate locations to avoid many conditions that create harm, such as turbidity, reduced food-source, or lack of cover, it is those juvenile fish that residualize in the areas where work is occurring that are likely to be taken. Take of resident fish, even juveniles, is even less likely to