FP-HCP & Biological Opinions
Abridged for Forest Practices Board
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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

Effects of the Action

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.

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.

Incidental Take
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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 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?

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

Activity Description

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)

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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

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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

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- 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.

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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

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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

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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

Final **Environmental Impact Statement**

For the Proposed Issuance of Multiple Species Incidental Take Permits or 4(d) Rules for the Washington State Forest Practices Habitat Conservation Plan

January 2006

Volume I

FEIS

U.S. Department of Commerce
National Marine Fisheries Service

U.S. Department of the Interior
Fish and Wildlife Service

Preface

Table P-1. Major Changes Made to the Draft FPHCP.

Final FPHCP Subsection	Page # in the Final FPHCP	Summary of Major Changes Made to the draft FPHCP that appear in the final FPHCP
Section 2-1	52	Updates about the cultural resource watershed analysis module and rule package and the Cultural Resources Protection and Management Plan were added.
Section 2-3.6	67	Update on Washington's Water Quality Management Plan to Control Nonpoint Source Pollution (Nonpoint Plan) was added.
Section 2-3.6	69, 70	Update on the annual report of accomplishments in implementing the Nonpoint Plan was added.
Section 2-3.9	72	Added a new section describing WDFW's Hydraulic Project Approval (HPA) process and its relationship with the Forest Practices program. An update on the integration of the forest practices permitting process with the HPA process was also added.
Section 4a-1.3	144	Update on the integration of the forest practices permitting process with the HPA process was added.
Section 4a-3.1	160-166	The section describing DNR's compliance monitoring program was reorganized. New information was added about the preliminary assessment of the RMZ rules including sample size and population; data collection; measurement techniques; sampling unit; sampling method; preliminary assessment results; and preliminary assessment review. The future direction of the compliance monitoring program was updated, including a proposed timeline for rule review.
Section 4a-3.1	163	Added Table 4.1 - Western Washington Type 1 - Type 3 RMZ Preliminary Assessment Results.
Section 4a-3.1	163	Added Table 4.2 - Eastern Washington Type 1 - Type 3 RMZ Preliminary Assessment Results.
Section 4a-3.1	166	Added Table 4.3 - Proposed Forest Practices Compliance Monitoring Timeline.
Section 4a-4	173	Information was added about Schedule L-1 of the FFR and its relationship to the Adaptive Management program. Added information about the process followed if there are changes proposed to resource objectives, performance targets, and research and monitoring priorities.
Section 4a-4.2	176	Information was added about the relationship between the CMER work plan and Schedule L-1, and CMER prioritization of programs.
Section 4a-4.2	178, 179	A summary of two completed high priority CMER studies was added: Type N Stream Demarcation Study and Desired Future Condition Study.
Section 4b	181, 182	Information was added on the role of Schedule L-1 as it relates to the conservation objective of the riparian strategy.
Section 4b-1	182, 183	Update was added on the FPB's action regarding the water typing system - to continue following the original interim rule (WAC 222-16-031) while using new water type maps.
Section 4b-3.3	206	Footnote #1 of Figure 4.7 was added clarifying the lands managed under existing HCPs and the relationship to the lands covered by the FPHCP.
Section 4c	217	Information was added on the role of Schedule L-1 as it relates to the conservation objective of the upland strategy.
Section 4c-2.3	224	Data was added about the number of approved RMAPs from July 2001 to December 2004.

Note: The FEIS describes water typing for Alt 1 Scenario 1 and this description is referenced as the method for the preferred alternative (Alt 2), too, on page 2-39

The Washington Forest Practices Rules pertaining to upland wildlife habitat became effective in July 1996 and were not part of the rules resulting from the FFR. Therefore, these particular rules would not be repealed under Alternative 1-Scenario 2. The rules include special provisions for 1) critical habitats (state-defined) of threatened and endangered species (WAC 222-16-080); 2) northern spotted owl habitats (WAC 222-16-085 and 086); 3) the marbled murrelet special landscape (WAC 222-16-087); 4) planning options for the northern spotted owl (WAC 222-16-100); and 5) cooperative habitat enhancement agreements (WAC 222-16-105). These rules would remain the same under each of the EIS alternatives.

2.3.1.2 Washington Forest Practices Rules and Program – Specific Description

Under No Action Alternative 1, the specific rules and programs to be implemented would vary depending on the scenario. A summary of the rules and programs under each scenario is provided below.

No Action Alternative 1- Scenario 1

With No Action Alternative 1-Scenario 1, the current Washington Forest Practices Rules and the Forest Practices Regulatory Program would be implemented. However, following a No-Action decision by the Services, No Action Alternative 1-Scenario 1 would likely result in a substantial reduction in the non-regulatory elements of the Forest Practices Regulatory Program based on the FFR, particularly over time. Specifically, it is expected that landowner participation in the adaptive management program would cease because the anticipated level of regulatory certainty provided by ESA take authorization or limits would not exist. Because the adaptive management program would be degraded, the pace at which the Washington Forest Practices Rules are improved over time would slow (subsection 1.3.1.2, The Forests and Fish Report).

Water Typing

Under No Action Alternative 1-Scenario 1, water-typing rules would be the same as the current rules. The following three water types are identified:

- Type S: All waters inventoried as Shorelines of the State.
- Type F: Waters not classified as Type S, which contain fish habitat. It also includes some waters diverted for domestic and fish hatchery use.
- Type N: Waters not classified as Type S or F, which are either perennial streams or are physically connected by an above-ground channel system to downstream waters such that water or sediment initially delivered to such waters will eventually be delivered to a Type S or F water. Type N waters include two subcategories: seasonal and perennial streams.

Streams of the State would be classified according to this system by Washington DNR in cooperation with Washington Department of Fish and Wildlife (WDFW) and Ecology, and in consultation with affected Indian tribes. The mapping would be based on a multi-parameter, field-verified Geographic Information System (GIS) logistic regression model. This model would be fish habitat-driven and use geomorphic parameters such as basin size,

opposed to fish-presence driven.

Chapter 2

HCP & BiOps say fish habitat water type maps would be reviewed and updated every 5 years, not the water types.

stream gradient, and elevation. Until these water type maps are available, an interim typing system would be used. Fish habitat water types would be reviewed and updated, as necessary, every 5 years based on observed field conditions.

Riparian Habitat

Under No Action Alternative 1-Scenario 1, the riparian habitat rules would be the same as the current rules. Riparian Management Zones (RMZs) are identified along all Type S and F waters. RMZs are measured horizontally from the bankfull width or from the edge of the Channel Migration Zone, if present. The Channel Migration Zone is defined as the area where the active channel is prone to move and where such movement would result in a potential near-term loss of riparian forest adjacent to the stream. RMZs differ between western and eastern Washington. RMZ dimensions also vary depending on the stream type, the site class of the land adjacent to the typed water, the management harvest option, and the stream size. No-harvest buffers are identified along some Type N waters and Equipment Limitation Zones are identified along all Type N waters.

This section provides a general description of the riparian measures that would remain in effect under No Action Alternative 1-Scenario 1. A detailed description of these riparian habitat components is provided in WAC 222-30-021 and WAC 222-30-022.

In addition to the RMZ requirements identified in this section, Type S waters are given additional protection under the Shoreline Management Act. Restrictions under the Act are implemented and enforced at the county level and include the establishment of a 200-foot Shoreline Management Zone, measured from the ordinary high water mark along Shorelines of Statewide Significance. Typically, a landowner may remove no more than 30 percent of the available merchantable trees within the Shoreline Management Zone, every 10 years using a selective harvest strategy, unless either local government or Ecology grants prior approval.

Western Washington—Type S and F Waters

In western Washington, RMZs for Type S and F waters are divided into three zones along the stream: the core zone is adjacent to the bankfull width or Channel Migration Zone outer edge and is closest to the water, the inner zone is adjacent to the core zone, and the outer zone is adjacent to the inner zone and is farthest from the water (Figure 2-1).

Core Zone. The core zone in western Washington is 50 feet in width. With the exception of approved road crossings and yarding corridors, no timber harvest or construction is allowed in the core zone. Any trees cut for or damaged by yarding corridors must be left on the site. Any trees cut as the result of road construction to cross a stream may be

2.3.2.2 Washington Forest Practices Rules and Program – Specific Description

Alternative 2 is the State's proposed habitat conservation plan, based on the FFR (April 29, 1999), as supplemented by Engrossed Senate and House Bill 2091, and subsequently refined. The groups who contributed to the development of the FFR included State agencies (Governor's Office, Washington DNR, WDFW, and Ecology), Federal agencies (USFWS, NMFS, and EPA), the Colville Confederated Tribes, the Northwest Indian Fisheries Commission, the Washington State Association of Counties, the Washington Forest Protection Association, and the Washington Farm Forestry Association.

Water Typing

Under Alternative 2, water-typing rules would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Riparian Habitat

Under Alternative 2, the riparian rules would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Wetlands

Under Alternative 2, the wetlands rules would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Hydrology

Under Alternative 2, the hydrology rules would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Forest Pesticides

Under Alternative 2, the forest pesticide rules would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description). However, it should be noted the Services would not provide take authorization for the use of forest pesticides as provided in the Washington Forest Practices Rules pending resolution of consultations between the Services and EPA regarding the effects of pesticide applications on listed species.

Unstable Slopes

Under Alternative 2, the rules pertaining to unstable slopes would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Forest Roads

Under Alternative 2, the forest roads rules would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Watershed Analysis

Under Alternative 2, the Watershed Analysis rules would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Upland Wildlife

Under Alternative 2, the Washington Forest Practices Rules pertaining to upland wildlife would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Cultural Resources

Under Alternative 2, the cultural resources rules would be the same as those described for No Action Alternative 1-Scenario 1 (subsection 2.3.1.2, Washington Forest Practices Rules and Program – Specific Description).

Adaptive Management

Under Alternative 2, the adaptive management program would be in the rules as described in WAC 222-12-045 and summarized below. The adaptive management program is more fully described in the FPHCP. The FPHCP addresses the consistency between the State's adaptive management program and Federal ESA requirements. Receiving ESA take authorization through Section 10 of the ESA would provide the anticipated incentive and opportunity for the adaptive management program to be a robust and functionally effective program. FFR participants voluntarily provide technical support to the adaptive management process, as well as forest sites and logistical support for on-going research. Broad stakeholder support and participation in the FFR collaboration would ensure the program has sufficient resources to staff and carryout the anticipated research and monitoring effort. Under this alternative, it is expected that the program would continue to receive public funding as well as broad support and direct participation by stakeholders. The resulting adaptive management program would address, as anticipated, scientific uncertainty and the degree to which the current Washington Forests Practices Rules meet established resource goals and objectives. A description of how the program would function is provided in the following paragraphs.

The adaptive management program was established to produce science-based recommendations and technical information to assist the Forest Practices Board in determining if and when it is necessary or advisable to adjust the Washington Forest Practices Rules and guidance to achieve the performance goal and resource objectives. The Washington Legislature established the adaptive management program as the primary means by which regulations could be modified (subsection 1.3.1.2, The Forests and Fish Report). The adaptive management program has three guiding principles: 1) ensure certainty of change as needed to protect covered resources; 2) ensure predictability and stability of the process of change so that landowners, regulators, and interested members of the public can anticipate and prepare for change; and 3) ensure that quality controls are applied to scientific study design, project execution, and interpreted results.

The performance goal for the adaptive management program is to ensure that forest practices, either singularly or cumulatively, would 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 beneficial uses, narrative and numeric criteria, and anti-degradation (Forests and Fish Report Schedule L-1; WAC 222-12-045 (2)(a)(ii)).

Resource objectives consist of functional objectives and performance targets and are designed to ensure that the aforementioned performance goal is met. Functional objectives are broad statements regarding major watershed functions potentially affected by forest practices. Performance targets are measurable criteria defining specific target forest conditions and processes. Functional objectives and performance targets have been established for water temperature, large woody debris/litterfall, sediment, hydrology, and forest chemical inputs and are listed in Schedule L-1 of the Forests and Fish Report.

The primary components of the adaptive management program include the Forest Practices Board, the TFW/FFR Policy Group, or similar collaborative forum; the CMER Committee; the Adaptive Management Program Administrator; and the Scientific Review Committee. The role of each of these program components is described below.

Forest Practices Board

The Forest Practices Board manages the adaptive management. The Forest Practices Board approves CMER members, establishes key research and monitoring questions and resource objectives, approves research and monitoring priorities and projects, approves CMER budgets and expenditures, oversees fiscal and performance audits of CMER, participates in the dispute resolution process, and considers recommendations from TFW/FFR Policy Group or similar collaborative forum for adjusting Washington Forest Practices Rules and guidance.

TFW/FFR Policy Group

TFW/FFR Policy Group, or a similar collaborative forum, makes recommendations to the Forest Practices Board regarding CMER priorities and projects, final project reports, and Washington Forest Practices Rules and/or guidance amendments. Policy membership is self-selecting and generally includes Washington DNR, WDFW, and Ecology, Federal agencies (including NMFS, USFWS, EPA, and the USDA Forest Service), timber landowners, tribal governments, county governments, environmental interests, and the Governor’s Office.

Cooperative Monitoring, Evaluation, and Research (CMER) Committee

The CMER Committee oversees and conducts research and monitoring related to the established resource objectives. The primary purpose of the CMER Committee is to advance the science needed to support the adaptive management process. The committee conditions and how system biology responds to habitat changes. The CMER Committee has identified four research topics suitable for inclusion in an intensive monitoring program (CMER Work Plan 2004). Currently, scoping is underway to identify critical questions and hypotheses.

Rule Implementation Tools

Rule implementation tools are projects designed to develop, refine, or validate protocols, models, and targets used to facilitate forest practices rule implementation. Two types of rule tool projects have been identified. The first type is known as Methodological Projects. These projects involve the development, testing, or refinement of field protocols and models used in the identification and location of important landscape features such as water type breaks, unstable slopes, and sensitive sites. The second type is known as Target Verification Projects. Projects in this category are designed to assess the validity of performance targets thought to have an uncertain scientific foundation such as the DFC basal area targets for RMZs. The CMER Committee has identified nine rule implementation tool sub-programs consisting of 23 projects (CMER Work Plan 2004). The CMER Committee and Washington DNR have agreed to assign management and oversight of rule implementation tools to Washington DNR Forest Practices Division. Washington DNR advises the CMER Committee on project priorities and provides regular status reports for ongoing projects.

A detailed discussion of the effect of varying levels of support for adaptive management program is found in Chapter 4 (Environmental Effects).

2.3.3 Alternative 3 (Implement a Conservation Plan with a NMFS Section 4(d) Limit 13 Approval and USFWS Section 4(d) Take Exemption)

2.3.3.1 General Description

Under Alternative 3, NMFS, consistent with it regulations (65 FR 42422), would issue a finding that the regulations adopted by the Forest Practices Board are at least as protective as the elements of the FFR and are consistent with the conservation of listed salmonids. With such findings, the take prohibitions would not apply to non-Federal and non-tribal forest management activities in Washington under 50 CFR 223.203(b)(13) (ESA Section 4(d) Limit 13). The NMFS Section 4(d) rule is described in more detail in subsection 1.2.3.2 (ESA Section 4). Alternative 3 would also include the development and adoption of an ESA Section 4(d) rule by the USFWS to authorize take of bull trout. Take authorization under this alternative differs from Alternatives 2 and 4 in terms of species covered and duration. Take coverage under ESA Section 4(d) can only extend to species currently listed as threatened, and only to those species specifically addressed in the rule. This alternative, therefore, addresses only the take of threatened species in portions of seven Evolutionarily Significant Units (ESUs) in Washington State (Table 1-1; Table 3-20; Figures 3-3 through 3-8). Unlike Alternative 2 or Alternative 4, fish and amphibian species not listed as threatened would not be covered. In addition, this alternative would not cover endangered species (e.g., Upper Columbia River Spring Chinook salmon, Upper Columbia River steelhead, and Snake River sockeye salmon), or Snake River steelhead, Snake River Spring/Summer Chinook and Snake River Fall Chinook, which are listed as

3.8 FISH AND FISH HABITAT

3.8.1 Introduction

Fish are an important natural resource with both biological and economic significance in the State of Washington. In particular, Pacific salmon and trout, as well as other fish species, are indicators of a properly functioning aquatic ecosystem because they require cool, clean water, complex channel structures and substrates, and low levels of silt (Bjornn and Reiser 1991). In addition, Pacific salmon and trout support economically important commercial and sport fishing industries, as well as subsistence fishing by many Washington Indian Tribes.

This section discusses the fish species in Washington and their habitats. A complete list of all species that are intended to be "covered" by the FPHCP is provided in Table 1-1. Chapter 3 of the FPHCP presents life history and status information for all of these species. Those fish species with the more critical Federal status of "endangered" or "threatened" are given the most attention within this section; however, other fish species with less critical Federal or State status are also described. Further, this section describes important components of the aquatic environment that fish require and that forest practices may effect. These components include water quality, water quantity, channel conditions, LWD, channel morphology, and fish passage.

The following subsections emphasize the affected environment for fish species on State and private lands within Washington State, which are regulated by Washington Forest Practices Rules. The discussion contains a review of fish distribution and status within the 12 analysis regions defined in subsection 3.1 (Introduction). This section also contains a review of important components of the aquatic ecosystem upon which fish rely for sustaining healthy, well-dispersed populations.

3.8.2 Fish Status in Washington

More than 70 species of freshwater fish are present in the more than 8,000 lakes and 50,000 miles of streams within Washington (Wydoski and Whitney 2003). Generally, at least one fish species is found in perennial streams with gradients less than 20 percent (Fransen et al. 1997). Occasionally, fish are found in streams with steeper gradients, but these circumstances are less common. Land-use practices upstream of fish-bearing waters can affect downstream fish habitat. Consequently, the affected environment for fish includes both fish-bearing and non-fish-bearing streams.

Two of the four goals of the Forest Practices Board for the Washington Statewide Salmon Recovery Strategy (Washington Forest Practices Board 1999) have special reference to fish and forestry interactions. One of the goals is to provide compliance with the Endangered Species Act (ESA) for aquatic and riparian-dependant species on all lands subject to the Forest Practices Act. A second goal is to restore and maintain riparian habitat on these forestlands to support a harvestable supply of fish.

Notably, NMFS has not listed any Pacific salmon or trout species as threatened or endangered throughout their entire range, because many populations within the entire range

3.8.4.6 Floodplains, Off-Channel Habitats, and Hyporheic Zones

Floodplains and off-channel areas are an important component of aquatic habitat that includes side channels, backwater alcoves, ponds, and wetlands. They provide important habitat seasonally to particular life stages as well as input of organic matter and LWD. Seasonally flooded channels and ponds are particularly important for rearing coho salmon and other fish species during winter months. Large floodplains can also function as filters for subsurface flows and maintenance of water quality (Gregory and Bisson 1997). Some backwater alcoves and ponds result from groundwater seeps and may have shade levels higher than the main channel. These areas provide cool water refugia during high summertime temperatures. Major floodplains in the planning area generally are located in the lowest reaches of major rivers. Beavers can play a substantial role in the development of ponds and wetlands important as habitat for salmon and trout, particularly for juvenile coho salmon (Cederholm et al. 2001; Pollock et al. 2001).

Hyporheic zones (the saturated sediment region under and along streams) are often the connections between groundwater and surface water in these habitat areas and often supply substantial habitat for hyporheic organisms such as insects, bacteria, and fungi (Edwards 1998; Naiman et al. 2000). The presence of a hyporheic zone is most often associated with the alluvium below the stream and in the floodplain adjacent to streams. Nutrients and organic matter is processed in this zone by bacteria and other organisms (e.g., invertebrates, specialize insects, and crustaceans) (Boulton et al. 1998). Where this water surfaces it may be high in nutrients producing locally high primary production areas (Edwards 1998; Boulton et al. 1998). The overall exchange of organisms and effects on stream production is not well known, and in most systems may be relatively minor; however, it could be more important in some floodplain habitats (Boulton et al. 1998). In dry summer months or during floods this zone may provide a refuge for some aquatic organisms (Boulton et al. 1998). Substrate porosity may affect its function and size, but the relationship is not clear (Boulton et al. 1998).

3.8.4.7 Water Temperature

Water temperature plays an integral role in the biological productivity of streams. Water temperature fluctuations and their relationship to dissolved oxygen can affect all aspects of salmon and trout life histories in fresh water including:

- incubation and egg survival in stream gravel;
- emergence, feeding, and growth of fry and juvenile fish;
- outmigration of young fish;
- adult migration, holding and resting; and
- prespawning and spawning activities.

A rise in temperature increases the metabolic rate of aquatic species. Consequently, more energy is required, even during periods of low activity. In addition, dissolved oxygen decreases as water temperature increases, potentially increasing stress on fish. Water temperatures in the range of 70°F (21°C) or greater can cause death in cold-water species such as salmon and trout within hours or days (Oregon Department of Environmental

Not the selected alternative.

The likelihood of correcting barriers to fish passage under No Action Alternative 1-Scenario 2 is low. This is because continued management-related inputs of coarse sediment are likely to produce aggraded channel conditions in some locations. Further, it is because the water typing system is less likely to properly identify fish-bearing streams, and the lack of RMAPs would not ensure all road-related barriers to fish passage are corrected.

The likelihood of correcting barriers to fish passage under No Action Alternative 1-Scenario 1 and Alternatives 2 and 3 is high. This is because these alternatives would reduce management-related inputs of coarse sediment that could aggrade channels, improve the identification of fish-bearing waters through the development and implementation of a new water typing system, and correct all road-related barriers to fish passage by 2016 through the implementation of RMAPs.

The likelihood of correcting barriers to fish passage under Alternative 4 is slightly higher than under No Action Alternative 1-Scenario 1 and Alternatives 2 and 3, and substantially higher than under No Action Alternative 1-Scenario 2 because it accelerates the schedule for implementing RMAPs and requires a cap on road densities. Like No Action Alternative 1-Scenario 1 and Alternatives 2 and 3, it also reduces management-related inputs of coarse sediment that could aggrade channels and implements a new water typing system.

Detailed Effects Analysis

Concerns for fish passage on commercial forestlands usually refer to passage through culverts at stream crossings. Culverts as barriers to fish passage are also a well-documented problem on Federal lands in the Pacific Northwest (U.S. General Accounting Office 2001). Reduced fish passage or complete blockages at culverts are usually the result of undersized culverts or culverts with water velocities too high for their length, sub-optimal placement relative to stream gradient and vertical drop, and lack of downstream holding pools (Hicks et al. 1991). However, other factors such as blockages caused by elevated stream temperatures, aggraded channel conditions, high suspended sediment levels, and loss of step-pool habitat can also restrict fish passage (Furniss et al. 1991; Washington Department of Ecology 2002a).

Historically, concerns were raised about large log jams and excessive stream loading from logging slash and debris that was left in streams, affecting fish passage that led to stream cleaning programs in some western states (Maser and Sedell 1994). However, the concerns over passage at log jams were minimized, and some stream cleaning programs were found to be detrimental. Consequently, resource agencies are now more careful about permitting or requiring LWD removal from streams.

Salmon and trout have a powerful instinctual desire to move upstream during spawning migrations, which leads them to pass seemingly insurmountable obstacles such as waterfalls. However, biological and physical limitations can restrict their movements. These limitations include burst swimming speed and duration, leaping ability, and water velocities and depth (Furniss et al. 1991; Bjornn and Reiser 1991; Dane 1978). Factors

Alt 2 = HCP

The likelihood of correcting barriers to fish passage under No Action Alternative 1-Scenario 2 is low. This is because continued management-related inputs of coarse sediment are likely to produce aggraded channel conditions in some locations. Further, it is because the water typing system is less likely to properly identify fish-bearing streams, and the lack of RMAPs would not ensure all road-related barriers to fish passage are corrected.

The likelihood of correcting barriers to fish passage under No Action Alternative 1-Scenario 1 and Alternatives 2 and 3 is high. This is because these alternatives would reduce management-related inputs of coarse sediment that could aggrade channels, improve the identification of fish-bearing waters through the development and implementation of a new water typing system, and correct all road-related barriers to fish passage by 2016 through the implementation of RMAPs.

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Salmon and trout have a powerful instinctual desire to move upstream during spawning migrations, which leads them to pass seemingly insurmountable obstacles such as waterfalls. However, biological and physical limitations can restrict their movements. These limitations include burst swimming speed and duration, leaping ability, and water velocities and depth (Furniss et al. 1991; Bjornn and Reiser 1991; Dane 1978). Factors that affect burst swimming speeds and duration include fish size and condition. Larger fish can swim faster and fish approaching senescence have reduced capacity or require longer rest periods between bursts (Bjornn and Reiser 1991; Powers and Orsborn 1985). Leaping ability is a combination of swimming speed and the availability of suitably sized pools from which to leap. Optimally sized pools allow fish to reach maximum speed at the proper angle to make the leap (~~Watts 1974;~~ Baker and Vatapka 1990; Powers and Orsborn 1985). Swimming speeds and water velocities determine the length of pipe through which a fish can successfully maneuver (Washington Department of Fish and Wildlife 1999a; Baker and Vatapka 1990).

Culverts become barriers when their physical characteristics exceed the capacity of fish biology. Barriers can occur to both juveniles moving upstream and downstream and adults moving upstream. Common problems include perched outlets with unsuitable leaping pools, culverts that become dry during summer months, culverts that are too long, culverts with high gradients resulting in high water velocities, and culverts with inadequate resting places (Furniss et al. 1991; Baker and Vatapka 1990). In addition, undersized or poorly constructed culverts that blowout during peak flows can become obstacles until fixed.

Also, debris flows are considered the primary blockage of upstream passage on streams when they trap large amounts of sediment (Bryant 1983). Debris flows caused either from culvert outwash, road failure, or hillslope debris slides could cause this type blockage. High bed sediment load in streams has also been found to cause areas to go dry during some flows restricting migration at least temporarily (Hartm~~e~~an et al. 1996~~5~~). High temperatures or high suspended sediment loads also can cause temporary blockages (Newcombe and MacDonald 1991; Whitman et al. 1982; Lloyd 1987; Hicks 2002; Washington Department of Ecology 2002a).

As noted earlier, the assumptions used in deciding whether a stream is fish-bearing are critical in evaluating whether existing stream crossings are adequate to supply fish passage. The stream classification system used among the alternatives would affect this determination.

No Action Alternative 1-Scenario 2

The January 1, 1999 Washington Forest Practices Rules water classification system would be used under this alternative. It had the five follwing categories:

- Type 1: All waters inventoried as “Shorelines of the State”; highly productive fish-bearing waters
- Type 2: Highly productive fish-bearing waters not designated as Type 1 streams
- Type 3: Fish-bearing waters with moderate to slight fish use
- Type 4: Perennial non-fish-bearing streams
- Type 5: Generally seasonal non-fish-bearing streams

Numerous additional water typing criteria based upon channel width, gradient, flow, size of impoundment (if present), and level of domestic use are utilized to categorize a stream

(WAC 222-16-030). Recent checking of this classification system has shown that many fish-bearing waters were untyped or mistyped as non-fish-bearing waters. However, the interim typing system in the current Washington Forest Practices Rules, which accounts for much of this mistyping, is assumed to continue even under No Action Alternative 1-Scenario 2.

Under No Action Alternative 1-Scenario 2, the interim water typing criteria would continue to be used, and there would be no systematic upgrade of culverts with fish passage problems. Some culverts would be identified and fixed as part of Watershed Analysis, but Watershed Analysis is voluntary for private landowners. Consequently, problem culverts could remain barriers until a forest practices application was received for a nearby harvest, or the State identified the problem through a State-sponsored Watershed Analysis. Based upon the forest practices application or Watershed Analysis, Washington DNR could then require repair or replacement of problem culverts. WDFW could also require correction of blocking culverts under its own Hydraulic Project Approval authority, or work cooperatively with landowners and funding entities to correct problem culverts.

No Action Alternative 1-Scenario 1 and Alternatives 2 and 3

No Action Alternative 1-Scenario 1 and Alternatives 2 and 3 would require new stream typing systems that would increase the accuracy of fish-bearing stream identification and would expedite correction of fish passage problems.

Under No Action Alternative 1-Scenario 1 and Alternatives 2 and 3 a new stream typing system would be implemented for State and private forestlands (DEIS Appendix B). The new system would include:

- Type S: All waters inventoried as "Shorelines of the State"
- Type F: Waters not classified as Type S, which contain fish habitat
- Type N: Waters not classified as Type S or F, which do not contain fish habitat and are either perennial streams (Type N_p) or seasonal (Type N_s)

HCP & BiOps say corrections by field observation are to be accomplished by ID Teams using non-lethal methods.

Identification of Type F waters would occur using a model, currently under development, that is likely to be based on stream gradient, drainage size, and other factors. Type F waters are likely to include all streams currently categorized as Type 2 and Type 3, plus a portion of Type 4 streams. Errors in stream types from the model can be corrected based upon field observations. Implementation of the new model is expected to substantially increase the total miles of streams classified as fish habitat and would thus, necessitate that fish passage is provided for all life stages of fish on those streams, a substantial improvement over No Action Alternative 1-Scenario 2.

Under No Action Alternative 1-Scenario 1 and Alternatives 2 and 3, landowners would be required to upgrade road networks to current standards by 2016, and large forest landowners must prepare an RMAP for their entire property by December 2005. Included in the Washington Forest Practices Board Manual are flow criteria for a given culvert length and fish species, and specific requirements for prioritizing roadwork based upon fish passage (Washington Forest Practices Board 2001b). Passage criteria for fish through culverts appear adequate for most species and life stages when compared to criteria reported by Powers and Orsborn (19854). However, water velocity criteria for trout are 50 to 100 percent higher than criteria reported in Powers and Orsborn (1984). Consequently, passage protection may not be adequate under all circumstances for trout. In combination, the new plan, passage criteria, and stream-typing system should result in substantial improvements in fish passage within the next 15 years under No Action Alternative 1-Scenario 1 compared to No Action Alternative 1-Scenario 2. No Action Alternative 1-Scenario 1 and Alternatives 2 and 3 do not require upgrades to all culverts. Upgrades would be required based upon the effect of a culvert on public resources. If no negative effects are present from a culvert, then the culvert would not require replacement until the end of its life.

Alternative 4

Alternative 4 would also require new stream typing systems that would increase the accuracy of fish-bearing stream identification and would expedite correction of fish passage problems. Alternative 4 would implement a new stream typing system based upon geomorphic characteristics:

- Type 1: Less than 20 percent gradient; all fish-bearing streams and other channels are considered important for fish
- Type 2: 20 to 30 percent gradients; channels are considered important for coarse sediment storage and as sources of LWD
- Type 3: Greater than 30 percent gradient; channels are considered prone to channelized landslides and as sources of LWD

Alternative 4 also includes road plans, but upgrades would be required by 2011. In combination, the new plan, passage criteria, and stream-typing system should result in substantial improvements in fish passage within the next 10 years under Alternative 4, with the largest amount of restoration occurring in eastside forests.

Alternative 4 does not require upgrades to all culverts. Upgrades would be required based upon the effect of a culvert on public resources. If no negative effects are present from a culvert, then the culvert would not require replacement until the end of its life.

In summary, as noted above, while culverts are the major factor potentially affecting fish passage related to forest practices, other factors including suspended and bedload sediment, and high water temperatures may affect fish passage or migration. Generally the relative rank of the alternatives for passage would follow that for coarse sediment, fine sediment, and water temperatures. Those alternatives with the highest likelihood of reducing management-related inputs of these parameters would be expected to have the highest likelihood for correcting fish passage barriers. The result would be that No Action Alternative 1-Scenario 2 would have the lowest likelihood for improvement while Alternative 4 would have the highest likelihood for improving fish passage conditions. No Action Alternative 1-Scenario 1 and Alternative 2 and 3 would be intermediate between these two.

Appendix B of the FEIS Vol I has a lot of reference to the water typing systems. The appendix states that Alternative 2 (HCP) would not use the interim rule, but this was a technical appendix written by an excellent technical author/analyst who does not hold decision authority in any relevant agency/organiziation. Thus, the appendix is not likely the place to look for clarity on policy thresholds. This note serves to point the interested reader to App B should it be relevant to your needs.

The following terms were not used in the FEIS Vol I or II:
electrofish,
electroshock,
protocol survey.

Final **Environmental Impact Statement**

For the Proposed Issuance of Multiple Species Incidental Take Permits or 4(d) Rules for the Washington State Forest Practices Habitat Conservation Plan

January 2006

Volume II
Response to Comments

U.S. Department of Commerce
National Marine Fisheries Service

U.S. Department of the Interior
Fish and Wildlife Service

provided without the 50-year term. Further discussion of the term can be found in the Adaptive Management response, Term Duration (subsection 3.5.2).

At least one commenter advocated an alternative that would combine Alternative 1-Scenario 1 with limited funding for adaptive management. The Services point out that Alternative 1 – Scenario 1 included an adaptive management program, but "functionally the program would be reduced." The Services believe the effects described are consistent with the suggestion of the commenter.

At least one commenter believed one alternative should have included "guaranteed" funding provisions. The Adaptive Management response, Adequate Funding (subsection 3.5.13), includes information about the feasibility of the applicant to "guarantee" future funding; within the State, one Legislature cannot bind the decisions of a future Legislature.

At least one commenter believed that the alternatives failed to consider the effects of regeneration of forests after harvest. The Services do not agree. Many mitigation measures rely on the regeneration of the forest over time and were described in Chapter 4 of the Draft FPHCP and Chapter 4 of the DEIS.

3.3.2 Alternative 1

During scoping of the DEIS, the Services received comments related to reasonable certainty that the Washington State Legislature would react to a failure to receive incidental take authorization under the No Action Alternative. At the same time, another group of interested persons believed it was reasonably certain that the Legislature would take no action whatsoever. The Services determined that these two positions warranted analysis under an assumption of "no action." They are described in Chapter 2 of the DEIS. Alternative 1 is the No Action Alternative. Scenario 1 of Alternative 1 assumes, literally, that no affirmative actions would be taken following a decision by the Services to not issue incidental take authorization. Scenario 2 of Alternative 1 assumes that the failure to receive incidental take authorization would result in a reaction by decision-makers to the failure to receive Federal assurances.

Several commenters opposed Alternative 1 because it would impede the adaptive management program and delay or halt progress toward resolution of various scientific uncertainties. Commenters were concerned about a halt to ongoing research dealing with water typing, landslide hazard zonation, and riparian function. At lease one was concerned about the potential reduction in educational and outreach efforts to protect cultural resources. A number of commenters opposed Alternative 1 because it was not consistent with the FFR. At least one felt that stakeholder support for the Alternative 1 – Scenario 1 should be described as "low" rather than "moderate." Several commenters noted that Alternative 1 would increase costs and reduce regulatory certainty, encouraging landowners to unilaterally seek a regulatory scheme that allowed the harvest of more trees or result in little support for funding road improvements, conservation easements, or other resource-oriented initiatives. The Services have noted each of these comments in opposition to Alternative 1.

Tribes find useful. In addition, extensive monitoring may not evaluate all parameters of interest to particular Tribes. This reinforces the need for local tribal ambient monitoring at the usual and accustomed watershed scale. The Services agree that ambient monitoring by individual Tribes can make important contributions to the adaptive management program.

3.5.8 Intensive Monitoring

One commenter recommended that one of the goals of intensive monitoring be to determine statistically significant trends and changes in water quality and aquatic habitat. Also, will the Washington Forest Practices Rules' effects on stream temperature, sediment yield, and hydrology result in the Washington Water Quality Standards being met? Will these objectives be met through the Intensive Monitoring Program?

In response, the FPHCP's adaptive management program has four components: (1) rule implementation tool development, (2) validation and effectiveness monitoring, (3) extensive monitoring, and (4) intensive monitoring. Each component has a specific purpose or goal. The goal of the rule implementation tool component is to develop scientifically based tools and guidance to facilitate forest practices rule implementation in the field. An example of a rule implementation tool is the Geographic Information System (GIS)-based water typing model currently under development.

The goal of the validation and effectiveness monitoring component is to determine if established performance targets for different geomorphic inputs (e.g., large wood, temperature, sediment, or hydrology) are appropriate and to determine if protection measures are effective in achieving those targets. For example, validation monitoring might address the question "*Is limiting road sediment inputs to 50 percent over background adequate to protect in-stream uses*" while effectiveness monitoring would address the question "*Are road maintenance and abandonment practices limiting road sediment inputs to 50 percent over background?*".

The goal of extensive monitoring is to evaluate the status and trends of key environmental parameters at a statewide scale. For example, the implementation of better management practices on covered lands should lead to reduced sediment inputs and greater retention of riparian cover. Together, these factors should result in the recovery of thermal regimes within forested watersheds throughout the State due to improved channel conditions (i.e., narrowing and deepening) and higher shade levels. Extensive monitoring is designed to test this hypothesis by monitoring stream temperatures at multiple locations throughout the State. The number and location of monitoring sites is intended to be representative of conditions across covered lands so results can be extrapolated to watersheds with similar vegetative and geomorphic conditions.

The goal of intensive monitoring is to determine if implementation of the full range of FPHCP protection measures is preventing cumulative watershed effects. While other monitoring components evaluate individual protection measures and performance targets, intensive monitoring will evaluate the integration of multiple protection measures to assess their effects on instream conditions at the watershed scale. While the intensive monitoring component of adaptive management is still under development, it is likely successfully converted to conifers. The Washington Forest Practices Rules also require DNR to track hardwood conversion activities and identify areas with susceptible to high rates of conversion.

Several commenters were concerned about the direct, indirect, and cumulative effects of hardwood conversions on stream productivity. The Services believe that hardwood-dominated riparian stands probably will not achieve DFC without active intervention. The Services also recognize that there are uncertainties about the effectiveness of hardwood conversions in re-establishing conifers and the effects of conversions on shade, stream temperature, and LWD recruitment. To reduce these uncertainties, the FPHCP's adaptive management program has a Hardwood Conversion project, which is currently underway.

One commenter asserted that alternate plans, under the rubric of hardwood conversions, have caused significant losses of riparian vegetation on many streams. The commenter did not provide supporting data, nor are the Services aware of information that supports this assertion. According to DNR, there have been approximately 200 approved alternative plan forest practices applications, out of more than 25,000 approved forest practices applications since January 1, 1999, when the current Washington Forest Practices Rules were implemented. Only a small portion of the 200 alternative plans have been related to hardwood conversions. The resource protection standard is the same for alternative plan forest practices applications as it is for regular forest practices applications. The difference is that hardwood conversions may result in short term riparian degradation, in exchange for long term improved functions as a result of converting a hardwood-dominated area to a conifer dominated area. Furthermore, all alternative plans are reviewed through an open, collaborative interdisciplinary team process. DNR gives considerable weight to the team recommendations when approving or disapproving alternative plans.

Several commenters are concerned that DNR has not defined "habitat." In fact, fish habitat is defined in the FPHCP as 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 off-channel habitat (WAC 222-16-045). Wetlands and other waterbodies may be defined as fish-bearing habitat if they meet the criteria provided in the Rule. To map the initiation point of fish-bearing habitat, CMER's Instream Scientific Advisory Group is developing and validating a GIS-based model to predict the upstream extent of fish habitat.

A related comment mentioned violations of Washington Forest Practices Rules in regard to harvesting in forested wetlands. In response, violations of the Rules, including inappropriate levels of harvest in fish-bearing habitat, would be subject to enforcement actions.

A number of commenters raised the concern that current DFC targets are inadequate. Suggestions were made to supplement the basal area per acre targets with other parameters, such as Quadratic Mean Diameter, Volume, Trees Per Acre, and/or Relative Density. A recent CMER study on the validation of DFC targets (CMER 2005) evaluated alternative target metrics on the basis of their ability to characterize stand interim water typing system, the use of map-based site class to determine RMZ widths, and the use of default basin sizes when estimating the Type Np network length. The adaptive management research noted by the commenter was conducted by CMER. The TFW/FFR Policy Group made recommendations to the Forest Practices Board and the Board may change specific rules in response. Until the Board acts, the interim water typing system, map-based site classes, and Type Np default basin sizes are required.

Another comment included above relates to the Perennial Initiation Point (PIP) survey work performed within the adaptive management program. The commenter notes that "*the differences in channel length between the upstream end point of perennial flow and the channel head are similar between the Eastside and Westside regions and relatively short within all regions surveyed.*" In response, this statement accurately reflects the results of the PIP surveys, which generally found that the basins represented by the upstream extent of perennial flow were substantially smaller than the default basin sizes included in the Washington Forest Practices Rules. The Forest Practices Board is currently considering these findings, as well as those that resulted from the tribal PIP data collection effort.

Another commenter stated the Type N Stream Demarcation studies (Palmquist 2003; Pleus and Goodman 2003), generated by the adaptive management program and the Northwest Indian Fisheries Commission, directly affect the Critical Area Calculations in the FPHCP. Both of these studies clearly invalidate the FFR default basin areas for Type Np waters in both eastern and western Washington, used in the DEIS Water Type Modeling approach (Appendix B), to calculate Critical Areas for estimating effects in the Minimal Effects Strategy in the FPHCP (FPHCP Appendix K; FPHCP Chapter 4e; DEIS Appendix B). The commenter concluded that this significant underestimate in Type Np channel length was not accounted for in the Critical Areas Estimates for the Minimal Effects Strategy in the FPHCP for estimating effects.

The Services note that DNR did not use the Type N study data because it has not been fully considered within the adaptive management process. The Palmquist (2003) and Pleus and Goodman (2003) studies have been reviewed by the Scientific Review Committee and have been approved by CMER; and the TFW/FFR Policy Group has made a recommendation to the Forest Practices Board. The Board has not yet acted on the recommendation. Until then, the current default basin sizes will remain in the Washington Forest Practices Rules. However, landowners do not always use the default basin sizes to define the Type Np/Ns break. The degree to which landowners use the default basin sizes versus field indicators to define the Type Np/Ns break is unknown. Therefore, rather than speculate about how the Type Np/Ns break is being defined across the landscape and the associated effects on Type Np stream length, DNR decided to use the current default basin sizes as a consistent means of estimating the extent of the Type Np network in the FPHCP Critical Areas Calculations.

3.6.5 Type N Stream Buffers

Commenters were concerned about the amount of protection afforded Type N streams by the FPHCP. The commenters noted that Type N channels are significant sources of sediment, they are sensitive to disturbance, and the time required for recovery is the protection measures and make adjustments where necessary to meet the FPHCP objectives.

3.6.6 Critical Area Calculations

Several commenters suggested the critical areas riparian acreage estimates were artificially inflated in the FPHCP Strategy, and significantly under estimated in the Minimal Effects Strategy. The commenter also suggested the riparian modeling methods are inconsistent with Forest Practices Board Manual language regulating timber harvesting in RMZs on Type F waters in eastern and western Washington as outlined in WAC 222-030-021. The commenter also suggested the total length of Type Np waters (Type 4) as a proportion of the entire channel network is underestimated on the DNR HYDRO maps, and this underestimate results in a flawed comparison in riparian protections between the Minimal Effects Strategy and the FPHCP Strategy. Finally, the commenter was also concerned that the methods did not address the Type N demarcation studies (Palmquist 2003; Pleus and Goodman 2003), which indicate that Type Np channels constitute the majority of the channel network in watersheds across FFR lands.

In response, the critical area calculations in the FPHCP Critical Areas assessment are not based on overestimates of RMZ width by site class. Tables 4.2 through 4.7 in the FPHCP list RMZ widths by site class, as required by the Washington Forest Practices Rules. The critical area calculations are based on these widths. The commenter may be equating the term “RMZ” with “no-harvest buffer.” Nowhere in the FPHCP are Type S and F RMZs described as no-harvest zones. Sections 4b-3.1.1 and 4b-3.2.1 of the FPHCP describe RMZ requirements for Type S and F waters in detail. These descriptions clearly indicate that harvesting is allowed in at least one (outer) and sometimes two (outer and inner) of the three zones that comprise the RMZ.

The Critical Areas assessment used the same water type lengths reported in the DEIS. Rather than using the DNR HYDRO layer, the DEIS used GIS technology to model a new hydro layer based on the current interim water typing rules. For the non-fish-bearing portion of the channel network (i.e., Type Np and Type Ns waters), the modeling used the default basin sizes cited in the Washington Forest Practices Rules as a means of identifying the upstream extent of perennial flow (i.e., the Type Np/Ns break). While the default basin sizes are only used to type waters when the Type Np/Ns break cannot be reliably identified using field indicators, they represented the only quantitative means of estimating Type Np and Type Ns stream lengths using GIS that is consistent with current Washington Forest Practices Rule requirements.

Another commenter stated it’s crucial that the estimated critical areas calculations under the FPHCP are an accurate reflection of the riparian prescriptions required for timber harvest under the Washington Forest Practices Rules (WAC 222-30-021). The commenter stated this is clearly not the case with the FPHCP as it claims to protect a percentage of critical areas greater than the actual Washington Forest Practices Rules and regulations require under WAC 222-30-021. Under the FPHCP (FPHCP Table 4.13) the calculation used to determine the proportion of critical areas (acreage) protected in RMZs for Type F waters are based on gross overestimates of RMZ width by Site Class (WAC 222-030-021). The Critical Areas estimates provided under the FPHCP (FPHCP Table which will further address these issues. Further, approval of an HCP includes the issuance of an ITP to the applicant, in this case from each of the Services, which implies that some take may occur incidental to otherwise lawful actions. The legal requirements for the issuance of an ITP are the same no matter who applies for an HCP. The specific compliance plans and programs are spelled out in several areas within both the DEIS and the FPHCP. Chapter 4 of the FPHCP describes the overall structure and processes within the Forest Practices Regulatory Program and the role of cooperating agencies and organizations. Specifically, Section 4a-3.1.3 of the FPHCP addresses Compliance and Enforcement of the Washington Forest Practices Rules including compliance checks of ongoing forest practices, compliance monitoring, and enforcement. Likewise, the DEIS also specifically addresses the compliance plans and programs of the Forest Practices Regulatory Program in Chapter 2.

The Services believe that sufficient information exists within both the FPHCP and the DEIS regarding the overall effects of the proposed action on specific species as well as the effectiveness of the compliance plans and programs in order for the Services to make an informed decision regarding the State's applications. However, the FPHCP's compliance monitoring information has been updated in the Final FPHCP.

3.17.9 Water Typing

One commenter expressed concerns that the water typing system is an interim system and is still in development. Another questioned the statistical accuracy of the model.

The Services note that the interim water typing system was originally put into place via emergency Washington Forest Practices Rules in late 1996. The new, permanent model-based water typing system has been delayed due to concerns over model validation and other concerns. The Services are involved in the technical and policy discussions to resolve the development and use of the model-based system. However, the Services are aware that whatever the outcome, the water typing system requires identifying fish habitat and protecting habitat accordingly.

One commenter stated that Section 4b-1 and 4b –1.1 of the FPHCP need to be updated to reflect the current status of the water typing rule, since landowners are currently under a modified interim Rule, using the new maps (westside) as a base map and following the provisions of the original interim Rule. The commenter also suggested the FPHCP should focus on water typing policy objectives, rather than quote specific Rules and how those objectives will be met (e.g., use of interdisciplinary teams, etc.), since it is important for the Forest Practices Board to have latitude to adopt new or amend existing WACs, if necessary to achieve policy goals.

The Final FPHCP has been updated to reflect the current status of the Water Typing Rule. However, the description of the Water Typing Rule in the Final FPHCP reflects the current rule language. This in no way prevents the Forest Practices Board from adjusting rules if necessary to meet policy goals. Adaptive management is fully incorporated into the FPHCP and allows for rule adjustment to meet policy goals.

Another commenter suggested the proposed water typing model doesn't account for the fact that "'end of fish use" can change significantly on an annual basis.

Response to Comments

The Services note that the adaptive management program is conducting research to determine the extent to which fish use may or may not vary seasonally and annually, and how determining fish-use variability may be used to determine the upper extent of fish habitat. These studies are being conducted in an effort to field validate the water typing model. Preliminary results from eastern Washington indicate little annual variability. Seasonal variability may be greater in some cases. Western Washington research is scheduled for 2006. These studies will be ongoing in order to estimate the extent to which fish use and fish habitat are related. Once these studies are completed, the CMER Committee will forward peer-reviewed reports to the TFW/FFR Policy Group for consideration. The TFW/FFR Policy Group will determine, based on the study findings, if recommendation(s) to the Forest Practices Board for changes to Rules, guidance and/or model implementation procedures are warranted. In the mean time, new western Washington water-type maps, resulting from the water typing model, are available for use. However, the interim water typing rule (WAC 222-16-031) used to define types has not changed. New eastern Washington maps are scheduled for release in March 2006.

One commenter suggested the DNR water type maps are inadequate because they do not include floodplain areas that are vital over-wintering habitat for coho salmon. The commenter also suggested the water typing system relies heavily on habitat default methods instead of actual survey of fish use, and therefore important questions that depend on knowledge of unique species requirements cannot be raised and specific problems such as disconnected habitats cannot be addressed.

In response, under the interim and permanent water typing systems, off-channel habitat is classified as Type 2 (interim system) or Type F (permanent system) water and protected accordingly. In addition, floodplains adjacent to streams or rivers considered Channel Migration Zones are treated as no-management areas due to their high ecological value. As a result, most if not all over-winter habitat important to species such as coho salmon receives protection under the proposed FPHCP. Under the interim water typing system currently in use, surveys of fish use are commonly used to classify surface waters. While the permanent water typing system will be model-based, the data used to construct the predictive model originates from actual field surveys of fish use. In order to improve the predictive capacity of the model, new information regarding fish distribution will be incorporated at five-year intervals. This new information will reflect changes in fish distribution that result from habitat recovery and seasonal or annual variations in streamflow.

One commenter suggested stream classifications should be based on the presence of usable and/or restorable fish habitat rather than the actual presence of fish, and changes should be allowed based on new observations of the presence of fish or new knowledge pertaining to usable fish habitat. Another commenter suggested it should be noted in both the FPHCP and the DEIS that many landowners reported finding no fish further downstream than the maps recognized, resulting in an over-prediction of fish habitat.

While output from the water typing model may be somewhat unbalanced between over and under-prediction at this point, the water typing model field validation studies are intended to improve the prediction accuracy of the model over time. In addition, the current water typing rule (WAC 222-16-031) does allow for changes through the water type modification form procedure.

One commenter disagreed with the use of emergency water typing rules in developing the alternative analysis. Another commenter took issue with the conversion of the permanent water typing system (WAC 222-16-030) to the interim water typing system (WAC 222-16-031) for the purpose of comparing alternatives in the DEIS.

In response, there were three different water typing systems and associated RMZ prescriptions used to determine stream miles and associated RMZ acreage in the DEIS alternatives analysis. The emergency typing rule was not used in any of the alternatives, rather the interim rule was used, which incorporates physical criteria (gradient and basin area) into determining the demarcation between Type 3 and 4 (for Alternative 1-Scenario 2) and Type F and N (for Alternative 1-Scenario 1 and Alternatives 2 and 3). In order to more accurately identify this demarcation, a modeling procedure was used to better reflect applying the water typing rule on the ground as opposed to simply relying on the map demarcation. The interim rule was used since there is an established history of using this system within the Washington Forest Practices Rules to determine RMZ requirements, and it was the system in place when the DEIS was written.

3.17.10 General Harvest

There were comments expressing concerns on minimizing wastage of harvested wood and on-the-ground fire prone conditions. A few commenters noted that the timber industry is gearing towards shorter cutting rotations and smaller timber, and focusing heavily on the most marketable species.

In response, the FPHCP is a conservation plan for aquatic species. It does not address wastage of harvested wood or on-the-ground fire prone conditions due to slash, length of rotations, loss of logging and sawmill jobs, and monoculture. However, certain aspects of the Washington Forest Practices Rules and the FPHCP objectives may affect these issues.

There are Washington Forest Practices Rules restrictions that apply to even-age harvest. WAC 222-30-025 states that even-age harvest units larger than 240 acres on land owned or controlled by one landowner are prohibited. Additionally, even-age harvest between 120 acres and 240 acres on land owned or controlled by one landowner can be reviewed by an interdisciplinary team if deemed necessary by DNR.

The conservation objective of the Riparian Strategy in the FPHCP is to restore riparian functions to high levels on lands covered by the FPHCP and to maintain those levels once they are attained (WAC 222-30-010(2) and the FFR, Appendix B). In western Washington, protection measures place riparian forests on growth trajectories toward a mature forest. A mature forest stand is expected to provide the 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. This type base maps. Field staff have found that the point of perennial flow that defines the downstream end of Type Ns waters is often substantially higher in the stream network than is shown on DNR water type base maps. Since the length of Type Ns waters is shorter than depicted on the water type maps, the extent of impacts from forest practices conducted in close proximity to Type Ns waters will be more limited than what map-based data suggest. CMER recently completed a high priority study to help refine the demarcation of perennial and seasonal Type N streams. As a result of the study, the Forests and Fish Policy Committee (FF Policy) informed the Forest Practices Board (the Board) that the existing default basin areas for determining stream perennial initiation points (PIPs) in WAC 222-16-031(3) and (4) are incorrect. FF Policy recommended to the Board on August 16, 2005, that the default basin area language be deleted from the WACs and replaced with language that refers readers to the forest practices Board Manual Section 23 to help them locate PIPs in the field. For additional information about the study, see Chapter 4a-4.2, Research and Monitoring, or go to www.dnr.wa.gov/forestpractices/adaptivemanagement/pipstudy/.

The minimal effects strategy was developed independent of the alternatives included in the Final Environmental Impact Statement (FEIS) (USFWS and NOAA Fisheries 2006). While in most cases, the minimal effects strategy provides greater protection than the FEIS alternatives, FEIS Alternative 4 (“Increased Forest Ecosystem Protections”; FEIS Chapter 2) is more protective in some respects. For example, FEIS Alternative 4 provides 70-foot, no-harvest RMZs along channels greater than 30 percent gradient. This represents increased protection relative to the minimal effects strategy in cases where the >30 percent channel category includes Type Ns waters. In addition, FEIS Alternative 4 includes the retention of no-harvest buffers within “channel disturbance zones” and “beaver habitat zones,” which are not recognized as critical areas under the minimal effects strategy.

Differences between the minimal effects strategy and FEIS Alternative 4 largely reflect different objectives behind their development. The minimal effects strategy was developed in an attempt to identify the level of habitat protection necessary to avoid adverse effects to covered species in light of existing scientific uncertainties about the effects of forest practices on aquatic and riparian habitats. As indicated earlier, this was necessary to satisfy ESA requirements related to HCP development. On the other hand, FEIS Alternative 4 was developed to satisfy National Environmental Policy Act (NEPA) requirements that call for the development of a range of reasonable alternatives. FEIS Alternative 4 represents one end of the range and was largely based on comments received from the public as part of the NEPA scoping process.

The spatial extent of critical areas was calculated for both the minimal effects and FPHCP strategies. Appendix K includes a detailed description of all critical areas calculations. The extent of critical areas under the FPHCP strategy was largely based on the results of riparian and unstable slopes modeling contained in Appendices C and E of the Forest Practices Rules EIS (2001) and Appendix B of the FPHCP NEPA EIS (2006).

Key assumptions underlying the modeling have been summarized from FEIS Appendices C and E and are as follows:

1) The interim water typing system currently in use is a reasonable surrogate for the permanent water typing system still under development.

2) Average CMZ width for Type S and Type F waters in western Washington are 30 feet and 10 feet, respectively. Average CMZ widths for Type S and Type F waters in eastern Washington are 5 feet and 2 feet, respectively.

3) The average site class adjacent to Type S and Type F waters is the average of site class II and site class III.

4) The average site class adjacent to Type Np waters in both western and eastern Washington is site class III (applies to the minimal effects strategy only; not included in FEIS modeling).

5) Forty percent of harvest units adjacent to Type Np waters in eastern Washington are clearcut, while 60 percent are partial-cut (applies to the FPHCP strategy only).

6) The SMORPH model (Shaw and Vaugeois 1999) reasonably predicts the extent of high hazard unstable slopes defined by the forest practices rules. While the SMORPH model has not been calibrated for eastern Washington, the most conservative (i.e., encompassing) calibration criteria from western Washington were used when applying the model in eastern Washington.

Bankfull widths were included in the calculations of critical area extent. While including bankfull width as part of the critical area increases the critical area acres, it does not affect the comparison of strategies since both strategies included bankfull width in the calculations. Also, unlike the riparian modeling performed as part of the DEIS, the modeling here made no attempt to account for the overlap of RMZs that occurs at channel junctions and did not include the channel areas of Type Ns waters and unbuffered Type Np waters in the calculation of critical area extent. Again, while these factors may affect the total critical area acres, they do not affect the comparison of strategies since neither strategy included overlap reduction factors nor Type Ns and unbuffered Type Np channel areas. For these reasons, the riparian critical area acres calculated for the FPHCP strategy do not correspond with the riparian management zone acres reported in the FEIS (See section 4.3 Land Ownership and Use).

4e-3 Results

Under the minimal effects strategy, the total critical area extent encompasses 2,613,151 acres statewide (Table 4.17). Of this total, about 2.1 million acres, or 81 percent, consists of riparian zones while the remainder is unstable slopes. Over 82 percent of the total minimal effects critical area is located in western Washington and 83 percent of western Washington critical area acres are riparian zones (Table 4.17). The 2.6 million acres that represent the minimal effects critical area encompass 28 percent of the approximately 9.3 million acres of forestlands covered under the FPHCP.