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National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
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NMFS Tracking
No. 2002/01961

December 15, 2003

John Phipps, Forest Supervisor
Mt. Baker Snoqualmie National Forest
21905 Sixty-fourth Avenue West
Mountlake Terrace, Washington 98403-2278

Re: Endangered Species Act Section 7 Consultation Programmatic Biological Opinion on the Forest Services' Programmatic Biological Assessment for the Mt. Baker-Snoqualmie National Forest and Essential Fish Habitat Consultation (WRIAs 1,3,4,5,7,8,9,10).

Dear Mr. Phipps:

The attached document contains NOAA's National Marine Fisheries Services's (NOAA Fisheries) Biological Opinion (Opinion) on the proposed Mt. Baker Snoqualmie National Forest (MBS Forest) Programmatic Biological Assessment (PBA) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 USC 1531 *et seq.*). This document also includes the consultation on Essential Fish Habitat (EFH) pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations (50 CFR Part 600).

The MBS determined that a portion of the proposed actions are likely to adversely affect the Puget Sound (PS) chinook salmon (*Oncorhynchus tsawytscha*), listed as threatened under the ESA. The EFH for this species would be adversely affected by the proposed action.

The Opinion and the EFH consultation are based on information provided by the MBS in the PBA received by NOAA Fisheries on December 4, 2002, and additional information transmitted via telephone conversations, meetings, mail and e-mail. A complete Administrative record of this consultation is on file at the Washington Habitat Branch Office.

NOAA Fisheries has concluded that the proposed action is not likely to jeopardize the continued existence of PS chinook salmon. As required by section 7 of the ESA, NOAA Fisheries has included reasonable and prudent measures with nondiscretionary terms and conditions that are necessary to minimize the effects of incidental take anticipated with this action. NOAA Fisheries also determined that EFH may be adversely affected, and included conservation recommendations that if implemented, will sufficiently address adverse effects to EFH.

This concludes consultation on these actions in accordance with 50 CFR 402.14(b)(1). The USFS must re-initiate this ESA consultation if new information reveals effects of the action that may affect listed species in a way not previously considered; if the action is modified in a manner that causes an effect to the listed species that was not previously considered; or if a new species is listed or new critical habitat designated that may be affected the identified actions. If you have any questions, please contact Thomas Sibley of the Washington State Habitat Branch Office at (206) 526-4446, or Thomas.Sibley@noaa.gov.

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

cc: James Doyle, USFS
Cindy Levy, USFWS

ENDANGERED SPECIES ACT - SECTION 7

PROGRAMMATIC BIOLOGICAL OPINION

AND

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

Implementation of a Diverse Group of Activities in the
Mount Baker-Snoqualmie National Forest

Agency: United States Department of Agriculture
Forest Service

Consultation Conducted By: National Marine Fisheries Service
Northwest Region

Date Issued: December 15, 2003

Issued by: For Michael R Crouse

D. Robert Lohn
Regional Administrator

NMFS Tracking No.: 2002/01961

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1.0 INTRODUCTION

The Endangered Species Act (ESA) (16 U.S.C. 1531-1544), amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the United States Fish and Wildlife Service and the NOAA's National Marine Fisheries Service (NOAA Fisheries), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats. This document is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations found at 50 CFR Part 402, and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C 1801 *et. seq.*), as amended by the Sustainable Fisheries Act of 1996[1] (U.S.C. 1855 *et. seq.*).

The objective of the ESA portion of this programmatic consultation is to determine whether the proposed actions by the United States Department of Agriculture (USDA) Forest Service (FS), Mount Baker-Snoqualmie National Forest (MBS Forest) within the Programmatic Biological Assessment (PBA) are likely to jeopardize the continued existence of Puget Sound (PS) chinook (*Oncorhynchus tshawytscha*). The PBA provided by the FS with requests for consultation, described below, included the finding that some actions permitted using the proposed PBA are "likely to adversely affect" the PS chinook Evolutionarily Significant Unit (ESU) listed as threatened under the ESA. Objectives of the MSA portion of this document, under section 305(b)(4) of the Act, is to provide discretionary Essential Fish Habitat (EFH) conservation and enhancement recommendations to the FS for actions that may adversely affect EFH.

1.1 Background and Consultation History

Soon after the listing of PS chinook as Threatened in March of 1999, the FS and NOAA Fisheries began discussing programmatic approaches to various FS actions. Many telephone conversations, electronic-mail (email) exchanges, meetings and site visits clarified the scope and application of the PBA. Most of these contacts helped to resolve issues and addressed programmatic ways to further reduce or remove adverse effects on listed species, their critical habitats, and designated EFH, while making the regulatory consultation process more efficient. The complete administrative record for this consultation is located in the Washington State Habitat Branch, in Lacey, Washington.

This document contains the Biological Opinion (Opinion) and EFH consultations, which

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[1] Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act to establish new requirements for "Essential Fish Habitat" (EFH) descriptions in Federal fishery management plans (FMPs) and to require that Federal agencies consult with NOAA Fisheries on activities that may adversely affect EFH. State agencies and private parties are not required to consult with NOAA Fisheries unless that action requires a Federal permit or receive Federal funding.

comprise an analysis of the effects of the proposed action on a portion of habitat utilized by PS chinook and additional species addressed through the MSA, including coho (*O. kisutch*), and PS pink salmon (*O. gorbuscha*). Critical habitat is not designated for PS chinook at this time.

The process of developing the PBA narrowed the scope of proposed actions to include only those whose effects are considered minor, repetitive and predictable. Proposed actions that may have unpredictable or unique site-specific effects are required to complete an individual consultation and are not covered under this document.

1.2 Description of the Proposed Action

The FS proposes to implement a diverse group of activities or projects in the MBS Forest over a five-year period. The included activities listed in the PBA are categorized according to whether they are Likely to Adversely Affect (LAA) and Not Likely to Adversely Affect (NLAA) PS chinook. The LAA activities analyzed in this Opinion are presented in Table 1 below. The NLAA activities are not analyzed within this Opinion, and will be addressed in a separate correspondence with the FS. These effect determinations were derived from the evaluation of the relative effects for each project type including short- (direct) and long-term (indirect) effects (50 CFR 402.02). For the purposes of the MSA, all of the proposed activities may adversely affect EFH, largely because the proposed activities can effect habitat functions necessary for coho salmon. Unlike some PS chinook populations within the action area, coho use habitat within or near many of the proposed actions.

The following are descriptions of the various types of activities that are covered by this document. Each project type has a series of management practices/conservation measures which need to be incorporated into the project, however, in some cases, one or more of the practices/measures may not be appropriate for a specific project. The proposed activities within Table 1 are the subject of the analysis within this document. Project descriptions are included within this document, and a portion of the text describing programs and project types has been incorporated from the PBA.

The projects and activities implemented as a result of this consultation will be consistent with the intent of minimizing or avoiding adverse effects on federally listed species and designated critical habitat. The Streamlined Consultation Procedures for section 7 of the ESA (USDA) *et al.* 1995) will set guidelines for implementation of this document.

Table 1. Programs with Likely to Adversely Affect Project Types

Program	**LAA Project Type**
Recreation Management	Developed Site Operation and Maintenance Trail Bridge Maintenance Trail Restoration Through Reconstruction and Construction Trail Bridge Restoration Though Reconstruction and Construction
Recreation Management	Bridge Construction/Reconstruction Transportation System Repair
Road Maintenance	Road Bridge Maintenance
Watershed Restoration	Stormproofing and Road Upgrading Landslide Stabilization Road Decommissioning Instream Aquatic Improvement/Hydrologic Restoration and Maintenance Fish Passage Improvement Wetland Restoration

Of the programs and project types listed in Table 1, the FS has estimated the number of projects per watershed that may be implemented within the time-line of the Opinion. The estimates within Table 2. reflect projects that may result in adverse effects largely through soil disturbances and possible sediment discharge to surface waters. Conservation Management Practices and project timing, as discussed in section 2.2.1, are anticipated to reduce the number of projects in Table 2 that actually result in adverse effects.

Table 2. Estimate of Likely to Adversely Affect Actions by Program/Project Type.

Program/ Project Type	**Nooksack River Basin**	**Lower and Mid Skagit River Basin**	**Upper Skagit River Basin**	**Stillaguamish River Basin**	**Skykomish River Basin**	**Green River Basin**	**White/ Puyallup River Basin**
Dev. Site Maint.	19 Sites	12 Sites	30 Sites	31 Sites	18 Sites	2 Sites	24 Sites
Trail Bridge Maint.	2 Sites	0	13 Sites	4 Sites	3 Sites	0	1 Site
Trail Restoration	1 Mile	0	13 Miles	1Mile	1 Mile	0	0

Trail Bridge Const. Reconst.	0	0	2 Sites	1 Site	1 Site	0	0
Road Bridge Const. Reconst.	2 Sites	0	1 Site	4 Sites	2 Sites	0	1 Site
Trans. System Repair	1 Mile	2 Miles	3 Miles	4.5 Miles	4.5 Miles	0	5 Miles
Road Stormpr. and Upgrading	4.5 Miles	8 Miles	24 Miles	3 Miles	7 Miles	0	5 Miles
Road Decomm.	8 Miles	4 Miles	11 Miles	4 Miles	8 Miles	0	6 Miles
Aquatic Instream Imp.	1.5 Sites	1 Site	5 Sites	2 Sites	2 Sites	2 Sites	2 Sites
Fish Pass. Imp.	2 Sites	1 Site	3 Sites	4 Sites	1 Site	0	4 Sites
Wetland Restoration	1 Acre	0	1 Acre	2 Acres	1 Acre	0	0
Landslide Stabiliz.	4 Acres	2 Acres	1 Acre	NA	1 Acre	0	2 Acres
Road Maint.	74 Road Miles	44 Miles Road	196 Miles Road	128 Road Miles	104 Road Miles	108 Road Miles	133 Miles Road

1.2.1 Program: Recreation Management

1.2.1.1 Developed Site Operation and Maintenance:

Developed sites include established campgrounds, interpretive sites, scenic overlooks, picnic areas, launching facilities, and trailheads. The purpose of the developed site maintenance program is to provide a safe and clean camping experience for the public. Campgrounds and developed sites generally are located along rivers, streams, or lake shores, and are accessed by major roads. Campground maintenance is normally conducted in the spring from mid-March until campgrounds are opened. Campgrounds are operated between Memorial Day and Labor Day, with shoulder seasons extending before and/or beyond these dates up until snow cover and access prevents people from reaching or entering the campground. Crews can spend up to two to three weeks completing preseason maintenance on the developed campgrounds. There are

36 developed campgrounds (all but three are operated and maintained by concessionaires) and 16 other developed recreation sites (group sites) and 27 picnic areas on the MBS Forest. None of these are opened and maintained year round. Appendix C of the PBA has a list of these developed recreational sites.

Recreation facility maintenance includes road and campsite maintenance, foot bridge maintenance (a foot bridge refers to constructing, from native wood materials, small trial-size crossing structures to avoid human passage through wet, sensitive areas), hazard tree removal, revegetation with native species, where necessary, and general cleanup and repair (tables, stoves, toilets, signs, barrier (re) placement, water systems, pumps, foot bridges, paths and steps, fences). Toilet repair/replacement and maintenance may involve digging new vaults, some vegetation removal, and toilet pumping. Heavy maintenance such as water well drilling may occur with a drill rig, usually from April to early August. The well-head area will involve gravel fill and pouring a concrete pad not to exceed 10 feet by 10 feet. The FS normally needs to drill one or two wells in a 10-year period. However, current plans are to drill two to four in the next several years because of campground relocations and current wells with inadequate water supply. Other heavy maintenance may include extended use of mechanized equipment. Other minor activities in campgrounds or other developed sites include lawn mowing, sign placement, kiosk development, roadway sweeping, and trash collection. Equipment used ranges from road equipment for road maintenance to chainsaws, lawn mowers, augers, and small power tools.

1.2.1.2 Trail Bridge Maintenance:

Typical items of work can include, but are not limited to: hand rail and rail post replacement; deck plank replacement, cleaning/flushing bridge deck (done by mechanical means, such as sweeping; debris is swept or end-hauled across the bridge deck and dumped off the deck onto the surrounding ground); removal of brush from beneath and alongside bridge; and repair of concrete bridge components. Each bridge repair may take up to six hours and may need to be done every other year. Equipment used may include chainsaws, brush cutters, gas powered tooting machines, power and hand tools. The FS proposes to maintain between 100 to 130 bridges per year.

1.2.1.3 Trail Restoration Through Reconstruction and Construction:

The purpose of trail construction and reconstruction is to provide access in the MBS Forest which meets FS standards for safety, to support recreational uses and to provide for resource protection. The current trail system includes trails which were user created or were designed for fire suppression access. Many of these trails include segments with steep grades and were located in areas prone to erosion or drainage problems. Trails often follow major drainage or stream systems and have been impacted by shifting stream channels. Presently, trail construction or reconstruction is in association with access that has already been developed within a watershed. New activities of this project type within riparian reserves[2] containing salmon-bearing channels will not be covered under this document.

Trail construction and reconstruction projects can require the use of chainsaws, small power tools, hand tools, and trail machines (small excavators, tractors, etc. that are used during trail construction).

The FS proposes to construct or reconstruct 133 miles of trail over the next five years, averaging about 25 miles per year.

1.2.1.4 Trail Bridge Restoration Through Reconstruction and Construction:

Most trail bridges are reconstructed because the current crossing structure has reached the end of its expected design-life and is becoming or has become unsafe. Trail bridges include everything from a single log stringer installed exclusively with hand tools in wilderness, to steel and/or glue-laminated structures built with heavy equipment. Equipment usually consists of chain saws, small power tools, a power wheelbarrow, and hand tools, but could entail use of small excavators or tractors, or helicopters. Occasional blasting might be done for associated trail construction. The FS proposes to construct or reconstruct 24 trail bridges over the next five years.

Only bridges that fully span the active stream channel are included under the proposed action. Construction or reconstruction of trail bridges which have supports or abutments within the bankfull elevation of the stream channel are not covered under this Opinion.

1.2.2 Program: Road Management

1.2.2.1 Road Bridge Construction/Reconstruction:

Bridges on MBS Forest roads are installed/reinstalled to provide passage of flood flows and associated bedload, for better fish passage, or because the current crossing structure has reached the end of its expected design-life and is becoming unsafe. Extent of activity varies, but will be limited to previously disturbed locations for the purposes of the proposed action. "Previously disturbed" is defined as those areas having previous bridge works located within, on, or adjacent to the bridge site. Road bridges could include everything from prefabricated bridges set from one side of the stream onto spread footings (with no equipment stream crossings or excavation), to built-in-place steel or concrete structures which may include some stream crossings with equipment, and re-channeling of the water flow (for either temporary diversions or permanent fill removal and regrading). Equipment includes larger tracked excavators and cranes, bulldozers, dump and concrete trucks, helicopters, and generators for pumps. Pile driving and/or blasting might also be performed. If the quantity of riprap replaced is in excess of the original

[2] Defined in ROD for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, 1994.

amount, this activity is not covered by this document.

Only bridges which fully span the bankfull stream channel are covered under this document. Construction or reconstruction of bridges which have supports or abutments within the bankfull elevation[3] are not covered. For bridge approaches that use fill within the floodplain, relief culverts will be placed to minimize instream velocities to match pre-project, baseline conditions. In addition, the height of the bridge will be designed to minimize debris build-up during high flow events. This document only covers the use of untreated wooden bridge decking, or other non-toxic materials. The design of the bridge approaches will minimize the potential for runoff, surface erosion, and sedimentation to the stream channel. The FS proposes to construct or reconstruct 32 bridges during the life of this document.

1.2.2.2 Transportation System Repair:

Heavy run-off events or other natural disturbances may require road repairs that are intended to alleviate imminent resource damage, such as unplugging culverts or other relatively minor repairs. This work usually is accomplished by the FS road maintenance crews.

It is common as a result of such events, that road system segments may be damaged or undermined beyond the capability of these crews to repair. Such situations may require bridge replacement or repair, placement of riprap and fill at failures, installation of new culverts or water movement devices, or realignment of small road segments. If the quantity of riprap replaced is in excess of the original amount, this activity is not covered by this document.

When replacing culverts after a flood event in fish-bearing channels the replacement structure will provide full fish passage for all life stages of fish for all flows.

These activities include the use of heavy earth moving equipment for up to several weeks at a site. Equipment may include backhoes, bulldozers, excavators, dump trucks, low-boy tractor trailers, rock crushers, and road graders. Contract specifications are written to minimize/avoid effects on aquatic resources. The FS proposes to repair 70 to 80 miles of the transportation system during the life of this document.

1.2.3 Program: Road Maintenance

The purpose of the FS road maintenance program is to provide safe vehicular access to the MBS Forest by maintaining the existing road surfaces, culverts, ditches, and roadsides free of potholes, debris, brush, etc., and to perform work necessary to minimize road related erosion. Road maintenance activities are those normal seasonal and annual activities needed to maintain safe conditions. Maintenance of these roads after heavy runoff events, such as floods, are

[3] 'Bankfull elevation' means the bank height inundated by a 1.5 to 2-year average recurrence interval and may be estimated by morphological features such average bank height, scour lines and vegetation limits.

covered under Transportation System Repair or Watershed Restoration project descriptions.

The FS presently maintains 2,630 miles of road in five different maintenance levels, as summarized in the PBA. The FS is actively engaged in reduction in overall Maintenance Level of the MBS Forest roads. When reducing the maintenance level of a road from Maintenance Level 3 to 2, or from Maintenance Level 2 to 1, it is necessary to improve the drainage capability of the road so it can withstand a reduced level of maintenance. Improving the drainage capability involves installing water bars, reducing fill, stabilizing fill-slopes, and protecting or possibly removing culverts. Typical activities involved with road maintenance include fillslope stabilization, grading, culvert cleaning, brushing, down and hazard tree removal pavement skin patching/potholes/cracks, gate maintenance, road closure, painting and shoulder maintenance.

Road maintenance activities that require dry weather such as shoulder maintenance, painting, pavement skin patching/potholes, cracks, and bridge maintenance are usually done during August, but can occur anytime between June 1 and September 30 depending on the weather. Bridge maintenance has a longer work window and might occur between April 1 and the end of October. Road maintenance activities involving controlling vegetation such as brushing occur year round, but are usually done in the spring through mid-summer when the sap is flowing because effects will last longer (April 1 to June 30). The FS has estimated that 700 miles of road each year (on average) will be maintained during the life of this document. Roughly 80% of that activity is likely to occur between March 1 and August 5.

1.2.3.1 Road Bridge Maintenance:

This activity is done every two to three years in the summer using a compressor and power washer. There are 74 bridges within the MBS Forest. Steel bridges also require periodic painting every 15 to 20 years, and two of the 14 require more frequent painting. Over the life of this document, it is estimated that two to four bridges per year will receive maintenance work. Routine bridge maintenance involves the following items of work: repair of bridge approaches with gabions or Hil-fiker walls, installation of riprap or pre-mixed bagged concrete on channel banks beneath bridge and/or around abutments and piers, brushing of approaches, hazard tree removal, movement of drift logs from the channel near bridge to downstream, asphalt patching and crack sealing, bridge and approach guardrail repair, skin patching of bridge deck, sign installation, replacement of deck running planks, flush/clean bridge decks, cleaning of all bridge bearing seats and bridge components, cleaning, sandblasting and spot painting of steel bridges with containment, removal of fill from contact with girder, and periodic inspections. This document does not cover chemical treatment of timber bridge components. If the quantity of riprap replaced is in excess of the original amount, this activity is not covered by this document.

When flushing and cleaning bridge decks, these additional conservation measures will be employed: (1) only clean water is to be used; (2) debris will be pushed or removed from the bridge decks to the far end of the decks onto the surrounding ground; (3) none of the water or debris will be placed where it may enter flowing waters at any time during the year; and (4) pressure washing of structures shall be done using appropriate screened tarping to control and contain paint particles and animal waste generated by the activity.

1.2.4 Program: Watershed Restoration

The project types in this section are exclusively designed for restoration of aquatic habitat functions. Watershed restoration treatments such as road storm-proofing and upgrading are employed to reduce or prevent risk of catastrophic failure at stream channel and road intersections. Storm-proofing treatments include the construction of channel and road crossing structures that will pass water and bedload for up to a 100-year flood event. Road upgrading treatments include the installation of the proper number of cross-drainage culverts along the road prism. The proper number of culverts is dictated by the frequency of natural drainage channels the road prism intersects and slope. At all culvert replacement locations, fill material is minimal in amount and is usually composed of crushed rock or gravel-sized particles.

1.2.4.1 Storm-Proofing and Road Upgrading:

The FS proposes to stormproof or upgrade 110 to 125 miles of road during the life of this document. Activities may include correcting stream diversion potentials at stream crossings, removing and reconfiguration of unstable fill, rerouting road drainage to stable areas, adding/replacing/installing culverts, hardening stream crossings, lowering inlets, out-sloping, ditch cleaning, placement of surface rock, installing waterbars, mulching and revegetating road surfaces and side slopes, bridge repair or replacement, slump repair, and other activities designed to control erosion and sedimentation.

1.2.4.2 Landslide Stabilization:

This activity involves techniques designed to minimize surface erosion from bare-soil areas within landslides. Opportunities on the MBS Forest are usually found outside of riparian reserves containing salmon bearing channels. Landslide-prone areas are usually located in the head-water areas of watersheds. Aside from manual work, landslide stabilization activities located adjacent to streams channel that contain salmon are not covered by this document. The FS proposes to stabilize 45 to 50 acres during the life of this document. Techniques such as seeding and fertilizing, installation of erosion control matting, contour wattling, brush layering and planting or transplanting of trees and shrubs typically involve hand labor. Activities such as live cribwall construction, log terracing, addition of boulders and logs, and hydro-mulching typically involve use of heavy equipment. Hydro-mulching may be done with helicopters. Equipment utilized may include chainsaws, log trucks, front end loaders, backhoes, and various power and hand tools.

1.2.4.3 Road Decommissioning:

The FS proposes to decommission 78 to 80 miles of road during the life of this document. These projects involve the permanent closure of roads that are not intended to be used in the future. Activities may include removal of culverts, ripping or de-compaction of road surfaces, outsloping, removal of unstable fill, water bar installation, and seeding/planting.

1.2.4.4 Instream Aquatic Improvement, Hydrologic Restoration and Maintenance:

The FS proposes to conduct activities at 30 to 33 sites during the life of this document. Activities may involve the placement of logs and/or rock structures in stream channels to restore ecological functions by providing energy dissipation, improved sediment routing and storage, stabilizing streambeds and streambanks, restoring degraded components of fish habitat and providing channel complexity, repair and maintenance of existing structures, bioengineering, and the introduction of salmon carcasses to restore depleted stream nutrients and enhance productivity. Work may include the re-connection of rearing ponds and other off channel habitat to fish-bearing waters. Stream banks and streambeds will be managed by one of more of these: (a) the retention of spawning gravels; (b) formation of pools for either fish holding/rearing or sediment deposition; c) reduction of channel bank erosion; and (d) reduction of channel migration or widening, largely through the placement of rocks and wood.

Projects which involve extensive excavation or earthmoving to reconstruct or relocate stream channels or are highly experimental and do not conform to standard restoration practices are beyond the scope of this analysis and are not included in the proposed action. Placement of riprap to stabilize streambanks are not included in the program of activities under consultation.

1.2.4.5 Fish Passage Improvement:

Many fish passage barriers at culverts that occur at high stream flows are not apparent during low and normal stream flows. Culverts must be analyzed at both the low and high fish passage design flows. Selection of the type and placement of the new structure depends on stream size, energy, morphology, and fish use. Possible options to remove structural barriers to fish passage (descending in order of preference) are: culvert removal, full span bridge or arch culvert, bottomless culvert, countersunk pipe or box culvert.

This work covers replacement of culverts or bridges, modification of impassible culverts, and construction of fish passage weirs that are directly related to replacement, modification, or removal of stream crossings. Work also includes the construction of bed control structures that are keyed into the streambank and directly related to replacement, modification, or removal of stream crossings. Streambed grading will only occur when it is directly related to replacement, modification, or removal of stream crossings. There will also be placement of streambed substrate and woody debris directly related to removal, replacement, or modification of stream crossings, and installation of bank protection on the roadway fill prism directly related to replacement, modification, or removal of stream crossings. This project type does not cover: streambank hardening or channelization using rock, concrete, bulkheads, groins, J-vanes, bendway weirs, or other similar structures or techniques, and culvert or bridge replacement or modification activities that do not provide or facilitate fish passage.

Relocating or removing fish from fish passage improvement sites may be needed. When this is necessary, conservation measures for fish sampling and removal will be required (see Appendix P of the PBA).

The FS has determined that there are 190 culverts across the MBS Forest that create fish passage problems for salmonids. Most of these problems involve juvenile resident trout populations. The FS estimates the potential exist to improve fish passage for salmon at 40 to 50 of these sites during the life of this document. Activities for improving fish passage include installing fishways, baffles, weirs, proper sized culverts, bridges, open-bottomed arch culverts, culvert removal, and resetting culverts to meet fish passage criteria.

1.2.4.6 Wetland Restoration:

Wetland restoration includes altering or modifying the hydrophytic vegetation, hydric soil, and/or wetland hydrology of a designated wetland area to restore properties unique to wetlands. Activities include preventing human access or removal of a road/culvert preventing proper wetland function, and will likely involve seeding/planting. Equipment might include heavy equipment such as excavators, cats, dump trucks, and generators for pumping water. Various hand and power tools might also be used. Work will be performed during summer low-flow season for most sites (Aug-Sept). This activity is limited to small wetlands of 3 acres or less. The FS estimates it could be restoring about 40 acres of wetlands over the next five years.

1.2.5 Conservation Management Practices

The following is a list of Conservation Management Practices applicable to the above described programs and activities, to minimize effects from ground disturbing activities.

1. If work is in the active channel, divert water around the project site.

2. Excess material (spoils) will be disposed of so they do not enter the stream channel. This measure is designed to keep fine and coarse sediments from reaching flowing waters where they can be transported downstream.

3. Erosion control methods shall be used to prevent silt-laden water from entering

the stream. These may include, but are not limited to, straw bales, silt fencing, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas.

4. If weather conditions during project operations generate and transport sediment to the stream channel, operations will be ceased until the weather conditions improve. The operation of ground disturbing equipment during large precipitation events will increase sediment production which may be transported to flowing waters.

5. All disturbed ground shall be reclaimed using appropriate best management practices. Retain measures to prevent sediment from reaching streams until the soil is secure. If appropriate, native species should be used in revegetation.

6. Wastewater from project activities and water removed from within the work area shall be routed to an area landward of the bankfull elevation to allow removal of fine sediment and other contaminants prior to being discharged to the stream.

7. The streambed shall be restored to the original gradient.

8. Streambanks should be properly sloped to an angle of stability (natural repose) when removing culverts. This measure can reduce sediment production from bank erosion, undercutting and slumping, as the stream channel re-establishes itself following culvert removal.

9. Any trees to be felled within reach of a stream shall be felled toward the stream and left in place.

10. Leave all non-treated wood in the stream/lake/wetland.

11. Have hazardous spill clean-up materials on site.

12. Any machinery maintenance involving potential contaminants (fuel, oil, hydraulic fluid, etc) will occur at an approved site or outside the Riparian Reserve.

13. Prior to starting work each day, check all machinery for leaks (fuel, oil, hydraulic fluid, etc) and make all necessary repairs.

14. Large woody material removed from a culvert inlet will be put back in the stream, downstream of the culvert.

15. No aircraft use within 200 feet of stream during fish presence.

16. Large wood management shall occur in accordance with this document.

17. In-channel activities will be limited to non-spawning and incubation time periods, and correspond to state timing windows for in-channel work.

1.2.6Individual Project Review Protocol within the Programmatic Biological Assessment and this Document

Through the development of the PBA, the FS and NOAA Fisheries developed a methodology to review each action addressed in this Opinion prior to its implementation. This methodology has been adopted by the FS and incorporated into the proposed action subject of this consultation. This review will ensure that each action fits within the effects analyzed within this Opinion. In addition, this review will enable biologists from the FS and NOAA Fisheries to ensure on a site basis that actions are minimizing and/or avoiding effects to listed species, to the maximum extent practicable.

Prior to project implementation, the FS aquatic biologists will evaluate the project for consistency with this document. If the project is found to be consistent, the biologists will complete the Project Consistency Evaluation Form (PCEF) (Example found in Appendix B within the Biological Assessment (BA)) with a description of the proposed project and a determination of effects for each listed species and habitat. Once the biologist has agreed that the project is consistent with this document or accompanying cover letter, and has completed and signed the PCEF, a copy will be sent to the designated FS representative for review and approval. Once the PCEF has been approved by the FS representative, copies of the PCEFs will be sent to NOAA Fisheries. NOAA Fisheries will then review the PCEF to ensure it is consistent with this document or accompanying cover letter. NOAA Fisheries will review and provide feedback to the PCEF within 15 business days of its receipt, and any questions or comments will be provided to the FS Level 1 representative within this time frame.

If a project is not found to be consistent with this document, a separate BA will be prepared by the FS and submitted to the Level 1 team. This project will then be consulted upon individually by NOAA Fisheries. The Level 1 team will resolve any concerns raised by NOAA Fisheries. If issues cannot be resolved, they will be elevated to Level 2 (USDA 1995).

For the purpose of implementing this Opinion, NOAA Fisheries and the FS have determined that actions that result in a LAA call for PS chinook must have a determination under the effect of the action column (see Appendix B of the PBA) of either restore or maintain within fifth field watersheds functioning at risk or at unacceptable risk for the following indicators on the matrix: (1) subpopulation size; (2) growth and survival; (3) life history diversity and isolation; (4)

persistence and genetic integrity; and (5) integration of species and habitat conditions. NOAA Fisheries and the FS determined that this strategy minimizes the risk of implementing projects within watersheds containing subpopulations of PS chinook that are at substantial risk of being extirpated. For those watersheds where the existing baseline is functioning at risk or at unacceptable risk and the subpopulation characteristics (indicators 1 through 4) are unknown, the indicator, Integration of Species and Habitat Conditions, must have an effect determination of restore or maintain to be consistent with this document. Those FS actions that do not fit within this framework will be consulted upon outside of this document within individual section 7(a)(2) consultation.

The FS has proposed that all projects covered by this document will: (1) comply with all Aquatic Conservation Strategy (ACS) objectives; (2) implement the appropriate FS Management Practices, (3) implement the EFH Conservation Measures, and (4) meet the Measures to Avoid, or Measures to Minimize Adverse Impacts identified in the Project Impact Analysis section as detailed in the PBA. Any activity that does not comply with the four conditions listed above is inconsistent with the PBA and this document and must be consulted on within a separate section 7(a)(2) consultation.

1.2.7 Monitoring Within the Programmatic Biological Assessment

Upon completion of any project considered LAA and covered in this PBA for PS chinook salmon, the FS project proponent will complete a monitoring form and submit it to the appropriate MBS fishery biologist for evaluation of effects. These monitoring forms will be completed and submitted to NOAA Fisheries for review before the end of each calendar year (November-December). This monitoring information will be reviewed by the FS and NOAA Fisheries and will be used to evaluate the scale and scope of project work covered under the PBA and this document for the following calendar year. In addition, during the first quarter of a new calendar year (Jan-Mar), NOAA Fisheries will meet with the FS's project managers to get an overview of that year's program-of-work that has potential for adverse effects on PS chinook salmon. Projects to be implemented later during the summer months will be reviewed at the end-of-the-year meeting. NOAA Fisheries will review monitoring reports to ensure consultation intent is being met, or to modify guidance, if necessary. Systematic monitoring and review are crucial steps in measuring the success of this streamlined multi-program, multi-year programmatic consultation, as well as to provide needed adjustments in a timely and efficient manner. Projects and activities implemented as a result of this consultation will not be considered in compliance with this document if they are not included in these annual monitoring reports. This monitoring form will be used to keep track of ESA and EFH information. An example of the monitoring form can be found in Appendix L of the PBA.

1.3 Action Area

"Action Area" means all areas to be affected directly or indirectly by the Federal action, and not merely the immediate area involved in the action (50 CFR 402.02). Because this consultation covers a program of activities that will occur within a variety of sites contained in the MBS National Forest, the action area has been defined to include the MBS Forest, and the 100-year floodplains of the downstream portions of each river system outside of the MBS Forest. The MBS Forest extends more than 140 miles along the western slopes of the Cascade Mountains from the Canadian border to the northern boundary of Mt. Rainier National Park. Populations of PS chinook occur within all of the major watersheds that are within the MBS Forest, from the White River north to the Nooksack River. The MBS Forest is located in the mid to upper portion of these watersheds as they drain the Cascade crest.

2.0 ENDANGERED SPECIES ACT BIOLOGICAL OPINION

The objective of this Opinion is to determine whether the effects of the program of activities proposed within the PBA, when evaluated together with the effects of the baseline and cumulative effects, will jeopardize listed PS chinook. The FS initiated formal consultation on December 4, 2002, seeking to ensure that their activities are consistent with the requirements of 7(a)(2) of the ESA.

2.1 Evaluating the Proposed Actions

The standards for determining jeopardy as set forth in Section 7(a)(2) of the ESA are defined by 50 CFR 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. Critical habitat is not designated for PS chinook, so the critical habitat analysis will not appear in this document. The jeopardy analysis involves the initial steps of: (1) defining the biological requirements of the listed species; and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of injury and mortality attributable to: (1) collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed species' life stages that occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

2.1.1 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list PS chinook for ESA protection and also considers new data available that is relevant to the determination.

The relevant biological requirements are those conditions necessary for PS chinook to survive and recover to naturally reproducing population levels such that protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

Five general classes of features or characteristics determine the suitability of aquatic habitats for salmonids: flow regime, water quality, habitat structure, food (energy) source, and biotic interactions (Spence *et al.* 1996). For this consultation, NOAA Fisheries believes all of the above habitat parameters might be adversely affected for the short term as a result of the proposed LAA actions.

The Federal Register Notices containing additional information concerning listing status and biological information for listed species considered in this Opinion are described in Table 3.

Table 3.

Species (Biological Reference)	**Listing Status Reference**
Chinook Salmon from Washington, Idaho, Oregon and California, (Meyers, *et al.* 1998).	The Puget Sound ESU is listed as Threatened under the ESA by the NOAA Fisheries, (64 FR 14308, March 1999).

2.1.2 Status of the Species in the Action Area

The PS chinook ESU has been defined to include all naturally spawned PS chinook populations residing below impassable natural barriers (e.g., long-standing natural water falls) in the Puget Sound region from the Nooksack River to the Elwha River on the Olympic Peninsula, inclusive. The Puget Sound Technical Review Team (PSTRT), an independent scientific body convened by NOAA Fisheries to develop technical de-listing criteria and guidance for salmon recovery planning in Puget Sound, has identified 21 geographically distinct populations representing the primary historical spawning areas of chinook in Puget Sound (PSTRT 2001). The boundaries of the PS chinook ESU correspond generally with the boundaries of the Puget Lowland Ecoregion (Franklin and Dyrness 1973). As listed in Table 4, 15 populations of PS chinook reside within the scope of this Opinion, ranging from the southern Puyallup and White River stocks, to the most northern populations of the Nooksack River system.

Overall abundance of PS chinook salmon in this ESU has declined substantially from historical levels, and many populations are small enough that genetic and demographic risks are likely to be relatively high (March 9 1998, 63 FR 11494). Both long- and short-term trends in abundance are predominantly downward, and several populations within this ESU are exhibiting severe short-term declines (March 9 1998, 63 FR 11494). Myers *et al.* (1998) roughly approximated that 690,000 adults of this ESU returned in 1908. The majority of these fish would have returned to the northern rivers within the action are of this Opinion. As Table 4 below indicates, recent numbers of naturally spawning fish are drastically below historical estimates.

Like all other salmonid species, PS chinook salmon are anadromous and semelparous (*i.e.,* dies after spawning once). Within this general life history strategy, however, PS chinook display a broad variation in survival tactics. A large part of the variation derives from the fact that the species occurs in two distinct behavior forms or races. One form, designated "stream-type" (Groot and Margolis 1991; Myers *et al.* 1998), spends one or more years as a fry or parr in fresh water before migrating to sea, performs extensive offshore oceanic migrations, and returns to its natal river in the spring or summer, several months prior to spawning. The second form, designated "ocean-type" (Groot and Margolis 1991; Myers *et al.* 1998) migrates to sea during the first year of life, normally within three months after emergence from the spawning gravel, spends most of its ocean life in coastal waters, and returns to its natal river in the fall, a few days or weeks before spawning (Groot and Margolis 1991; Myers *et al.* 1998).

Some adult stream-type PS chinook are also referred to as "spring" fish, often returning to their natal streams from April through July and holding in freshwater several months prior to spawning. Ocean-type PS chinook are commonly referred to as "summer" or "fall" fish, typically returning later than spring fish and usually spending less time in fresh water prior to spawning, usually from September through November. Most rivers in the action area have returns of stream-type PS chinook, though ocean-type PS chinook make up the pre-dominant returns in the ESU (Myers *et al*. 1998). Stream and ocean type ratios are not static; freshwater rearing conditions and ocean survival, among other factors, alter adult returns of each from year to year (Groot and Margolis 1991). Stream-type fish are thought to account for at least 20% of returning adults within the South Fork Nooksack, Skagit, Snohomish, and White Rivers (Myers *et al*. 1998).

Table 4. **Puget Sound Chinook Population Data**

Puget Sound ESU Population	Spawning Locations	Ocean/Stream Type Ratio	Population[f]
North Fork Nooksack	North (RM 44 to RM 66) and Middle Forks. Tributaries include Glacier, Cornell, Canyon, Maple Kendall and Racehorse Creeks	(91/9)[a]	64
South Fork Nooksack	South Fork. Tributaries include Hutchinson and Skookum Creeks.	(31/69)[a]	148
Lower Skagit River	Mainstem Skagit downstream of the Sauk River (RM 66). Tributaries include Hansen, Alder, Grandy, Jackman, Jones, Nookachamps, Sorenson, Day and Finney Creeks.	(55/45)[a]	1,537
Upper Skagit River	Mainstem Skagit RM 66 to RM 94. Tributaries include Diobsud, Bacon, Falls, Goodell, Illabot, and Clark Creeks.	(55/45)[a]	7,332
Suiattle River	Mainstem and tributaries including Buck, Downey, Sulphur, Tenas, Lime, Circle, Straight, and Big Creeks.	(18/82)[a]	401
Lower Sauk River	Downstream of RM 21.	(55/45)[a]	480
Upper Sauk River	Upstream of RM 39.	(55/45)[a]	298
Cascade River	Approximately RM 6 to RM19.	N/A, thought to be predominately stream type.[g]	268
North Fork Stillaguamish River	Mainstem North Fork, Approximately RM 14 to RM 30. Tributaries include Boulder, Squire and French Creeks.	(97/3)[a] (90/10)[b]	483

Table 4 cont. **Puget Sound ESU Population**	**Spawning Locations**	**Ocean/Stream Type Ratio**	**Population**[f]
South Fork Stillaguamish River	Mainstem Stillaguamish and Pilchuck Creek. Mainstem South Fork, tributaries include Jim and Canyon Creeks.	Included in North Fork Stillaguamish ratio.	250
Skykomish River	Upper Snohomish Mainstem and Pilchuck River. Mainstem Skykomish, Wallace River and Bridal Veil Creek.	(70/30)[a,c]	1,662
Snoqualmie River	Mainstem Snoqualmie, tributaries include Tolt and Raging rivers, and Tokul, Cherry and Griffin Creeks.	Included in Skykomish ratio's.	1,467
Green/Duwamish	Mainstem Green, RM 31 to RM 61. Tributaries include Newuakum and Soos Creeks.	(99/1)[a]	547
Puyallup River	Mainstem Puyallup, tributaries include Carbon River, and South Prairie, Wilkeson, Voight, and Clark Creeks.	(97/3)[a]	2,039
White River	Mainstem White, tributaries include Clearwater and Greenwater Rivers, and Boise and Huckleberry Creek.	(80/20)[e]	735

Table 4. Puget Sound chinook populations within action area (PSTRT 2001).
[a] Data complied by Myers *et al*. (1998), ocean/stream type ratios may reflect single year sampling results.
[b] Stillaguamish Technical Advisory Group (STAG) 2000.
[c] Pentec Environmental 1999.
[d] Dunston 1955.
[e] Washington State Department of Fish and Wildlife (WDFW) 1993.
[f] NOAA Fisheries Biological Review Team, Draft Report 2003. Naturally Spawning fish.

2.1.3 Environmental Baseline

The ESA regulations (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, state, or private actions and other human activities in the action area. The environmental baseline also includes the anticipated effects of all proposed Federal projects in the action area that have undergone section 7 consultation, and the effects of state and private actions that are contemporaneous with the 4(d) submittal and review process. The action area is defined to mean "all areas to be affected directly or indirectly by the ... action and not merely the immediate area involved in the action."

Generally, land use within the MBS Forest has gradually shifted from predominantly timber harvest to recreational use. It has been estimated that 62% (3.63 million people) of the state's population lives within a 70-mile drive of the MBS Forest. Another 1.5 million in the Vancouver, British Columbia metro area are also within easy reach of the northern part of the MBS Forest (FS 2003). The large population factor, coupled with easy road access, makes the MBS Forest one of the most visited National Forests in the country. Congressional action over the last 40 years has established the following wilderness areas: Glacier Peak (1964, 1968, 1984), Alpine Lakes (1976), Mt. Baker (1984), Noisy-Diobsud (1984), Boulder River (1984), Henry M. Jackson (1984), Norse Peak (1984), and Clearwater (1984). These largely untouched areas provide permanent protection to old-growth forests and mostly higher-elevation headwaters across 42% of the MBS Forest.

As part of the PBA, the FS has completed comprehensive environmental baseline assessment for fifth-field watersheds that contain land within the MBS Forest. These baselines include assessments of the MPI for each fifth field watershed. These completed baselines can be found within Appendix I of the PBA. NOAA Fisheries has reviewed these baseline assessments, and generally agrees with their MPI conclusions. In addition to Appendix I of the PBA, other sources of information of habitats within the action area can be found in *Our Changing Nature* (Washington State Department of Natural Resources 1998 and 2000), the *Catalog of Washington Streams and Salmon Utilization* (Williams *et al.* 1975), *An Assessment of the Status of Puget Sound Chinook and Strait of Juan De Fuca Coho Stocks as Required Under the Salmon Fishery Management Plan* (Puget Sound Salmonid Stock Review Group (PSSSRG) 1997) and many others.

Downstream of the MBS Forest, relative sediment inputs, shade and wood recruitment, among other indicators, can significantly influence habitat conditions throughout each river system as they flow through state and private lands. While portions of the MBS Forest, as detailed in Appendix I of the PBA, have been degraded from timber harvest and road building, among other factors, the MBS Forest nonetheless represents some of the most intact freshwater habitats within the PS chinook ESU. Habitat indicators are generally thought to be improving over time, through a variety of management actions and natural regeneration of habitat functions (USDA

FS 2002).

Virtually all of the natural disturbance regimes of the major river systems within the action area have been altered to varying degrees. Anthropogenic induced change to watershed functions in the action area have generally altered the rate and character of disturbance events. Habitat effects within many, but not all of the subbasins in the MBS Forest and downstream to state and private areas include changes in flow regimes, sedimentation, high temperatures, streambed instability, estuarine loss, loss of large woody debris (LWD), loss of pool habitat, and blockage or passage problems associated with dams or other structures (March 9, 1998, 64 FR 11494). Land-use activities within the action area associated with logging, road construction (and urban/agricultural development outside of the MBS Forest) among others have significantly altered fish habitat quantity and quality (Myers *et al.* 1998). Effects associated with these activities include alteration of streambank and channel morphology, elimination of spawning and rearing habitat, fragmentation of available habitats, removal of vegetation resulting in increased stream bank erosion, elimination of downstream spawning gravel and LWD recruitment and increased sedimentation input into spawning and rearing areas (Williams *et al*. 1975; Myers *et al.* 1998). These habitat effects are generally more acute as rivers flow through state and private lands.

The consequences of these historically altered conditions have largely lead to aquatic habitats that have limited capacity to provide habitat necessary for PS chinook survival and recovery over the past century. Often, the large sediment loads within these systems have led to channel lateral shifts or downcutting, which is further exacerbated by the lack of LWD recruitment. Unstable channels have compromised PS chinook spawning habitat through redd scour and deposition and drying, leading to decreased egg to fry survival. While elevated sediment levels and channel instability have impacted nearly every major watershed within the action area, perhaps the most acute examples occur within the Nooksack and Stillaguamish River systems.

Schuett-Hames and Schuett-Hames (1984) reported that many tributaries within the Nooksack system were found to be unstable, and containing high levels of fine sediments. Many subbasins lack adequate canopy cover, which has resulted in increased peak flows and stream scouring, and increased bank erosion. Sediment mobilization and delivery to the Nooksack system as a whole has been exacerbated through past forest management practices (Bretherton 1998; Schuett-Hames 1984). Over the past several decades, numerous mass wasting events and poorly designed and non-maintained roads continue to deposit large quantities of fine sediment (WDOE 1995). A report by Cascade Environmental Services, Inc. (1993) revealed that elevated sediment levels have reduced the size and depth of spring PS chinook holding pools and reduced spawning gravel quality in lower gradient reaches of the South Fork Nooksack. Cobble embeddedness samples show the riffles to be between 35 and 51% embedded.

The Stillaguamish watershed had 1,080 landslides between the early 1940's and 1990's (Perkins and Collins 1997). Of these, it was documented that 851 delivered sediment to surface waters, and the vast majority (97%) occurred in the forested headwaters of the North and South Forks. Although landslides are part of the natural disturbance regime of Puget Sound and coastal watersheds (Swanson *et al.* 1987), road construction and clearcuts within the basin accounted for 75% of these slides. Historic logging practices harvested most riparian areas within the basin. By 1910, riparian logging harvested most large conifers on the mainstem, lower South and North Fork to RM 20.8 (Collins 1997). By the 1940's, most riparian areas in the anadromous zone had been logged (STAG 2000). Presently, less than one percent of intact riparian coniferous forest occur on non-federal land. The combination of landslides, reduced riparian contribution of large wood, high density of open roads, and active removal of log jams (Collins 1997) has resulted in degraded spawning conditions. Ninety percent of the largest annual peak flows within the MBS Forest on record occurred between 1980 and 1995, and are thought to have been caused by logging practices within the basin (STAG 2000).

Downstream of the MBS Forest, freshwater and estuarine habitats have been lost or degraded in every major river basin in Puget Sound. Many off-channel and estuarine areas have been lost or isolated through agricultural, urban, and industrial development. Off channel and estuarine habitats in the Green/Duwamish and Puyallup have generally been lost to industrial development; many habitats have been diked/leveed and filled. Estuarine habitat loss within the Skagit (56%) (Beamer *et al*. 1999), Stillaguamish (85%) (STAG 2000), Snohomish (85%) (Haas and Collins 2001), Green/Duwamish (90%) (NMFS 2001) and Puyallup (98%) (David Evans and Associates, Inc. 1991) is thought to limit PS chinook populations (Myers *et al*. 1998; WDFW 1993; PSSSRG 1997).

2.1.4 Relevance of Baseline to Status of Species

NOAA Fisheries concludes that not all of the biological requirements of the species within the action area are being met under current conditions, based on the best available information on the status of the affected species; information regarding population status, trends, and genetics; and the environmental baseline within the action area. Significant improvement in habitat conditions over those presently available under the environmental baseline is needed to meet the biological requirements for survival and recovery of these species. Any further degradation of these conditions would have a significant impact due to the amount of risk they presently face under the environmental baseline.

2.2 Analysis of Effects

NOAA Fisheries' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." "Indirect effects" are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02).

NOAA Fisheries has developed an analytic methodology that serves as a tool for evaluating these effects (Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale, NMFS 1996). It is often referred to as the Matrix of Pathways and Indicators, or MPI. To assess the effects of current and proposed management actions on listed fish species and the essential fish habitats in the PBA, the FS has utilized the MPI. In the MPI framework, the pathways for determining the effect of an action are represented as six conceptual groupings (e.g., water quality, channel condition) of a suite of habitat condition indicators. The indicators constitute the habitat aspects of a species' biological requirements--the essential physical features that support spawning, incubation, rearing, feeding, sheltering, migration, and other behaviors. Such features include adequate instream flow, pure cold water, loose gravel for spawning, unimpeded fish passage, deep pools, and abundant large tree trunks and root wads. Indicator criteria (mostly numeric, though some are narrative) are provided for three levels of environmental baseline condition: *Properly Functioning*, *At Risk*, and *Not Properly Functioning*. The effect of the action upon each indicator is classified by whether it will restore, maintain, or degrade the indicator.

Although the indicators used to assess functioning condition may entail instantaneous measurements, they are chosen, using the best available science, to detect the health of underlying processes, not static characteristics. "Best available science" advances through time. This advance allows Proper Functioning Conditions (PFC) indicators to be refined, new threats to be assessed, and species' status and trends to be better understood. River habitats are inherently dynamic, and the PFC concept recognizes that natural patterns of habitat disturbance will continue to occur. Floods, landslides, windstorms, and fires all result in spatial and temporal variability in habitat characteristics, as do human activities. Unique physiographic and geologic features may cause PFC indicators to vary between different landscapes. For example, aquatic habitats on timberlands in glacial mountain valleys are controlled by natural processes operating at different scales and rates than are habitats on low-elevation coastal rivers. The MPI provides a consistent, but geographically adaptable, framework for making effect determinations. The pathways and indicators, as well as the ranges of their associated criteria, may be altered through the watershed analysis process.

For the proposed action, NOAA Fisheries' jeopardy analysis considers direct or indirect injury and mortality of fish attributable to the action, and considers the extent to which the proposed action impairs the function of essential elements necessary for migration, spawning, and rearing of the listed species under the existing environmental baseline.

The effects of the actions were assessed at the watershed scale, thus conservative effect determinations were made by the FS in the PBA. NOAA Fisheries and the FS team identified project design criteria for each category of proposed action in the PBA in order to minimize or avoid any potential adverse effects associated with these activities.

Upon the issuance of this Opinion, individual actions will be analyzed by NOAA Fisheries and the FS to determine if they fit under one of the PBA categories and its respective effect determination. If the effect determination is the same as the PBA effect determination or less impacting (*i.e.,* PBA effect determination is LAA, and the individual action is NLAA), no additional consultation is necessary. If the effect determination is greater than the PBA effect determination (*i.e.,* PBA effect determination is NLAA, and the individual action is LAA) a separate, independent section 7(a)(2) consultation is required.

Given the conservative approach towards effect calls, the following groups of actions were determined to LAA. However, most individual projects subsequent to the issuance of this Opinion are not anticipated to result in adverse effects. Where they do occur, adverse effects are expected to be minimized in size and duration. NOAA Fisheries finds that temporary adverse effects on PS chinook and their habitat may occur with the proposed PBA LAA actions. In each case, these adverse effects are not anticipated to retard or prevent attainment of properly functioning habitat indicators important to PS chinook at the project or watershed scale. NOAA Fisheries and the FS have determined the need to develop an accurate prediction of the number, location, and timing of projects along with an overall assessment of the existing environmental baseline conditions that includes the status of listed species. These project lists, similar to Table 2 above, can be found in appendices of the PBA. This information forms the basis to assess the direct, indirect, and cumulative effects on listed aquatic species from implementing projects pursuant to over the five-year implementation period.

2.2.1 Direct Effects

The FS has estimated that in-water work will occur where PS chinook are anticipated to be present at only seven sites over the five-year term of this Opinion. A number of projects may occur within streams above habitat utilized by chinook, and most of the LAA programs or project types may involve work near surface waters. As a result, adverse effects on listed fish and their habitat could occur through a variety of mechanisms. Earth-disturbing activities such culvert removal, road maintenance, and road grading result in increased delivery of sediment to streams, and increase turbidity in the water column. The severity of the impact depends on numerous factors including the proximity of the action to the water, amount of ground-disturbing activity, slope, amount of vegetation removed, and weather. Activities that do not necessarily occur near streams, such as some Road Maintenance activities, nonetheless have the potential to mobilize and deliver sediment to surface waters from exposed soils and altered water routing.

Most adverse effects resulting from these programs and project types are short term, and occur from relatively immediate construction/earth movement disturbances. Work associated with these projects in or near water could result in the disturbance of PS chinook and their habitat through turbidity, noise, contact (or near-contact) with equipment, compaction and disturbance of instream gravel from heavy equipment, and modification to adjacent riparian areas. Juvenile PS chinook that may be rearing in the vicinity of the project area will most likely be displaced, although activities conducted during the in-water work period will decrease the likelihood of fish presence.

While effects are likely in some settings, it is important to note that the Management Practices submitted by the FS as part of the described actions, as well as limits to where and when projects will occur in relation to fish presence, will greatly minimize adverse effects.

2.2.1.1 Sediment Mobilization and Deposition

Direct effects on PS chinook can occur during construction near surface waters. Earth-disturbing activities, including excavation, stockpiling, vegetation manipulation, and construction, can result in increased delivery of sediment to streams, and increase turbidity in the water column. The severity of the effect depends on numerous factors including the proximity of the action to the water, amount of ground-disturbing activity, slope, amount of vegetation removed, and weather. Sediment introduced into streams can degrade spawning and incubation habitat, and negatively affect primary and secondary productivity. This may disrupt feeding and territorial behavior through short-term exposure to turbid water.

The effects of suspended sediment and turbidity on fish are reported in the literature as ranging from beneficial to detrimental, though the vast majority of literature reports negative consequences from anthropogenic or naturally induced sediment regime changes. Elevated total suspended solids (TSS) conditions have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival. Elevated TSS conditions have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Important factors for detrimental effects of TSS on fish are the season, frequency and the duration of the exposure (not just the TSS concentration) and the lifestage of the species.

Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore *et al.* 1980; Birtwell *et al.* 1984; Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (McLeay *et al.* 1984, 1987; Sigler *et al.* 1984; Lloyd 1987; Scannell 1988; Servizi and Martens 1991). Juvenile salmonids tend to avoid streams that are chronically turbid, such as glacial streams or those disturbed by human activities, except when the fish need to traverse these streams along migration routes (Lloyd 1987). In addition, a potentially positive reported effect is providing refuge and cover from predation (Gregory and Levings 1998), though this circumstance is limited.

Fine sediment can act as a physical barrier to fry emergence (Cooper 1959, 1965; Wickett 1958; McNeil and Ahnell 1964), and McHenry *et al.* (1994) found that fines (greater than13% of sediments less than 0.85mm) resulted in intragravel mortality of salmonid embryos due to oxygen stress and metabolic waste build-up. Deposited sediment can cover intragravel crevices that juvenile salmonids use for shelter, in turn decreasing the carrying capacity of streams for juvenile salmon (Cordone and Kelley 1961; Bjorn *et al.* 1974). Particulate materials physically abrade and mechanically disrupt respiratory structures (fish gills) and respiratory epithelia of benthic macroinvertebrates (Rand and Petrocelli, 1985).

Fine sediment can also affect juvenile PS chinook prey. Embedded gravel and cobble reduce access to microhabitats (Brusven and Prather 1974), entombing and suffocating benthic organisms. When fine sediment is deposited on gravel and cobble, benthic species diversity and densities have been documented to drop significantly (Cordone and Pennoyer 1960; Herbert *et al.* 1961; Bullard 1965; Reed and Elliot 1972; Nuttall and Bilby 1973; Bjorn *et al.* 1974; Cederholm *et al.* 1978). Reduced prey availability could contribute to reduced growth and survival of juvenile PS chinook.

Sediment deposition and increased temperatures can lead to decreased levels of dissolved oxygen (DO). In addition to the potential lethal effects of low DO, sublethal effects manifest in juvenile salmonids. Bjorn and Reiser (1991) determined that growth and food conversion efficiency are affected at DO levels of less than 5mg/L. Phillips and Campbell (1961) determined that DO levels must average greater that 8mg/L for embryos and alevins to have good survival rates. Silver *et al.* (1963) and Shumway *et al.* (1964) observed that chinook reared in water with low or intermediate oxygen levels were smaller sized and had a longer incubation period than those raised at high DO levels. Low DO levels increased the incubation periods for anadromous species, and decreased the size of alevins (Garside 1966; Doudoroff and Warren 1965; Alderice *et al.* 1958).

Fish that remain in turbid (elevated TSS) waters might be less susceptible to predation by piscivorous fish and birds (Gregory and Levings 1998). In systems with intense predation pressure, this provides a beneficial trade-off (*i.e.,* enhanced survival) to the cost of potential physical effects (*i.e.,* reduced growth). Turbidity levels of about 23 Nephalometric Turbidity Units have been found to minimize bird and fish predation risks (Gregory 1993). Exposure duration is a critical determinant of the occurrence and magnitude of physical or behavioral effects (Newcombe and MacDonald 1991). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjorn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987; Lloyd 1987; Servizi and Martens 1991).

Isolating work areas from active water flow will minimize turbidity. Isolating streamflow can cause increased turbidity by suspending sediment. Commonly, reintroducing the stream to a stretch that had been dewatered to conduct work will introduce some level of turbid waters downstream. To address this issue, projects conducted under the program will include ramped flow re-introduction to the project site after the completion of work.

The discussion above illustrates the full range of reported effects of suspended solids, turbidity, in the water column. A portion of the studies listed above attributed adverse affects from chronic inputs of sediments. Proposed activities are transitory in nature, and those that occur in-water are constrained by WDFW timing windows. As such, there is a low probability of direct mortality from turbidity associated with proposed activities because it should be localized and brief, and because the work site will be isolated from fish bearing waters during the construction period. No chronic input of sediments are anticipated from the proposed actions and their associated Conservation Management Practices.

2.2.1.2 Other Effects from In-Water Work

Instream use of equipment can compact and disturb stream bed gravels. Compaction and disturbance of stream bed gravels increase difficulty in redd excavation and the ability of the gravels to be aerated, resulting in lost productivity. Work within the wetted perimeter of the channel can at the least alter habitat quality and availability to PS chinook.

On rare occasions when adult PS chinook are present during work activities, they will likely avoid disturbed areas. Juveniles may be more prevalent during construction periods and subject to greater exposure to the effects of in-water work. Changes of stream flows in the project area could contribute to displacement from preferred habitats, and could contribute to a decrease in the spatial and temporal extent of water velocities within the tolerance of juvenile PS chinook.

While these effects are anticipated to occur, work within the construction window will greatly decreased the likelihood of PS chinook presence. Conservation Management Practices also direct heavy equipment to work from the banks as much as possible and to avoid entering the stream channel except to make required stream crossings in order that the gravel compaction issues discussed above are minimized or avoided.

When there are adult and juvenile PS chinook within, and downstream of the project reach, it is likely that they will be disturbed (to various degrees) by the mechanisms described above. It is recognized that the steps the FS will take to reduce these effects on adults and juveniles will minimize, though not completely eliminate, adverse effects on PS chinook.

2.2.1.3 Fish Sampling and Removal from Habitat

Fish are likely to experience the adverse effects of worksite isolation practices themselves. Work area isolation is a way of minimizing the exposure of fish to the effects of in channel construction. Isolating the work area can reduce the adverse effects of erosion and runoff on any individual fish present in the work isolation area. Those fish that are not excluded from the work area undergoing dewatering can be captured and released downstream of the work area. Of these seven sites that are located within chinook habitat, three are projected to include the collection of juvenile PS chinook as a conservation measure.

Even though this practice reduces the number of fish exposed to construction effects, that act of fish capture and handling causes stress. Fish can typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived. The primary contributing factors to stress and death from handling are differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps, if the traps are not emptied on a regular basis. Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis. These biological effects will be minimized or avoided by following the conservation measures as detailed in Appendix Q of the PBA, and conducting work when there will be few chinook.

2.2.1.4 Riparian Disturbance

Short-term alterations to riparian areas to facilitate work near and access to the stream can increase turbidity and reduce functional vegetation. The loss of vegetation may result in some small amount of increased solar radiation and subsequent small increase in stream temperature. However, most small streams on the MBS Forest are not considered temperature sensitive and expected small and short-term changes in temperatures from local disturbances would not be meaningful to PS chinook. The FS will identify temperature-sensitive streams for PS chinook and document any affects from these programs of activities during annual monitoring reports.

Construction activities in riparian areas have the potential to degrade the function of the existing riparian habitat by removing vegetation and de-stabilizing stream banks. Potential effects include decreased LWD recruitment, decreased bank stability, loss of riparian shade and cover, loss of habitat complexity and decreased floodplain interactions.

These effects will be minimized within the program because projects will occur mostly in previously disturbed areas, such as on and adjacent to existing bridges, roads and trails.

Conservation Management Practices integrated into program activities will ensure that disturbance to riparian areas and channels are minimized and avoided. For example, Conservation Management Practices 9 and 10 will ensure that existing LWD remain in the stream or riparian area. Conservation Management Practice 14 directs that any wood removed in culvert and bridge cleaning operations will be placed downstream. These Conservation Management Practices will ensure that existing LWD will continue to provide necessary habitat functions, such as water velocity refuge, sediment and nutrient retention and pool formation, within the action area of the consultation.

2.2.1.5 Equipment Spills and Chemical Use

Construction projects near water bodies include a risk of introducing harmful substances into streams and rivers. Project activities may also result in a spill of hazardous materials, including fuel, oil and grease. These can be acutely toxic to fish at high levels of exposure, and cause acute and chronic lethal or sub-lethal effects on salmonids, aquatic invertebrates, and aquatic and riparian vegetation. The FS will have hazardous spill clean-up materials on site and any machinery maintenance involving potential contaminants (fuel, oil, hydraulic fluid, etc) will occur at an approved site or outside the riparian area, and prior to starting work each day, all machinery will be checked for leaks (fuel, oil, hydraulic fluid, etc.). These measures should greatly decrease the likelihood of equipment spills, and subsequent effects if they occur. The FS has not proposed herbicide or pesticide use within the PBA.

2.2.1.6 Summary of Direct Effects

Adverse effects from erosion and turbidity, in water water work, riparian disturbance and equipment spills are likely to occur within each project or activity analyzed within this Opinion. The scope of each activity included in the program is narrowly proscribed. Furthermore, each activity or project type includes specific practices or conservation measures tailored to avoid direct adverse effects of those actions on habitat. As a result, the program limits direct effects on listed fish to those associated with isolation of in-water work areas, an action necessary to avoid greater environmental harm. All other direct adverse effects will likely be transitory and avoidable by both juveniles and adults. Such behavioral avoidance will probably be the only significant biological response of PS chinook to the proposed actions. This is because project areas are widely distributed and small compared with the total habitat area, and the intensity and severity of environmental effects within the action areas have been comprehensively minimized. Often, work in or near water will take place upstream of habitat utilized by PS chinook for spawning and rearing. Where work does occur in habitat used by PS chinook, proper work timing will greatly decrease the possibility of actual fish presence and reduces or avoids the exposure of fish to adverse effects. By absolute numbers, the majority of PS chinook within the action area are ocean-type, which typically move downstream to estuarine and Puget Sound nearshore habitats within a few months of emergence (Myers *et al*. 1998). In-water work can often be accomplished during low flow periods after juveniles have emerged from gravel and moved downstream, and prior to the return of adult fish.

Although ocean-type fish predominate PS chinook returns, stream-type fish occur in virtually every river system within the action area, and in some rivers they are the majority of adult returns. In the relatively rare settings where in water work will occur when adult or juvenile PS chinook are present, NOAA fisheries believes that the proposed conservation measures, including fish exclusion and removal provisions found in Appendix Q of the PBA, as well as specific limitations within each program and project type, will sufficiently minimize take of individual fish, and habitat functions essential for survival and recovery of PS chinook.

2.2.2 Indirect Effects

Indirect effects are caused by the proposed action, are later in time, and are reasonably certain to occur (50 CFR 402.02). Indirect effects can occur outside of the area directly affected by the action. Indirect effects can include the effects of other Federal actions that have not undergone section 7 consultation, but will result from the action under consultation.

While many of the direct effects of the proposed actions are relatively similar, the indirect effects of the LAA programs have a greater degree of variety. To provide a thorough illustration of effects on PS chinook and their habitat, this indirect effect analysis has been completed on a program and project type basis. Given the important role of disturbance events to aquatic ecosystems, NOAA Fisheries has also analyzed the relative influence of the LAA programs and project types on the rate and character of disturbance events.

Many of the proposed actions with short term direct effects will, over time, reduce or eliminate on-going effects from improperly designed or placed infrastructure. An example of this scenario is replacing a culvert that inhibits fish passage, bedload and wood movement with a full spanning bridge. While disturbance rates and character will not likely be appreciably influenced on a large, watershed wide scale from proposed actions, they may nonetheless be altered on a local, subbasin scale. In doing so, some proposed actions may influence subbasin disturbance frequency and character to more closely match conditions in which PS chinook evolved. Collectively, these actions will influence and largely benefit habitat parameters throughout the action area.

2.2.2.1 Program: Road Management and Road Maintenance - Project Type: Road Bridge Construction/Reconstruction, Transportation System Repair, Road Bridge Maintenance.

Prior to the listing of PS chinook, road networks were established throughout the MBS Forest largely to facilitate timber removal. Roads within forested lands can dramatically alter aquatic habitat conditions. Primary effects resulting from the increased drainage network include sediment delivery to streams, mass wasting, and increased water yields scouring channels, riparian degradation from roads built within channel migration zones, and stream crossings that limit fish passage, channel migration, and bedload movement, and the movement of large woody debris (Geppert *et al.* 1984). Without adequate maintenance, chronic sediment delivery to streams can occur. In addition, large scale delivery of sediments can occur from mass wasting events. These programs address the continuing function of the existing road infrastructure of the MBS Forest and influence aquatic system health through a variety of actions.

The Road Maintenance program is designed to keep roads accessible through the prevention of drainage problems and fill failure. This program is relevant to the type of road network that is prevalent in the MBS Forest. While addressing at least in small part, some similar issues to those in maintaining other types of roads and road systems, nothing in this analysis of this particular road maintenance program should be considered comparable to other non-forest road maintenance programs in Washington or Oregon.

Where roads are not maintained, the potential is high for a chronic or catastrophic increase in sediment production (Geppert *et al.* 1984). As such, long-term consequences of maintenance activities are generally positive. Road maintenance measures will enhance watershed function through improved fish passage and road drainage, and less erosion from the prevention, and repair of failed culverts and road prisms. As stated in the project descriptions within this program, typical activities are conducted within the previously disturbed area of the road prism. Activities include grading, fillslope stabilization, brushing, and culvert cleaning. Many MBS Forest roads intersect hillside surface and subsurface drainage, and waterbars, ditches and culverts are used to convey water at designated locations. Periodic removal of sediment, which typically occurs during the dry summer months, can maintain conveyance capacity, thus reducing potential for failure and heavy erosion during periods of large runoff events. Many road culverts are located on ephemeral waterways, thus most maintenance occurs when there is little or no water flowing. Wood that is blocking culverts on perennial or seasonal streams will be removed and replaced on the downstream portion of the channel to ensure that it will remain in the aquatic system. Fallen trees are often cleared from roadways, those that are within riparian reserves with salmon bearing channels will be removed from the road prism, but left within the riparian area to serve as nurse logs or LWD within streams. Road Bridge Maintenance involves cleaning of bridge surfaces, hazard tree removal, replacement of structural components such as decking materials and isolated bank stabilization at failures. Most adverse effects are associated with work that can occur in or near the active flow of water. The FS will utilize project conservation measures as appropriate, and the placement of bank stabilization will be limited to replacement only. Thus baseline conditions will not be degraded by additional bank stabilization. Wood that is caught on bridge superstructure will be removed and replaced immediately downstream to ensure that it is not lost from the stream system. Sediment delivery will be limited from bridge deck cleaning activities by pushing materials off the end of the deck and onto the surrounding land in areas it cannot enter flowing waters.

The Road Management program covers the repairs of or prevention of bridge and roadway damage from floods and large rainfall or snowmelt events. Bridge Construction and Reconstruction activities include replacing structures to improve passage of flood flows, bedload movement, and fish passage. To minimize adverse effects from in water work, and to ensure that stream functions are enhanced, the FS will replace bridges with those that fully span the Bankfull elevation, limit bank stabilization to replacement only, and will not construct or reconstruct bridges that have supports or abutments within the bankfull stream channel. Riparian functions will be preserved because bridge construction and reconstruction activities within this project type will only occur in previously disturbed locations, defined as those areas having previous bridge works located on, within, or adjacent to the site, and will not occur within riparian reserves containing salmonid bearing waters. For projects require floodplain fill, relief outlets (*i.e.,* culverts) will be placed to match pre-project/baseline instream velocities. Further, the bridges will be of sufficient height above the water to allow passage of debris underneath during flood flows. These provisions will prevent improperly designed and maintained bridges which could limit channel migration and alter hydrology through bank armoring or in channel abutments. They also prevent channel volume restriction during flood events which result in increased water velocity immediately downstream that can scour redds and limit the streams access to the floodplain.

Transportation System Repair activities are conducted to repair damaged road segments, or prevent imminent infrastructure and resource damage. Work includes culvert placement and replacements, placement of rip rap at fill failures (outside of the aquatic system), installation of new culverts or water bars, and the realignment of small road segments. Similar to other programs and project types, bank stabilization will be replacement only, thus functions like channel migration and riparian vegetation will not be degraded, replacement culverts will provide full fish passage, and new culverts will only be placed in non-salmonid bearing streams and ephemeral waterways. While work may result in short term (days to weeks) sediment delivery to streams, it will reduce long-term or catastrophic erosion by correcting drainage problems like failing or plugged culverts, and moving road segments away from chronic erosion locations near streams.

Collectively, the Road Management and Road Maintenance programs will ensure that adverse effects listed above are reduced or avoided through restrictive timing of work, and sediment control measures. Adverse effects of natural disturbance events such as floods and landslides can be exacerbated by road infrastructure. Although site specific variability influences road failure potential, there are not large scale studies that indicate that the potential for failure is reduced with time (Geppert *et al.* 1984). Thus, proper maintenance is critical to minimize changes to basin hydrology and sediment delivery to surface waters. Many program actions will address past management and infrastructure that continues to compromise aquatic habitat functions. By improving culvert and bridge function, adverse effects such as road failure and added delivery of large volumes of sediment to surface waters will be minimized during floods.

Aquatic conditions will be enhanced by improving fish passage, decreasing or eliminating chronic sediment sources and/or improving channel migration and bedload and wood movement where they have been constrained as a result of poorly designed infrastructure. As a result, adverse effects of disturbance events such as floods and landslides will not be appreciably exacerbated in quantity and character from these actions. Conversely, actions such as drainage maintenance and culvert removal or replacement will ameliorate aquatic habitat response to floods and landslides.

2.2.2.2 Program: Recreation Management - Project Type: Developed Site Operation and Maintenance, Trail Bridge Maintenance, Trail Restoration Through Reconstruction and Construction, Trail Bridge Restoration Though Reconstruction and Construction.

Developed Site Operation and Maintenance includes some relatively minor activities such as general cleanup and repair of structures like tables, signs, and barriers, and lawn mowing and trash collection. Adverse indirect effects from this project category are likely to be from public use associated with these areas, and additional wells. Many of these sites are located adjacent to anadromous fish reaches within the MBS Forest, as such, poaching and harassment of PS chinook is probable. In addition, adverse effects on habitat will likely occur from ad hoc rearrangement of streambed rocks. The rearrangement of rocks for human swimming holes can impede fish passage, redistribute spawning substrate and alter natural channel migration. It can also harass adult and juvenile fish. Public use of streambank areas can result in trampling of riparian areas and removal of wood from channels and riparian areas for fires. The loss of riparian shrubs from trampling may expose soils and lead to streambank erosion, while the collection of live and downed timber within riparian areas can decrease their overall productivity through loss of leaf litter and nutrient removal. The FS partially addresses these issues by placing wood and rock barriers to vehicle travel within the riparian areas, revegetating denuded banks, and maintaining and building small footpaths to concentrate pedestrian traffic away from sensitive areas, and placing educational and warning signs that address some of the issues associated with public use. Additionally, trees that are threats to public safety and are cut from campgrounds and riparian roadways will be left in the area to serve as nutrient sources and instream woody debris. Additional well installation could reduce water available to streams through lowered aquifer levels. Well installations approved within this Opinion will occur only for replacement of water source. For example, surface water sources may be shut off or existing wells may be replaced with new wells. In these scenarios, additional water consumption will not occur as a result of new well installation.

Many MBS Forest trails are located adjacent to streams, in riparian areas, or on steep grades. As such, many of the activities within the Trail Restoration through Reconstruction and Construction project type are related to fixing trail stability. Most trail maintenance within the MBS Forest involves the use of hand tools and wood materials for repairs, although larger trails may require heavier machinery, such as small excavators. The repair or construction of trails near streams or on steep grades can involve the disturbance of upland and riparian vegetation, which can in turn decrease soil and bank stability, nutrient input to streams, and incrementally decrease shade near surface waters. These possible adverse effects will not likely result in quantitative habitat changes because activities are limited to areas that have previous access established, thus the large scale removal of riparian vegetation will not occur. In some cases, trail segments located along the edges of streams that are impacted by channel migration may be moved away from the watercourse, with native vegetation planted in its place. Adverse affects will be further limited because new activities in riparian areas and streams containing salmon-bearing channels are not part of the proposed action within this project type.

The Trail Bridge Maintenance and Trail Bridge Restoration through Reconstruction and Construction project types involve work on or near bridges that can cross streams that contain listed PS chinook. Minor amounts of vegetation removal can occur from brushing near the structures, and work can introduce sediment to waterways from sweeping and exposed soils. Bridges that are repaired or reconstructed may improve instream hydrological conditions by fully spanning the bankfull elevation of the stream channel. The FS has proposed that work on supports or abutments in channels will not occur as part of this project type, thus adverse affects from instream work will be further limited. The removal of vegetation will be limited to small shrubs and trees near the bridges, thus woody debris input and shade impacts should be negligible.

2.2.2.3 Program: Watershed Restoration - Project Type: Stormproofing and Road Upgrading, Landslide Stabilization, Road Decommissioning, Instream Aquatic Improvement, Hydrologic Restoration and Maintenance, Fish Passage Improvement, Wetland Restoration.

Natural disturbance events exhibit a large degree of spatial variability. Some may encompass virtually the whole watershed, such as the major flood events of 1990 and 1995/96 in Puget Sound Rivers, while others, such as minor landslides, may influence only portions of small ephemeral streams. At natural frequencies, these processes are important to maintaining salmonid fish production in aquatic ecosystems (Gregory *et al.* 1991) and are necessary for normal ecosystem functions and diverse aquatic communities (Poff and Ward 1990).

Most of the Watershed Restoration program categories have the common goal of enhancement of habitat functions and increasing resilience to natural disturbance events. Not all of the projects will focus on habitats used exclusively by PS chinook. Ultimately, all of the project categories will have some direct or indirect positive impact to aquatic systems and have the likelihood to contribute positively to salmonid utilization of their habitats. Improving freshwater natural production and survival through restoration activities such as installing instream structures, including placement of rock and wood, improving secondary channel habitats, restoring wetland hydrology, carcass placement, or removing structural barriers (culverts) within the MBS Forest has the potential to significantly improve salmonid populations and habitat conditions within the whole action area in the long-term.

Fish Passage Improvement projects that remove fish blockages obviously benefit populations by allowing access to unoccupied habitat. Salmonid reproduction estimates can be made based on supporting data or assumptions about the quantity (area) and quality of aquatic habitat that becomes accessible. Habitat improvement projects such as riparian planting or upland sediment reduction projects may improve the ecological function of presently occupied habitat. There is potentially a large range of beneficial population effects that could occur from these type of projects.

Bilby reported average salmonid densities of 0.4 to 0.8 per m^2 for basins in southwest Washington (Bilby 1994, unpublished). The multiplier effect of hundreds of miles of freshwater streams suggests a potentially significant beneficial affect from these types of projects. Hollowed and Wasserman (2000) reported as many as 10 million additional adult salmon per year in production capacity from correction of 8,800 blocking culverts in Washington State waters. Within the MBS Forest, there have been over 120 culverts identified as blocking fish habitat, with 40-50 of these thought to block anadromous salmonids. The additional beneficial effects on habitat access enjoyed by unlisted salmonids that nonetheless contribute to the biological integrity of the system further multiplies the positive contribution of these projects.

In addition to likely fish population response to passage improvement projects, habitat characteristics are influenced by increasing fish passage. The removal of culverts, replacing culverts with full spanning bridges, or full stream-width culverts will allow bedload movement to nearly match pre-disturbance rates over time. Upstream sediment and gravels can once again move throughout the system, in addition to large wood that can be blocked by passage barriers. The long-term benefit of re-establishing fish passage to these spawning and rearing habitats will, when weighed against the effects of construction with conservation measures, more than outweigh the short term effects of project construction

The Instream Aquatic Improvement project type includes the placement of logs and rocks to improve habitat complexity within stream channels. Off channel habitats that have been isolated by past management may be reconnected through the removal of culverts or fill. Salmon carcasses are also distributed to under seeded waterways to augment nutrient availability. Most project activities will involve in-water work and the adverse effects as detailed in the direct effects section of this Opinion. Longer term/post construction effects from the placement of wood and rocks are likely to be beneficial to PS chinook and their habitat. Channel morphology will be altered to provide beneficial functions, such as increased holding and rearing habitat for adult and juvenile salmonids, sediment and organic debris trapping, and off channel habitat complexity enhancement. Scour pools of various sizes and depths often develop adjacent to wood and rocks, as a result, holding habitat, an important component for adult PS chinook, will develop.

In addition to adult use, the rock and wood also provide habitat components beneficial to juvenile salmonids. Juvenile chinook often utilize stream margin habitats, where water velocity is typically slower than other micro-habitats (Lister and Genoe 1970; Bjorn and Reiser 1991). It is expected that added structure will decrease water velocities immediately adjacent to each structure, and will provide increased micro-habitat complexity preferred by juvenile salmonids. Large wood accumulations and associated pool habitats also provide cover from predators and refuge habitats during larger flow events (Everest *et al.* 1985). As streams adjust to the new flow dynamics, there is a potential for minor to substantial re-distribution of river substrate. Any PS chinook redds, in particular those built after rock or wood placement but prior to higher flows, may be subject to scouring. Scour could lead to decreased emergence rates of alevins.

The Stormproofing and Road Upgrading, and Road Decommissioning project types will have many of the same beneficial effects of the activities in the Road Maintenance and Road Management programs, although they will provide a greater degree of improvement of baseline conditions. As previously mentioned, forest roads can alter the natural transport of water within drainages, as a result elevated sediment mobilization and delivery to surface waters can occur. In many instances, past timber harvest and road building within the MBS Forest and state and private lands altered the timing and volume of flows and subsequent delivery of sediment to surface waters (Geppert *et al*. 1984). Increased peak flows can occur through the loss of evapotranspiration and a more rapid delivery of surface waters from the road drainage network. These types of changes are more detectable in forested areas west of the Cascade Range (Spence *et al*. 1996) and where roads constitute four to 12% or more of the catchment area (Spence *et al.* 1996; Harr *et al.* 1979; Harr *et al.* 1975; Hsieh 1970). In concert with altered flow regimes are increased levels of sediment delivered to surface waters from roads; Reid (1981) detected fine sediment (greater than 2mm) production increased 4.5 and 7.2 times as result of logging roads in two basins within the Olympic Peninsula, with 43 and 49% coming from the road surface.

Actions taken as part of the Stormproofing and Road Upgrading project type include activities, such as installation of water bars, that benefit road integrity through managing drainage to minimize chronic sediment mobilization and triggering potential slope instability, *i.e.,* landslide events. Decommissioning will further reduce effects on local hydrology and erosion by eliminating vehicle traffic; sediment concentrations from road runoff may be 15 to 100 times greater from heavily used logging haul roads than from lightly used gravel roads or paved roads (Reid 1981; Wald 1975). Decommissioning will also allow the forest canopy and native vegetation to colonize in previously open areas, in turn reducing runoff from enhanced evapotranspiration, and eliminating altered subsurface drainage patterns over time.

The Landslide Stabilization project type is typically conducted near the headwater areas of drainages. Techniques range from planting native vegetation, installing erosion control matting, or log terracing or live cribwall construction. Erosion from these activities is influenced by the type of equipment used, the size of the site and its location relative to surface waters. The FS has proposed that most landslide stabilization will occur outside of salmonid bearing channels and riparian areas, which decreased the potential for adverse effects from earth disturbance. Work should reduce fine sediment delivery to surface waters from chronic surface erosion. Landslides and attendant surface erosion can also occur more frequently from clear cutting and road building activities. Furniss *et al.* (1991) reported that landslides associated with roads produced 26-346 times the volume of sediment as undisturbed watersheds. While the rate and character of disturbance has been altered, improperly designed infrastructure such as culverts and bridges exacerbate effects by impeding fish passage, limiting bedload movement and channel migration during various flood events. Given that many subbasins within the action area have undergone elevated landslide activity over the past century associated with road building and timber harvest, this project type should reduce disturbance events related to past management such as timber harvest, or road building on steep slopes.

Wetland Restoration actions are designed to restore the vegetative communities and hydrologic conditions of wetlands that have been limited or lost through a variety of past management. Activities include blocking human access, revegetation and the removal of culverts or other hydrologic controls that limit wetland function. Some sites may be located adjacent to salmonid bearing waters, thus construction related adverse effects could occur. Long-term improvement of habitat functions will occur through increased water retention and infiltration, as well as water quality improvements; wetlands have been documented to attenuate runoff and pollutants, increase infiltration of rainwater and encourage deposition of sediments (Spence *et al*. 1996).

The Watershed Restoration program and associated actions will benefit habitat functions within and outside of the MBS Forest. Collectively, these projects will decrease chronic turbidity with streams, increase wood and organic matter content, increase available habitat for spawning salmonids, and enhance rearing habitat. Although these actions will provide the most dramatic initial benefits upon habitat within the MBS Forest, benefits to downstream aquatic habitat functions will nonetheless occur. The most tangible benefits outside of the MBS Forest are likely improved water quality, and the downstream movement of wood placed by the FS, and wood and gravels allowed to move downstream as a result of fish passage projects. Gravels that move downstream in some settings may enhance spawning habitat utilized by PS chinook, and wood that moves downstream can increase pool and rearing habitat, and increase overhead cover and refuge in estuarine and Puget Sound near-shore settings.

2.3 Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." Other activities within the watershed have the potential to impact fish and habitat within the action area. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and certain land management activities are being (or have been) reviewed through separate section 7 consultation processes with a variety of Federal action agencies.

Non-Federal activities of the same type identified as factors for decline by NOAA Fisheries and within the action area are expected to increase with a projected 34% increase in human population over the next 20 years in Washington (Washington State Department of Natural Resources, 1998 and 2000). Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, but at increasingly higher levels as population density climbs. NOAA Fisheries believes the majority of environmental effects related to future growth will be linked to land clearing, associated use shift (*i.e.,* from forest to lawn/pasture) and impervious surface and related changes. Urban and suburban growth around aquatic systems downstream of the MBS Forest is occurring at a rapid rate. Land use changes and development of the built environment are likely to continue under existing zoning. Further, NOAA Fisheries believes that many of the existing local and state regulatory mechanisms intended to minimize and avoid effects on watershed function and listed species from future commercial, industrial, and residential development are generally not adequate, and/or not implemented sufficiently. Thus, while these existing regulations could decrease adverse effects on watershed function, they still allow incremental degradation to occur, which accumulate over time, and when added to the degraded environmental baseline, might result in degraded habitat conditions and reduce habitat quantity and quality for listed species.

NOAA Fisheries believes that baseline conditions within much of the action area will be subject to substantial, local changes in the short and long term. Until substantial improvements in non-Federal land management practices are actually implemented and shown to be effective for enhanced productivity of PS chinook habitats, NOAA Fisheries assumes that future private and state actions will continue at similar intensities as in recent years. Now that the PS chinook ESU is listed under the ESA, NOAA Fisheries assumes that non-Federal land owners, and permitting entities who have control to condition permits/deny permits to achieve watershed protection and enhancement in those areas, will also take steps to curtail or avoid land management practices and permitting that would result in the unauthorized take of the this species. Such actions that contribute to take are prohibited by section 9 of the ESA, and may be addressed by the incidental take permitting process under section 10 of the ESA.

2.4 Conclusion

The NOAA Fisheries has determined, based on the information, analysis, and assumptions described in this Opinion, that the proposed program of actions by the FS is not likely to jeopardize the continued existence of PS chinook. In arriving at this determination, NOAA Fisheries considered the status of the PS chinook ESU, the best scientific and commercial data available, environmental baseline conditions, the direct and indirect effects of the action, and the cumulative effects of actions anticipated in the action area.

NOAA Fisheries evaluated the proposed action and found that it would in some cases cause short-term adverse degradation of some environmental baseline indicators. The placement of stream isolation structures, and in-water work will cause listed species to abandon feeding and resting sites and seek other shelter. The act of isolating the work site and removing flowing waters has the greatest probability of adverse effects as, despite efforts to capture and transfer fish there is at least some probability that not all fish will be successfully captured and transferred. During the re-introduction of stream flow to a completed project there is a likelihood that at least some sediment will be re-suspended and be transported to downstream habitats. Adverse effects are expected to be minimal, however, and the proposed action is not expected to result in further degradation of aquatic habitats over the long term. Longer-term effects are largely beneficial. Upgrading MBS Forest infrastructure through actions such as removing and replacing culverts, maintaining, enhancing and decommissioning roads improves aquatic systems response to disturbance events, and on a subbasin scale may reduce the adverse effects of storms and floods. Thus, the effects of the proposed action would not reduce pre-spawning survival, egg-to-smolt survival, or upstream/downstream migration survival rates to a level that would appreciably diminish the likelihood of survival and recovery of PS chinook.

2.5 Conservation Recommendations

Section 7 (a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out programs for the conservation of threatened and endangered species. The conservation recommendations provided here are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of habitats, or to develop additional information. NOAA Fisheries believes the following conservation recommendations are consistent with these obligations, and therefore should be carried out by the FS. This information will help to reduce uncertainty about the effects of past and ongoing human and natural factors leading to the status of listed salmon and steelhead, their habitats, and the aquatic ecosystem within the action area.

1. Fish passage should be provided at all road or trail crossings that present anadromous blockages within the MBS Forest. Those blockages that would not directly benefit PS chinook would nonetheless improve habitat parameters and long term marine-derived nutrient levels that enhance overall aquatic system health.

2. MBS Forest roads that parallel stream systems and impede channel migration or compromise riparian function should be decommissioned, bank hardening removed, and planted with native vegetation.

2.6 Reinitiation of Consultation

Consultation must be reinitiated after five years. It also must reinitiated if: the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16). To reinitiate consultation, the FS should contact the Habitat Conservation Division (Washington State Office) of NOAA Fisheries.

2.7 Incidental Take Statement

The ESA at section 9 (16 U.S.C. 1538) prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule (50 CFR 223.203). Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." (16 USC 1532(19)). Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." (50 CFR 222.102). Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering." (50 CFR 17.3).

Incidental take is defined as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." (50 CFR 17.3). The ESA at section 7(o)(2) removes the prohibition from incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement.

2.7.1 Amount or Extent of Take

As stated in section 2.1.2 above, PS chinook use the action area during seasons when a portion of the proposed actions will be implemented, for a variety of normal behaviors and are likely to be exposed to project effects. Therefore, incidental take of PS chinook is reasonably certain to occur. Most incidental take is likely in the form of harm, or habitat modification that kills or injures fish by impairing certain normal behavioral patterns (feeding, rearing, migrating, etc.). Table 2 in section 1.2 provides the FS estimate for the number of LAA projects per watershed. Of these totals, the actual volume of projects that result in harm, largely through sediment delivered to surface waters, is anticipated to be largely limited to those projects that occur during adverse weather conditions that cause delivery of sediment. Because projects are generally timed to avoid adverse weather, in-water work is timed to reduce the exposure of PS chinook to projects effects on the fewest individuals possible, and because incidental take is likely mainly from habitat modification, NOAA Fisheries cannot quantify the precise number of individual fish that might be taken. In such circumstances, NOAA Fisheries characterizes the take as unquantifiable. However, the PCEFs for LAA projects will identify the FS estimate for stream disturbance for each project. This incidental take statement becomes effective at the project level, after NOAA Fisheries confirms that projects are consistent with provisions of the this Opinion using the PCEFs.

In contrast to those activities discussed above NOAA Fisheries can estimate the amount take from other projects that require direct handling through capture, removal, and release of juveniles. The FS has estimated that three in-water work projects will require the capture of PS chinook as a measure to minimize adverse effects. NOAA Fisheries has estimated the amount of take associated with those three projects requiring isolation of the in-water work area using the following assumptions: (1) each project requiring in-water work area isolation is likely to capture no more than 100 juvenile PS chinook; (2) each project will occur during the same year, and; (3) of the PS chinook to be captured and handled in this way, 98% or more are expected to survive with no long-term effects and 1-2% are expected to be injured or killed, including delayed mortality because of injury. To allow for variations in experience and work conditions, an estimate of 5% of mortality for the captured PS chinook will be used here. Capture and release of adult fish is not expected to occur as part of the proposed isolation of in-water work areas. Thus, NOAA Fisheries does not anticipate that any adult fish will be taken.

An average of 21,189 naturally spawning adult PS chinook return to the ESU as a whole (NOAA Fisheries 2003). By applying a conservative 4,000 eggs per female to the estimated 10,594 females (half of 21,189), approximately 42 million eggs may be expected to be produced annually within the Puget Sound ESU. Published estimates of survival from egg-to-smolt are few and variable but have been estimated to average around 10% (Healey 1991). As such, a rough estimate of 4.2 million juvenile PS chinook may be produced within the ESU. Of the FS proposed handing of 300 juvenile PS chinook, this estimate translates to 0.000007% of the smolts being handled. The estimated mortalities from in water work are estimated to be 0.0000004% of the smolts from any particular year class. Even if monitoring proves the 5% mortality rate is accurate, isolation of in-water work area activities will not affect ESA-listed species at the population level.

Given these assumptions, up to 285 juvenile PS chinook may be subject to harassment, and an additional 15 fish may be killed. These numbers are a total estimate for the course of the five-year period of the incidental take statement.

2.7.2 Reasonable and Prudent Measures

The measures described below are non-discretionary. They must be implemented so that they become binding conditions in order for the exemption in section 7(a)(2) to apply. The FS has the continuing duty to regulate the activities covered in this incidental take statement. If the FS fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. NOAA Fisheries believes that activities carried out in a manner consistent with these reasonable and prudent measures, will not necessitate further site-specific consultation. Activities which do not comply with all relevant reasonable and prudent measures will require individual consultation.

The following reasonable and prudent measures are necessary and appropriate to avoid or minimize the amount or extent of take of listed fish resulting from implementation of the proposed program. The FS shall:

1. Minimize incidental take from each and every program activity through individual project reviews and faithful implementation of programmatic conservation actions.

2. Minimize incidental take from general activities near or in-water.

3. Minimize incidental take from project specific activities within or near stream channels and riparian reserves.

4. Minimize take by implementing a comprehensive monitoring and reporting program to confirm the program elements are achieving the intended results.

2.7.3 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the FS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary and, in relevant part, apply equally to proposed actions in all categories of activity.

1. To implement Reasonable and Prudent Measure No. 1 (administration of the Programmatic Biological Assessment for the MBS Forest), the FS shall:

   a. Individual Project Review. Individually review each project to ensure that all direct and indirect adverse effects on listed salmon and their habitats are within the range of effects considered in this Opinion.

   b. Full Implementation Required. Departure from full implementation of the terms and conditions of the following incidental take statement will result in the lapse of the protective coverage of section 7(o)(2) regarding "take" of listed species and may lead NOAA Fisheries to a different conclusion as to the effects of the continuing action, including findings that specific projects will jeopardize listed species.

c. Salvage Notice. If a sick, injured or dead specimen of a threatened or endangered species is found in association with covered FS activities, the finder must notify the Seattle Office of NOAA Fisheries Law Enforcement at (206) 526-6133. The finder must take care in handling of sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

d. Reinitiation. Reinitiate formal consultation on this Opinion within five years of the date of issuance. This term and condition is in addition to reinitiation requirements described in section 2.1.6 above.

2. To implement Reasonable and Prudent Measure No. 2 (activities near or in-water, or that may lead to increased turbidity in streams), the FS shall ensure that:

a. Diversion of Water. If work is in the active channel flow, water shall be diverted around the site. If adult or juvenile PS chinook are reasonably certain to be present, the work area will be well isolated from the active flowing stream using inflatable bags, sandbags, sheet pilings, or similar materials. The work area will also be isolated if in-water work may occur within 300 feet upstream of spawning habitats.

b. Erosion Control. Erosion control methods shall be used to prevent silt-laden water from entering the stream.

i. Inspection of Erosion Controls. During construction, all erosion controls must be inspected daily during the rainy season and weekly during the dry season to ensure they are working adequately.[4]

(1) If inspection shows that any of the erosion controls are ineffective, work crews must be mobilized immediately to make repairs, install replacements, or install additional controls as necessary.

(2) Sediment must be removed from erosion controls once it has reached 1/3 of the exposed height of the control.

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[4] "Working adequately" means no turbidity plumes are evident during any part of the year.

(3) Excess sediment will be disposed of so they do not enter the stream channel.

c. Weather Conditions. If weather conditions during project operations generate and may transport sediment to a water course that can deliver to PS chinook habitat, cease operations until the weather conditions improve.

d. Disturbed Ground. All disturbed ground shall be reclaimed using appropriate best management practices. Measures shall be retained after project construction until soil has stabilized and are unlikely to erode into streams.

e. Wastewater. Wastewater from project activities and water removed from within the work area shall be routed to an area landward of the bankfull elevation to allow removal of fine sediment prior to being discharged back to the stream.

f. Streambed Gradient. Streambed disturbance shall be limited to the extent practicable. Streambeds shall be restored to the original gradient.

g. Culvert Removal, and Removal with Replacement. Culvert replacement shall follow the following provisions, and follow NOAA Fisheries fish passage guidance.[5]

i. Crossing Types. Design road crossings in the following priority.

(1) Nothing – road realignment to avoid crossing the stream.

(2) Bridge – spanning the stream to allow for long-term dynamic channel stability.

(3) Streambed simulation – bottomless arch, embedded culvert, or ford.

(4) No-slope design culvert[6] – sometimes referred to as hydraulic design, here limited to zero percent slopes.

ii. Spawning Areas. If the crossing will occur near a spawning area, only full span bridges or streambed simulation may be used.

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[5] NOAA Fisheries fish passage guidance can be found at http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/release_draft.pdf

[6] "No-slope design culvert" means a culvert that is sufficiently large and installed flat to allow the natural movement of bedload to form a stable bed inside the culvert.

iii. Fill Width. Fill width and depth must be limited to the minimum necessary to complete the crossing, and must not reduce existing stream width.

iv. Streambanks. Streambanks shall be properly sloped to an angle of stability (natural repose) after culverts have been removed and be suitable for establishment of permanent woody vegetation.

h. Felled Trees. Trees that must be cut due to public safety concerns within the riparian reserve, the channel migration zone[7] and/or floodplain shall be felled toward the stream, preferably with the rootwad intact and left in place, or used within stream restoration projects.

I. Wood Removal. All non-treated wood shall be left within the aquatic habitat, including within the riparian reserve/channel migration zone.

j. Hazardous Materials Plan, Materials and Personnel. The Pollution and Erosion Control Plan must contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations. Hazardous spill materials and trained operators shall be on site prior to conducting work.

i. Erosion Control. Practices shall be implemented to prevent erosion and sedimentation associated with access roads, stream crossings, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas.

ii. Inventory. A description of any hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.

iii. Containment Plan. A spill containment and control plan with notification procedures, specific clean up and disposal instructions for different products, quick response containment and clean up measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment. Booms shall be in place before working instream, and sufficient number of absorbent pads will be on hand to contain the largest possible spill.

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[7] "Channel migration zone" means the area defined by the lateral extent of likely movement along a stream reach by evidence of active stream channel movement over the past 100 years, i.e, alluvial fans or floodplains formed where channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams.

iv. <u>Construction Debris</u>. Practices to prevent construction debris from dropping into any stream or water body, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.

k. <u>Heavy Equipment and Machinery Maintenance</u>. Use of heavy equipment will be restricted as follows.

i. <u>Choice of Equipment</u>. When heavy equipment must be used, the equipment selected must have the least adverse effects on the environment (*i.e.,* minimally sized, low-pressure tracked, operating off wooden mats in very wet areas).

ii. <u>Vehicle Staging</u>. Vehicles must be fueled, operated, maintained and stored as follows:

(1) Vehicle staging, cleaning, maintenance, refueling, and fuel storage must take place in a vehicle staging area placed 150 feet or more from any stream, water body or wetland.

(2) All vehicles operated within 150 feet of any stream, water body or wetland must be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected must be repaired in the vehicle staging area before the vehicle resumes operation.

(3) All equipment operated instream must be cleaned before beginning operations below the bankfull elevation to remove all external grease, dirt, and mud.

iii. <u>Stationary Power Equipment</u>. Stationary power equipment (e.g., generators, cranes) operated within 150 feet of any stream, water body or wetland must be diapered to prevent leaks.

iv. <u>In-Stream Operations</u>. Equipment that traverses or operates within bankfull elevation of waterways shall use vegetable based oil.

l. <u>Culvert Maintenance</u>. Maintenance of culverts shall be consistent with the following measures.

i. <u>Wood Replacement</u>. Any wood removed from culvert inlets shall be immediately placed back in the stream downstream of the culvert.

ii. <u>Cleaning Access</u>. Culverts must be cleaned by working from the top of the bank, unless culvert access adjacent to the stream would result in less habitat disruption.

iii. Minimize Debris Removal. Remove only the minimum amount of wood, sediment and other natural debris necessary to maintain culvert function without disturbing spawning gravels.

iv. Post-Project Fish Passage. After the maintenance activity, fish passage shall not be inhibited from pre-project conditions. Under no conditions shall culverts within the anadromous zone be "perched" as a result of maintenance activities.

m. Timing of In-Water Work. Work within the active channel will be completed during the WDFW preferred in-water work period[8], as appropriate for the project area, unless otherwise approved in writing by NOAA Fisheries.

n. Fish Screens. All water intakes used for a project, including pumps used to isolate an in-water work area, will have a fish screen installed, operated and maintained according to NOAA Fisheries fish screen criteria.[9]

o. Treated Wood. Projects using treated wood[10] for any structure that may contact flowing water or that will be placed over water are not authorized. Projects that require removal of treated wood will use the following precautions.

i. Treated Wood Debris. Care must be taken to ensure that no treated wood debris falls into the water. If treated wood debris does fall into the water, it must be removed immediately.

ii. Removal of Treated Bridge Materials. If treated bridge materials will be removed, the following conditions apply:

(1) Once loose, materials must be placed on an appropriate dry storage location, and not left in the water or piled onto the stream bank.

(2) If materials located in water, or below the Bankfull elevation, break during removal, the stump must be removed by breaking or cutting 3 feet below the sediment surface, then covered with a clean substrate appropriate for the site.

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[8] NOTE: WDFW work windows are provided as an attachment to this Opinion.

[9] National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/release_draft.pdf)

[10] "Treated wood" means lumber, pilings, and other wood products preserved with alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), ammoniacal copper zinc arsenate (ACZA), copper naphthenate, chromated copper arsenate (CCA), pentachlorophenol, or creosote.

iii. Disposal of Treated Wood Debris. All treated wood removed during a project must be disposed of at a facility approved for hazardous materials of this classification.

p. Temporary Stream Crossings. Projects utilizing temporary stream crossings shall adhere to the following measures:

i. Frequency. The number of temporary stream crossings must be minimized.

ii. Design. Temporary road crossings must be designed as follows:

(1) A survey must identify and map any potential spawning habitat within 300 feet downstream of a proposed crossing.

(2) No stream crossing may occur at known or suspected spawning areas, or within 300 feet upstream of such areas if spawning areas may be affected when adult fish are present.

(3) The crossing design must provide for foreseeable risks (*i.e.,* flooding and associated bedload and debris) to prevent the diversion of streamflow out of the channel and down the road if the crossing fails.

(4) Temporary stream crossings must cross riparian areas and streams at right angles to the main channel wherever possible.

(5) Consider fill material of wood chips over filter cloth in riparian areas to minimize removal disturbance.

q. Site Preparation. Native materials will be conserved for site restoration.

i. Native Materials. If possible, native materials must be left where they are found.

ii. Native Material Replacement. Materials that are moved, damaged or destroyed must be replaced with a functional equivalent during site restoration

iii. Material Stockpiling. Any large wood[11], native vegetation, weed-free topsoil, and native channel material displaced by construction must be stockpiled for use during site restoration.

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[11] For the purposes of this Opinion only, "large wood" (or LWD) is defined as a tree with a minimum diameter of 0.1 meters (10 centimeters) along 2 meters of its length

r. Capture and Release. Before and intermittently during pumping to isolate an in-water work area, an attempt must be made to capture and release fish from the isolated area using trapping, seining, electrofishing, or other methods as are prudent to minimize risk of injury.

   i. Supervision. A fishery biologist experienced with work area isolation and competent to ensure the safe handling of all ESA-listed fish must conduct or supervise the entire capture and release operation.

   ii. Electrofishing. If electrofishing equipment is used to capture fish, the capture team must comply with NOAA Fisheries electrofishing guidelines[12].

   iii. Handling. The capture team must handle ESA-listed fish with extreme care, keeping fish in water to the maximum extent possible during seining and transfer procedures to prevent the added stress of out-of-water handling.

   iv. Release Sites. Captured fish must be released as near as possible to capture sites.

s. Earthwork. Earthwork (activities that disturb soils) will be completed as quickly as possible.

t. Site Stabilization. All disturbed areas must be stabilized, including obliteration of temporary roads, within 12 hours of any break in work unless construction will resume work within 7 days between June 1 and September 30, or within 2 days between October 1 and May 31.

u. Source of Materials. Boulders, rock, woody materials and other natural construction materials used for the project must be obtained outside the riparian area.

   i. Surface Water. Surface water from the area must not be diverted from or increased to an existing wetland, stream or near-shore habitat sufficient to cause a significant adverse effect to wetland hydrology, soils or vegetation.

v. Site Restoration. All streambanks, soils and vegetation disturbed by the project shall be cleaned up and restored as follows.

   i. Restoration Goal. The goal of site restoration is renewal of habitat access, water quality, production of habitat elements (such as LWD), channel conditions, flows,

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[12] National Marine Fisheries Service, *Backpack Electrofishing Guidelines* (December 1998) (http://www.nwr.noaa.gov/1salmon/salmesa/pubs/electrog.pdf).

watershed conditions and other ecosystem processes that form and maintain productive fish habitats.

ii. Revegetation. Areas requiring revegetation must be replanted before the first April 15 following construction with a diverse assemblage of species that are native to the project area or region, including, forbs, shrubs and trees.

iii. Pesticides. No pesticide application is allowed, although mechanical or other methods may be used to control weeds and unwanted vegetation.

iv. Fertilizer. No surface application of fertilizer may occur within 50 feet of any stream channel.

v. Transfer. ESA-listed fish may not be transferred to anyone except NOAA Fisheries personnel, unless otherwise approved in writing by NOAA Fisheries.

3. To implement Reasonable and Prudent Measure No. 3 (minimize incidental take from project specific activities within stream channels and riparian reserves.), the FS shall:

a. Trail Restoration Through Reconstruction and Construction. Project activities within/adjacent to salmon bearing channels for this project category are not covered within this Opinion.

b. Activity Limitations. The following activities are not authorized within this Opinion, as specified below.

i. Rip Rap and Bank Stabilization. No new volume of rip rap is authorized under this Opinion. The placement of rip rap on stream banks is limited to replacement only, with native vegetation plantings to occur within the rip rap. Banks shall not be stabilized with rock or other materials aside from native tree and shrub placement.

ii. Large Wood. There shall not be a net loss of woody material from stream channels, riparian reserves, channel migration zones, and floodpains of streams. Individual pieces of wood may be moved within fifth-field watersheds as part of channel restoration projects as described within the proposed actions.

iii. Landslide Stabilization. Landslide Stabilization work utilizing hand work only may occur within riparian areas of salmon bearing channels. Heavy equipment use is not authorized within riparian areas of salmon bearing channels.

c. Road and Trail Bridge Works. Projects involving road and trail bridges shall follow the following limitations and measures.

i. Abutments. Construction or reconstruction of bridges that have abutments or other infrastructure within the bankfull elevation are not authorized.

ii. Location Conditions. Construction or reconstruction of bridges shall be limited to previously disturbed locations. Previously disturbed is defined as those areas having previous bridge works located within, on, or adjacent to the site.

iii. Design. Construction or reconstruction of road and trail bridges should adhere to these design parameters:

(1) The bridge shall fully span the bankfull elevation of the stream channel.

(2) If there is fill placed within the floodplain as part of bridge approaches, relief outlets (*i.e.,* culverts) shall be installed to match in-stream water velocities to pre-project/baseline conditions.

(3) The bridge shall be of sufficient height above flood waters to allow debris passage underneath.

4. To implement Reasonable and Prudent Measure No. 4. Minimize take by implementing a comprehensive monitoring and reporting program to confirm this Opinion is meeting its objective, the FS shall:

a. Individual Monitoring of LAA Projects. Each LAA project shall be monitored for compliance with these Terms and Conditions, with corresponding monitoring form compiled by FS staff. These monitoring forms shall be submitted to NOAA Fisheries prior to the end of each calendar year.

b. Program of Work Preview. By March 31 of each year, the FS shall meet with NOAA Fisheries to assess upcoming projects to be implemented in accordance within this Opinion.

c. Program of Work Review. By December 31 of each year beginning in the year 2004, the FS shall meet with NOAA Fisheries to assess projects that were completed that calendar year in accordance with this Opinion. The purpose of the reporting is to help estimate the extent and amount of take that may have occurred and validate assumptions regarding aggregated watershed effects.

d. Failure to provide timely monitoring causes Incidental Take Statement to expire. If the FS fails to provide specified monitoring information by December 31, of each year beginning in the year 2004, NOAA Fisheries will consider that a modification of the action that causes an effect on listed species not previously considered and causes the Incidental Take Statement of the Opinion to expire.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA, as amended, established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Under the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2)).

- NOAA Fisheries must provide conservation recommendations for any Federal or state action that would adversely affect EFH (section 305(b)(4)(A)).

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (section 305(b)(4)(B)).

Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA section 3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*i.e.,* contamination or physical disruption), indirect (*i.e.,* loss of prey or reduction in species fecundity), site-specific or habitat-wide effects, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Essential Fish Habitat consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects on EFH.

3.2 Identification of Essential Fish Habitat

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies presently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (*i.e.,* natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects on these species' EFH from the proposed action is based, in part, on this information.

3.3 Proposed Actions

The proposed actions that were determined to be LAA for PS chinook under the ESA are detailed above in section 1.2 of this document. The proposed action for the projects determined to be NLAA for PS chinook under the ESA, are described in the PBA. The LAA and NLAA projects include habitats that have been designated as EFH for various life-history stages of chinook, coho and Puget Sound pink salmon. Because coho salmon inhabit waters that are more sensitive to habitat alteration from all of the programs and project types, all NLAA projects have been determined to adversely effect EFH as well. As such, the EFH conservation recommendations listed in section 3.6 apply to both LAA and NLAA projects listed in the PBA.

3.4 Effects of Proposed Action

As described in detail in section 2.1.3.1 of this document, the proposed actions may result in short-term adverse effects on a variety of habitat parameters. These adverse effects are:

1. Temporal loss of riparian function.

2. Increases in turbidity pursuant to the earth disturbing activities.

3. Modification of water levels, flow regimes and effects on fish passage.

4. Introduction of pollutants into waterbodies.

5. Modification of stream morphology.

3.5 Conclusion

NOAA Fisheries concludes that the proposed action would adversely affect the EFH for chinook; coho (*O. kisutch*), and Puget Sound pink salmon (*O. gorbuscha*).

3.6 Essential Fish Habitat Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH.

1. Conservation recommendations for temporal loss of riparian function temporal loss of riparian function:

   a. Streambanks. Streambanks should be properly sloped to an angle of natural repose after culverts have been removed and be suitable for establishment of permanent woody vegetation.

      I. Felled Trees. Trees that must be removed within the riparian reserve and/or within the channel migration zone and floodplain should be felled toward the stream and left in place.

      ii. Wood Removal. All non-treated wood should be left within the aquatic habitat, including within the riparian reserve/channel migration zone.

   b. Site Preparation. Native materials should be conserved for site restoration.

      I. Native Materials. If possible, native materials should be left where they are found.

      ii. Native Material Replacement. Materials that are moved, damaged or destroyed should be replaced with a functional equivalent during site restoration.

      iii. Material Stockpiling. Any large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction should be stockpiled for use during site restoration.

   c. Heavy Equipment and Machinery Maintenance. Use of heavy equipment will be restricted as follows:

      I. Choice of Equipment. When heavy equipment must be used, the equipment selected should have the least adverse effects on the environment (*i.e.,* minimally sized, low-pressure tracked, operating off wooden mats in very wet areas).

ii. Vehicle Staging. Vehicles should be fueled, operated, maintained and stored as follows.

(1) Vehicle staging, cleaning, maintenance, refueling, and fuel storage should take place in a vehicle staging area placed 150 feet or more from any stream, water body or wetland.

(2) All vehicles operated within 150 feet of any stream, water body or wetland should be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected should be repaired in the vehicle staging area before the vehicle resumes operation.

(3) All equipment operated instream should be cleaned before beginning operations below the bankfull elevation to remove all external oil, grease, dirt, and mud.

d. Stationary Power Equipment. Stationary power equipment (*i.e.,* generators, cranes) operated within 150 feet of any stream, water body or wetland should be diapered to prevent leaks.

e. Temporary Stream Crossings. Project utilizing temporary stream crossings should following the following measures.

I. Frequency. The number of temporary stream crossings should be minimized.

ii. Design. Temporary road crossings should be designed as follows.

(1) A survey should identify and map any potential spawning habitat within 300 feet downstream of a proposed crossing.

(2) Stream crossing should not occur at known or suspected spawning areas, or within 300 feet upstream of such areas if spawning areas may be affected when adult fish are present.

(3) The crossing design should provide for foreseeable risks (*i.e.,* flooding and associated bedload and debris) to prevent the diversion of streamflow out of the channel and down the road if the crossing fails.

(4) Temporary stream crossings should cross riparian areas and streams at right angles to the main channel wherever possible.

(5) Consider fill material of wood chips over filter cloth in riparian areas to minimize removal disturbance.

2. Conservation recommendations for short term increases in turbidity pursuant to the earth disturbing activities:

a. Timing of In-Water Work. Work within the active channel should be completed during the WDFW preferred in-water work period, as appropriate for the project area, unless otherwise approved in writing by NOAA Fisheries.

b. Diversion of Water. If work is in the active channel flow, water should be diverted around the site. If adult or juvenile chinook, coho or Puget Sound pink salmon are reasonably certain to be present, the work area should be well isolated from the active flowing stream using inflatable bags, sandbags, sheet pilings, or similar materials. The work area should also be isolated if in-water work may occur within 300 feet upstream of spawning habitats.

c. Erosion Control. Erosion control methods should be used to prevent silt-laden water from entering the stream.

I. Inspection of Erosion Controls. During construction, all erosion controls should be inspected daily during the rainy season and weekly during the dry season to ensure they are working adequately.

(1) If inspection shows that any of the erosion controls are ineffective, work crews should be mobilized immediately to make repairs, install replacements, or install additional controls as necessary.

(2) Sediment should be removed from erosion controls once it has reached 1/3 of the exposed height of the control.

(3) Excess sediment should be disposed of so they do not enter the stream channel.

d. Weather Conditions. If weather conditions during project operations generate and may transport sediment to a water course that can deliver to EFH habitat, operations should be ceased until the weather conditions improve.

I. Disturbed Ground. All disturbed ground should be reclaimed using appropriate best management practices. Measures should be retained after project construction until soil has stabilized and are unlikely to erode into streams.

ii. Wastewater. Wastewater from project activities and water removed from within the work area should be routed to an area landward of the bankfull elevation to allow removal of fine sediment prior to being discharged back to the stream.

iii. Capture and Release. Before and intermittently during pumping to isolate an in-water work area, an attempt should be made to capture and release fish from the isolated area using trapping, seining, electrofishing, or other methods as are prudent to minimize risk of injury and exposure to sediment plumes.

3. Conservation recommendations for modification of water levels, flow regimes and effects on fish passage:

a. Fish Screens. All water intakes used for a project, including pumps used to isolate an in-water work area, should have a fish screen installed, operated and maintained according to NOAA Fisheries fish screen criteria.

b. Culvert Removal, and Removal with Replacement. Culvert replacement should follow the following provisions, and follow NOAA Fisheries' fish passage guidance.

I. Crossing Types. Road crossing should be designed in the following priority.

(1) Nothing – road realignment to avoid crossing the stream.

(2) Bridge – spanning the stream to allow for long-term dynamic channel stability.

(3) Streambed simulation – bottomless arch, embedded culvert, or ford.

(4) No-slope design culvert[13] – sometimes referred to as hydraulic design, here limited to zero percent slopes.

[13]"No-slope design culvert" means a culvert that is sufficiently large and installed flat to allow the natural movement of bedload to form a stable bed inside the culvert.

ii. Spawning Areas. If the crossing will occur near a spawning area, only full span bridges or streambed simulation should be used.

iii. Fill Width. Fill width and depth should be limited to the minimum necessary to complete the crossing, and should not reduce existing stream width.

iv. Streambanks. Streambanks should be properly sloped to an angle of stability (natural repose) after culverts have been removed and be suitable for establishment of permanent woody vegetation.

4. Conservation recommendations for introduction of pollutants into waterbodies:

a. Hazardous Materials. Hazardous spill materials and trained operators should be on site prior to conducting work.

b. Fertilizer. No surface application of fertilizer may occur within 50 feet of any stream channel.

c. Treated Wood. Projects using treated wood[8] for any structure that may contact flowing water or that will be placed over water should not be used. Projects that require removal of treated wood should use the following precautions.

I. Treated Wood Debris. Care should be taken to ensure that no treated wood debris falls into the water. If treated wood debris does fall into the water, it should be removed immediately.

ii. Removal of Treated Bridge Materials. If treated bridge materials will be removed, the following conditions apply.

(1) Once loose, materials should be placed on an appropriate dry storage location, and not left in the water or piled onto the stream bank.

(2) If materials located in water, or below the Bankfull elevation, break during removal, the stump should be removed by breaking or cutting 3 feet below the sediment surface, then covered with a clean substrate appropriate for the site.

iii. Disposal of Treated Wood Debris. All treated wood removed during a project should be disposed of at a facility approved for hazardous materials of this classification.

5. Conservation recommendations for modification of stream morphology:

a. Activity Limitations Within Stream Channels and Riparian Reserves. The following activities should be limited within riparian reserves and stream channels.

I. Rip Rap and Bank Stabilization. The placement of rip rap on stream banks should be limited to replacement only, with native vegetation plantings to occur within the rip rap. Banks should not be stabilized with rock or other materials aside from native tree and shrub placement.

ii. Large Wood. Large Woody Debris (LWD) should not be removed from stream channels, riparian reserves, or channel migration zones and floodplains of streams. Large woody debris that must be felled should be felled toward the stream and left in place.

iii. Landslide Stabilization. (Landslide Stabilization work utilizing hand work may occur within riparian areas of salmon bearing channels).

b. Road and Trail Bridge Works. Projects involving road and trail bridges should follow the following limitations and measures.

I. Abutments. Construction or reconstruction of bridges that have abutments or other infrastructure within the bankfull elevation should not be used.

ii. Location Conditions. Construction or reconstruction of bridges should be limited to previously disturbed locations. Previously disturbed is defined as those areas having previous bridge works located within, on, or adjacent to the site.

iii. Design. Construction or reconstruction of road and trail bridges should adhere to these design parameters:

(1) The bridge should fully span the bankfull elevation of the stream channel.

(2) If there is fill placed within the floodplain as part of bridge approaches, relief outlets (*i.e.,* culverts) should be installed to match in-stream water velocities to pre-project/baseline conditions.

(3) The bridge should be of sufficient height above flood waters to allow debris passage underneath.

c. Culvert Maintenance. Maintenance of culvert should be consistent with the following measures.

I. Wood Replacement. Any wood removed from culvert inlets should be placed back in the stream downstream of the culvert.

ii. Cleaning Access. Culverts should be cleaned by working from the top of the bank, unless culvert access using work area isolation would result in less habitat disruption.

iii. Minimize Debris Removal. Remove only the minimum amount of wood, sediment and other natural debris necessary to maintain culvert function without disturbing spawning gravels.

iv. Post-Project Fish Passage. After the maintenance activity, fish passage should not be inhibited from pre-project conditions. Under no conditions should culverts within the anadromous zone be "perched" as a result of maintenance activities.

d. Spawning Areas. If the crossing will occur near a spawning area, only full span bridges or streambed simulation should be used.

e. Fill Width. Fill width and depth should be limited to the minimum necessary to complete the crossing, and should not reduce existing stream width.

f. Streambed Gradient. Streambed disturbance should be limited to the extent practicable. Streambeds should be restored to the original gradient.

3.7 Statutory Response Requirement

Pursuant to the MSA (section 305(b)(4)(B)) and 50 CFR 600.920(k), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse effects of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

The FS must reinitiate EFH consultation with NOAA Fisheries if the proposed actions are substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(l)).

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EXHIBIT 1 - Work Window Table

Table - Allowable Work window for Hydraulic Projects - 26 Pages