Programmatic Biological Assessment Restoration Actions in Washington State

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Introduction

This programmatic Biological Assessment (PBA) is not a guidance document. It simply describes the actions covered for Section 7 consultation with the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (together referred to as "the Services"). This PBA relies on other technical guidance documents: The Stream Habitat Restoration Guidelines (2004), Integrated Streambank Protection Guidelines (Cramer et al. 2003), NMFS Anadromous Salmonid Fish Facility Design manual (available at NMFS' website), Design of Road Culverts for Fish Passage (Bates et al. 2003), and the regional recovery plans for each subject area. The first three documents are produced through the Aquatic Habitat Guidelines (AHG) program. The Services and the Corps encourage the use of the most current versions of these technical guidance documents in conjunction with this programmatic BA.

All documents published in the AHG series emphasize analyzing and characterizing physical and ecological watershed processes, leading to process-based, long-term stream habitat restoration or rehabilitation. They show how to avoid site specific short term fixes. The Corps encourages the reader to develop each restoration or enhancement project using the methods outlined in the AHG documents. Use of these documents is not mandatory. However, process-based assessment methods, as outlined in the AHG documents, need to be utilized to be able to qualify for ESA coverage under this programmatic.

Also, the regional recovery plans and follow up implementation documents[1] should be used as guidance when planning a restoration project. They are based on process-based watershed analysis and contain stream or reach-specific information regarding limiting factors and may even identify specific projects (common for the watersheds in the LCR ESU). A restoration project covered under this PBA needs to demonstrate how it furthers watershed recovery goals identified in the regional recovery plans.

The primary goal of each project category is intended to be restoration or enhancement of aquatic and associated riparian habitat. However, replacements of currently passable culverts are covered for any reason other than increases in road capacity. As such, replacements of culverts with slightly longer culverts for safety reasons, and culvert replacements or upgrades that increase debris passage capacity, restore hydrologic function, or reduce the risk of future failure are covered. Also, projects that have a second purpose aside from restoration can use practices in this PBA as long as all elements of the project are covered by this PBA and an overall habitat benefit will result from the action. For example: Many riparian enhancement projects have as one component soft streambank stabilization. As long as the combined project will result in significant habitat benefits and all elements of the action are listed in the proposed action below, the projects may use this programmatic consultation.

[1] For example, the Six-Year Habitat Work Schedules for individual watersheds prepared by the Lower Columbia Fish Recovery Board, or the Three Year Workplans for individual watershed in Puget Sound.

Implementation Process

1. Applicant will fill out a Specific Project Information Form (SPIF).
2. The Corps will individually review each SPIF/project to ensure that the project falls within the nine action categories described below. Also, the Corps will ensure that all adverse effects to ESA-listed species and their designated critical habitats are within the range of effects considered in the Opinion.
3. If the Corps determines that the proposed restoration project differs from the nine action categories described below, but all adverse effects to ESA-listed species and their designated critical habitats are within the range of effects considered in the Opinion, the Corps may inform the Services about the exception in their Memorandum to the Services and provide rationale for how the action meets the intent of the restoration programmatic. If the Services disagree with the Corps' determination of a deviation still meeting the range of effects covered in the Opinion each agency may request an individual consultation.
4. For every project the Corps will forward the SPIF and copies of necessary project plans (*i.e.*, pollution and erosion control, temporary access routes, and stormwater management), to the Services for prior approval.
5. The Services will review and approve a SPIF, if warranted, within 30 calendar days.
6. After project completion the applicant will report required sediment monitoring data (extent and duration of plume) to the Corps.
7. The Corps will prepare an annual monitoring report by ESU, DPS or Interim Recovery Unit (IRU). The monitoring report will include:
    a. The number of permits that were issued under each of the nine action categories.
    b. Projects/SPIFs that were approved with minor deviations.
    c. The sum of all project extents (stream miles effected) by watershed.
    d. The turbidity monitoring data.
    e. A list of problems encountered and solutions.
    f. If culverts are replaced with new culverts rather than a bridge in fish bearing creeks with slopes above 6% the Services can request monitoring data of substrate, invert elevation and channel form (structural elements of high gradient channel: boulders, pools, low flow channel) after 10 year flow events. These monitoring reports will be sent directly to the Services with a cc to the Corps.
8. The Corps and the Services will complete an annual coordination meeting to discuss the annual monitoring report and any actions that could improve conservation or make the program more efficient or more accountable.

Area Covered by this Programmatic Consultation

This programmatic consultation covers all restoration activities described below in Washington State. This programmatic may be used on tribal, private, county, state and Federal Lands except on U.S. Forest Service (USFS) / Bureau of Land Management (BLM) lands where a different programmatic applies (NMFS 2007). This programmatic may be used on the Washington banks of the Columbia River and shorelines of the islands in the Columbia River. However, some of the proposed activities are not suitable for Columbia River mainstem application: (1) Fish Passage; (3) Installation of Instream Structures: Grade Control ELJs, Felling of Large Trees for Use in Instream Habitat Structures, Boulder Weirs and Roughened Channels (8) Hardened Fords and Livestock Crossings.

The COE will review applications to determine if the project falls under the lead of another Federal agency or coordination with other entities (e.g. state, county, or tribes) is needed. For instance, the county or a state conservation district may propose a restoration action on privately owned land or right-of-way within a National Forest, Indian Reservation, State Park, or other public lands that could have downstream effects. In these instances, the adjacent landowners should be notified of the action to ensure that the project is not in conflict with resource protection objectives or needs to be designed to reduce the risk of potential property damage.

The Corps proposes to limit the extent of projects with in-stream components or in-steam effects including sedimentation to five percent of the anadromous stream miles per fifth field Hydraulic Unit Code (HUC). The Corps derived this number by using data from past restoration projects to project an upper limit of anadromous stream miles likely to be affected by in-steam restoration. See Appendix A.

Description of the Proposed Action Categories

The Corps proposes to permit restoration activities designed to maintain, enhance and restore watershed functions that affect aquatic species. Covered actions are restoration projects that utilize one or a combination of actions from the following nine restoration categories:

1. Fish Passage

Description: The objective of passage barrier removal is to allow all life stages of salmonids access to historical habitats from which they have been excluded by non-functioning drainage structures (road, trail, and railroad crossings) and water impoundments (tide gates, temporary dams).

a. Culvert Replacement and Relocation

Description: Culverts at road crossings will be replaced with bridges, appropriately sized culverts, bottomless culverts, or arch pipes. Culverts may be replaced with slightly longer culverts to accommodate safety improvements. Culverts may be relocated to restore natural hydrology and stream alignment.

Conservation Measures:

1. When there is a series of barriers on one system that is scheduled to be resolved in a short period of time, work will start at the most upstream barrier. This way, the work at the more upstream sites can be done without listed fish in the action area.
2. Road crossings will be designed to the culvert design benchmarks set in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual (http://www.nwr.noaa.gov/Salmon-Hydropower/FERC/upload/Fish_Passage_Design.pdf) except for the deviations mentioned below. The WDFW technical guidance manual Design of Road Culverts for Fish Passage (Bates et. al. (2003)) may be used to achieve these benchmarks.
3. Where site specific designs lead to a conflict in design standards, a solution will be proposed by the designer. This solution will be used as a basis of talks between the Services, WDFW, and the project applicant. The final design needs to be approved by the Services.
4. Projects in stream channels with gradients above six percent will preferably utilize a bridge. If that is not feasible, crossings will be designed using the stream simulation option. For culverts in fish bearing streams with gradients higher than six percent the Services can request monitoring data of: 1) placed substrate integrity and bedload deposition; 2) inlet and outlet conditions; and 3) channel form (structural elements of high gradient channel: boulders, pools, low flow channel) after the first 10 year flow (or higher) events. The Services will require a maintenance plan to assure the crossing remains within design conditions.
5. Culvert replacements on fish-bearing streams will be designed to provide upstream and downstream passage for juvenile and adult salmonids using the criteria below (6-17).
6. Project designs for stream simulation will meet the WDFW (Bates et al. (2003)) design standards for width (for confined to moderately confined channels: width of the culvert bed to equal 1.2 * bankfull width + 2 feet; unconfined channels will require a larger span).

7. The hydraulic design method is a design process that matches the hydraulic performance of a culvert with the swimming abilities of a target species and age class of fish. There are significant errors associated with estimation of hydrology and fish swimming speeds that are resolved by making conservative assumptions in the design process. Determination of the high and low fish passage design flows, water velocity, and water depth is required for this option. Designs will meet the WDFW (Bates et al. (2003)) flow range criteria and will be designed to accomplish fish passage between the 7 consecutive days, 2 year low flow and the 10% exceedance flow (the flow that is exceeded only 10% of the time; high design flow). Additionally, the high design flow will be calculated based on the life histories of the target fish species[2], and time periods they are most likely to be moving upstream. This design method may be applied to the design of new and replacement culverts and may be used to evaluate the effectiveness of retrofits of existing culverts.
   Hydraulic design is limited to situations where:
   a. Channel gradient is low to moderate, generally less than 3%. If it is not possible to embed/countersink the culvert, the maximum channel gradient should not exceed 0.5%.
   b. The bottom of the culvert should be buried into the streambed a minimum of 20% of the height of the culvert below the elevation of the tailwater control point downstream of the culvert, and the minimum embedment must be at least 1 foot.
8. Active channel (no-slope/embedded pipe): This method provides a simplified design methodology that is intended to provide a culvert of sufficient size and embedment to allow the natural movement of bedload and the formation of a stable bed inside the culvert. It is intended for use only in very small streams. Determination of the high and low fish passage design flows, water velocity, and water depth is not required for this method, since the stream hydraulic characteristics within the culvert are intended to mimic the stream conditions upstream and downstream of the crossing. Structures for this design method are typically round, oval, or squashed pipes made of metal or reinforced concrete. Culverts are installed level at 0% slope.
   Design is limited to situations where:
   a. The natural slope is less than 3% and the culvert length is less than 80 feet.

[2] Target Fish Species are generally all adults and juveniles of the species for which the subject area has been designated as critical habitat. However, deviations can be suggested by the applicant and implemented with agreement by both NMFS and WDFW. There may be cases where NMFS may require additional species passage.

b. The bottom of the culvert should be buried into the streambed not less than 20% of the culvert height at the outlet and not more than 40% of the culvert height at the inlet. For example, in a ten foot diameter circular culvert the downstream end invert has to have at least 2 feet of substrate.
c. At a minimum the culvert width has to be equal to the average channel bed width at the elevation the culvert meets the streambed; generally this elevation is at 20% to 30% of its diameter (see above, 8b). Thus, combining the requirements of countersinking the outlet and the culvert width for a circular culvert, the diameter must be at least 1.25 times the channel bed width.

The culvert bed slope (S in units of length/length or rise/run) times culvert length (L) is less than or equal to 20 percent of the culvert diameter (D). S*L<0.2*D (Chapter 4 (Bates et al. 2003)). Thus, culverts utilizing the no-slope option are generally less than 75 feet long.

Length (ft)	Slope	S*L	Channel Bed Width CBW (ft)	Diameter Culvert D=1.2* CBW	0.2*D
50	0.02	1	6	7.2	1.44
50	0.03	1.5	8	9.6	1.92
75	0.02	1.5	10	12	2.4
75	0.03	2.25	12	14.4	2.88

9. Culverts longer than: 150 feet for stream simulation, 75 feet for no-slope and 500 for any other option are excluded under this programmatic.
10. Culvert widths greater than 20 feet are excluded under this programmatic, because for widths greater than 20 feet a bridge generally provides better passage.
11. For any design, the proponent will demonstrate that the design condition can be maintained over the expected life of the culvert. This includes maintaining placed bed material in the culvert.
12. All sites will have a maintenance plan that assures that the culvert will be in design condition prior to each fish passage season. The best designed culvert will not provide passage if it is blocked by debris, or if energy dissipation features are compromised.
13. Bridge footings will be located outside of the ordinary high water (OHW) line.
14. Hard bank stabilization at crossing structures will be limited to the width of the existing road fill prism.

15. Grade control structures to prevent headcutting above or below the culvert or bridge may be built using rock or wood. Grade control structures typically consist of boulder and/or wood structures (see below: Grade Control Engineered Log Jams (ELJs), Boulder Weirs and Roughened Channels) that are keyed into the banks, span the channel, and are buried in the substrate. Grade control structures will provide fish passage for juvenile and adult salmonids, and will be designed to the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.
16. Designs will demonstrate that ecological functions including bedload movement, large wood and other debris movement, and flood flows can occur as appropriate to the site.

b. Retrofitting Culverts

Description: Where culvert replacement is not currently feasible culverts may be retrofitted in the short term to improve passage by installing structures including baffles and step-and-pool weirs at outlets.

Conservation Measures:

1. Projects will be retrofitted to meet the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual or WDFW's fish passage criteria for salmon and trout (Bates et al. 2003).
2. Projects will demonstrate a commitment to a long-term solution. A retrofitted culvert will be replaced with a bridge or culvert that is at the time of retrofitting scheduled and funded and that meets the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.
3. All retrofitted culverts will have a maintenance plan which assures that the fishway will be maintained to provide original design conditions prior to each fish passage season and inspected at least after every 10 year flow event.

c. Culvert Removal

Description: Removal of unnecessary culverts to improve salmonid access and habitat functions. When circumstances permit, culvert removal is the preferred alternative.

Conservation Measures:

1. When there is a series of barriers that is proposed to be removed in a short period of time on one system, work will start at the most upstream barrier to minimize impacts to listed fish.

d. Tidegate Removal

Description: Removal of unnecessary or non-functioning tide gates to restore salmonid access to historic estuarine habitats.

e. Removal or Modification of Sediment Bars or Terraces that Block or Delay Salmonid Migrations

Description: Land use practices such as timber harvest, large scale agriculture and urban development have resulted in increased, generally fine, sediment delivery to streams. This sediment can accumulate in low velocity areas and contribute to widening of stream mouths, forming bars or terraces. The bar or terrace can spread the streamflow into finely braided or sheet flow patterns, forming low flow fish passage barriers. These temporary blockage points often provide opportunities for illegal snagging of holding adult salmon. The Corps proposes to restore fish passage by removing sediment to restore flow conditions that allow for passage.

Conservation Measures:

1. The maximum amount of material removed from a passage impediment is 100 cubic yards.
2. If the removed material contains more than 60% silt or clay it will be disposed of upland. Material with more than 40% gravel will be deposited within the active floodplain, but not in wetlands. Material with more than 50% gravel and less than 30% fines (silt or clay) may be deposited below the OHW line. If material is deposited below the OHW line the applicant will explain the expected benefits, e.g. use as bankfull bench for riparian plantings in area where flood storage is not an issue.
3. If the removed material is suitable for spawning it may be used within the watershed for spawning gravel supplementation including below dams and in sediment-starved reaches.
4. Sandbags may be placed to temporarily improve fish passage. Sandbags will be removed prior to anticipated high flows that could wash away sandbag or cause flow to go around them.
5. If removal of sediment at the same location is proposed for a second time within ten years, a long term plan for a solution other than sediment removal will be presented. For example, placement of large wood can result in scour that may alleviate the local passage impediment.

f. Temporary Placement of Sandbags, Hay Bales, and Ecology Blocks to Improve Salmonid Passage

Description: Land use practices such as large scale agriculture, including irrigation, and urban and residential development have changed the hydrology of affected watersheds. Reduced forest cover and increased impervious surface have resulted on the one hand in increased runoff and peak flows and on the other hand in less aquifer recharge and resulting increased frequency, duration and magnitude of summer droughts. During recent droughts, temporary placement of sandbags, hay bales, and ecology blocks have been successful in providing short-term fish passage, especially in Eastern Washington. The Corps proposes to utilize these techniques to restore fish passage during seasonal low flow periods.

Conservation Measures:

1. All material placed in the stream to aid fish passage will be removed when stream flows increase, prior to the onset of the fall rains.

g. Construction of Structures to Provide Passage over Small Dams

Description: Diversion dams, generally in Eastern Washington, often create a permanent or temporary fish passage blockage. The Corps proposes to authorize structures at existing dams to restore fish passage. Structures will be constructed from rock or wood or a combination of rock and wood. Examples of designs of structures include Rock Chevrons and V-weirs.

Conservation Measures:

1. Construction of passage structures over irrigation dams is limited to dams of less than seven feet in height.
2. NMFS engineers are presented with plans for and approve of passage projects at structures that are between 3 and 7 feet high.
3. Construction of passage structures is limited to facilitate passage at existing diversion dams, not in combination with new dams.
4. The design of passage structures will follow the appropriate design standards in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.

Excluded Activities:

Tidegate and floodgate replacements are not proposed under this PBA.

Installation of fish ladders to create passage around blockages higher than seven feet is not proposed under this PBA.

Culvert replacements for road capacity improvements are not proposed under this PBA.

2. Installation of Instream Structures

Anthropogenic activities like altered riparian habitats, splash damming and the removal of large wood and logjams have reduced instream habitat complexity in many rivers. They have eliminated or reduced features like pools, hiding cover, and bed complexity. Salmonids need habitat complexity for rearing, feeding, and migrating. To improve habitat complexity where an identified need exists the Corps proposes to permit the following practices:

a. Placement of Woody Debris

Description: Large Woody Debris (LWD) can be placed in the channel, estuary, or marine environment either unanchored or anchored in place using rock, rebar, or wooden piles. The amount of rock used is limited to that needed to anchor the LWD. The use of metal cables will be limited to situations where no other technique will work.

Conservation Measure:

1. Large trees may be dislodged or felled for constructing in-stream habitat in areas where the following criteria are met: (1) Lack of instream LWD has been identified by a watershed analysis, reach assessment or similar document as a limiting factor for the subject reach; and (2) Presence of an adequately stocked and healthy mature riparian forest; (3) Felling/tipping of trees into the water will not significantly impact stream shading; (4) Sufficient natural recruitment of native woody vegetation is expected and the threat of invasive vegetation filling created gaps is minimal or replanting with native woody species is planned; (5) The LWD design aims at providing several years of in-stream habitat benefits; (6) The trees are not suitable habitat for listed terrestrial species. Whenever possible, rootwads will be used for in-stream habitat, too. Attempts will be made to procure and stockpile LWD to be used before felling live trees. Finally, felling trees may be most appropriate where stream access is limited for creating LWD jams.

b. Placement of Live Stakes

Description: This technique consists of planting of live cottonwood stakes perpendicular in the ground. The arrays are planted either perpendicular, at slight angles to, or parallel to the flow/course of the river; in the floodplain or into the active channel, depending on the objective of the project. Objectives of flood fencing include:

i. Establish riparian vegetation and mimic (hydraulically) a mature riparian forest. Spaces between rows may be planted with additional riparian vegetation.

ii. Create habitat complexity. The live stakes slow water velocities and collect/catch debris and sediment during bankfull and flood events.

iii. Slow water velocities to reduce scour in the vicinity of riparian plantings, increasing successful establishment of new riparian plantings,
iv. Decrease width to depth ratios in widened channel reaches,
v. Create backwater effects to allow natural reconnection of side channels.

The installation of flood fences is accomplished by boring with augers and placing boles vertically into arrays, or by trenching in adjacent, and staggered, rows to create arrays.

Conservation Measure:

1. All materials removed are replaced once boles are in place, and in fact, are used to reduce scour around boles during the first bankfull events. Boles are generally sealed on the top to prevent excessive desiccation. In sensitive areas, such as side channels and bar locations, this step is omitted.

c. Placement of Engineered Log Jams

Description: For detailed descriptions of each technique refer to the Stream Habitat Restoration Guidelines (Saldi-Caromile et al. 2004), the Integrated Streambank Protection Guidelines (Cramer et al. 2003), and the Conceptual Design Guidelines: Application of Engineered Logjams (Herrera 2006). Engineered log jams (ELJs) are designed collections of large woody debris. Different types of ELJs include bank protection ELJs (see below, General CM), bar apex ELJs, and grade control ELJs (see below). Engineered log jams are patterned after stable natural log jams and can be either unanchored or anchored in place using rebar, rock, or piling (steel may be used if other long term anchoring is not possible at site. Explain in SPIF). Engineered log jams create a hydraulic shadow, a low-velocity zone downstream that allows sediment to settle out. Scour holes develop adjacent to the log jam. While providing valuable fish and wildlife habitat they also redirect flow and can provide stability to a streambank or downstream gravelbar.

Excluded Activities: Logjams with a primary purpose other than habitat restoration or enhancement.

d. Grade Control ELJs

Description: Grade control ELJs are designed to arrest channel downcutting or incision by providing a grade control that retains sediment, lowers stream energy, and increases water elevations to reconnect floodplain habitat and diffuse downstream flood peaks. Grade control ELJs also serve to protect infrastructure that is exposed by channel incision and to stabilize over-steepened banks. Unlike hard weirs or grade control structures, a grade control ELJ is a complex broad-crested structure that dissipates energy more gradually. Examples of grade control ELJs include Rickreall Creek, Dallas, Oregon (Herrera 2006).

e. Trapping Mobile Wood

Description: Construction of wood structures to trap mobile wood. Wood may be anchored with rebar, anchor rocks, and untreated wood piling. Less than 10 inch diameter steel piling may be used if necessary for stability reasons. Examples of streamside large woody debris catchers are outlined in Slaney P.A. and D. Zaldokas (1997), http://nfcp.org/Archived_Reports/RM97-2.pdf and http://nfcp.org/Archived_Reports/RM96-3.pdf. The Lower Columbia Fisheries Enhancement Group which operates in southwest Washington has installed several of these structures and is willing to offer limited design help.

Conservation Measure:

1. In the marine environment steel piling will not be driven with an impact hammer.

f. Placement of Boulders

Description

Placement of individual large boulders and boulder clusters to increase structural diversity. Structural and hydraulic diversity is important to provide holding and rearing habitat for salmonids. As with all proposed methods, this treatment will be used in streams that have been identified as lacking structural diversity and that naturally and/or historically had boulders. (Boulders may have been removed historically to facilitate wood transport.) For a more detailed description of potential applications see "Boulder Clusters" in AGH (2003). Preferably, boulders are sized and located to not need anchoring. However, if necessary for design objective, boulders placed on bedrock may be pinned with for example epoxy resin (Hilty system) to ensure long-term stability (Slaney and Zaldokas 1997).

Excluded Activities: Boulders may not be cabled in systems other than bedrock.

g. Boulder Weirs and Roughened Channels

Description:

Full channel-spanning boulder weirs will be installed to enhance or provide fish habitat in stream reaches where log placements are not practicable due to channel conditions (not feasible to place logs of sufficient length, bedrock dominated channels, deeply incised channels, artificially constrained reaches, *etc.*). Boulder weirs and roughened channels may also be installed for grade control at culverts (see No. 1 above) and constructed side channels. For boulder weirs in wood dominated systems grade control ELJs (see above) will be used.

Conservation Measures:

1. Boulder weirs will be installed only in:
   a. Highly uniform, incised, bedrock channels.

b. Stream channels that have been artificially confined between levees or other floodplain revetments that are not feasible to remove or set-back.
c. Locations for which salmonid recovery plans identifies channel spanning boulder weirs as a priority restoration technique (e.g. lower Entiat River).
d. To provide grade control at culverts or constructed side channels.

2. Boulder weirs will be low in relation to channel dimensions so that they are completely overtopped during channel-forming, bankful flow events (approximately a 1.5-year flow event).
   Boulder weirs will be placed diagonally across the channel or in more traditional upstream pointing "V" or "U" configurations with the apex oriented upstream.
3. Boulder weirs will be constructed to allow upstream and downstream passage of all native listed fish species and life stages that occur in the stream at all flows.
4. The project shall be designed and inspected by a multidisciplinary team (including a salmon or trout biologist) that has experience with these types of structures.
5. Full spanning boulder weir placement will be coupled with measures to improve habitat complexity and protection of riparian areas to provide long-term inputs of LWD to the maximum extent possible.
6. Roughened channels will be designed to standards contained in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.

h. Gravel Placement Associated with Structure Placement

For work in gravel-deficient areas, a maximum of 100 cubic yards of clean, washed, appropriately sized gravel (river-run gravel, not quarry spalls or crushed gravel) can be imported or relocated and placed upstream of each structure. When placing LWD on the outside of meander bends, bar material can be removed from the inside of the meander bend and relocated immediately up and/or downstream of the new structure. If the work area on the gravel bar is dry, work may be performed without use of a coffer dam. This gravel relocation would be expected to speed up the realignment of the thalweg and protect the new structure.

Excluded Activities:

Construction of instream structures with a primary purpose other than habitat enhancement.

Construction of boulder weirs or other channel spanning structures in gravel or finer substrate dominated streams.

Gravel shall not be placed in areas that are currently suitable for salmonid spawning.

3. Levee Removal and Modification

Description: Levee modification or removal serves many purposes including habitat restoration, erosion reduction, water quality improvements, reduced high flow velocities, groundwater recharge and reduction of floods in other sections of the river. Techniques that are covered by this programmatic need to have the sole purpose of restoring flood plain function or enhancing fish habitat. Covered actions are listed below and apply to freshwater, estuarine, and marine areas.

Full and partial removal of levees, dikes, berms, and jetties.

Breaching of levees, dikes and berms.

Lowering of levees, dikes and berms.

Setback of levees, dikes and berms.

Conservation Measures:

1. Non-native dike and levee material will be hauled to an upland site to the greatest degree practicable.
2. Native material may be spread across the floodplain in a manner that does not restrict floodplain capacity and minimizes juvenile stranding. If the material is used to create/alter microtopograhphy it has to be done in a manner to minimize juvenile stranding. This can be achieved by sloping side channels to the main channel or water body and by designing access channels for depressional areas. These restrictions on microtopography in the floodplain only apply, if the project contains elements of altering/designing floodplain microtopography like side channels and depressions.
3. Ditches previously constructed to drain wetlands will be filled preferably with native material, otherwise with clean imported material of similar substrate to the adjacent/native banks.
4. In setback dikes/levees the amount of rock will be kept to a minimum. However, up to the same amount of hard material in the existing dike/levee may be used.

4. Side Channel/Off-Channel Habitat Restoration and Reconnection

Description: Side channel habitats are generally small watered remnants of river meanders. They provide important spawning and rearing habitat for juveniles and refuge habitat during high flows. They are most common in floodplains that have been strongly glacially influenced leaving alluvial material in a flat valley floor. Off-channel habitat includes abandoned river channels, spring-flow channels, oxbows and flood swales. Off-channel habitat has been reduced by human activities in the floodplain including diking, removal of LWD, straightening of the channel, and bank armoring. Thus, there is a need in many Washington watersheds for off-channel restoration.

Restoration techniques covered by this PBA focus on the restoration or creation of self-sustaining off-channel habitat. Self-sustaining is not synonymous with maintaining a static condition. Self-sustaining means the restored or created habitat would not require major or periodic maintenance, but function naturally within the processes of the floodplain. However, up to two project adjustments, including adjusting the elevation of the created side channel habitat are included under this proposal. The long-term development of a restored side channel will depend on

natural processes like floods and mainstem migration. Over time, the side channel may naturally get drier or be taken over by the main river flow.

The following off-channel restoration activities are covered under this PBA:

- Creation of new side channel habitat. This approach would create self-sustaining side channels which are maintained through natural processes. Designs must demonstrate sufficient hydrology.
- Excavating pools and ponds in the historic floodplain/channel migration zone to create connected wetlands.
- Reconnecting existing side channels with a focus on restoring fish access and habitat forming processes (hydrology, riparian vegetation).
- ELJs, barbs and groins may be used to direct some flow through a side channel, see below General Conservation Measures 1.
- Restoration of existing side channels including one-time dredging and an up to two times project adjustment including adjusting the elevation of the created side channel habitat.

Conservation Measures:

1. All side channel and pool habitat work will occur in isolation from waters occupied by listed fish species until project completion, at which time a final opening may be made by excavation to waters occupied by listed fish or water will be allowed to return into the area.
2. Side channel habitat will be constructed to prevent fish stranding by providing a continual positive grade to the intersecting waters of the U.S. or a year around water connection.

5. Salmonid Spawning Gravel Restoration

Description: The quality and quantity of available spawning gravel has been impacted by many anthropogenic features and activities. For example, dams and culverts can block the downstream movement of gravel and result in gravel starved reaches. Channelization, hard streambank stabilization, and diking restrict a stream from meandering and recruiting gravel. Elimination of riparian buffers and grazing up to the stream's edge introduce fines that often cause embedded or silted-in spawning gravel.

To address problems with gravel quality in constructed chum spawning channels, periodic cleaning is proposed. A variety of techniques have been developed to restore the quality of degraded spawning gravel. For more technical information refer to "salmonid spawning gravel cleaning and placement" (WDFW et al. 2004)). These techniques generally result in some improvements. However, they may be detrimental to salmonids if they are not used in combination with process-based methods that address the cause of the problem. To address a lack of gravel quantity, gravel may be added below dams and in gravel starved reaches using a dump truck, tracked excavator, conveyor belt, helicopter, or hand carried bucket.

This PBA covers the following categories of spawning gravel restoration:

- Cleaning of gravels in artificial chum spawning channels in the Lower Columbia River ESUs with mechanic or hydraulic methods where excessive levels of fine sediment have been identified as a limiting factor.

- Gravel placement in combination with other restoration activities that address the underlying systematic problem. For example a combined project consisting of: Planting streambank vegetation, placing instream LWD and supplementing spawning gravel.
- Gravel supplementation below dams.

Conservation Measure:

1. Spawning gravel will contain appropriate size distributions (river-run gravel, not quarry spalls or crushed gravel) as recommended by Hydraulic Project Approval (HPA), or as recommended by a salmon biologist, for jurisdictions that do not fall under State law.

Excluded Activities:

Cleaning and/or placement of gravels is not proposed for bull trout spawning and rearing areas (see Table 3).

The construction of artificial spawning channels is not proposed under this PBA.

6. Forage Fish Spawning Gravel Restoration

Description: The quality and quantity of available forage fish spawning substrate has been impacted by many anthropogenic features, including beach armoring. Forage fish (surf smelt and sand lance) spawning habitat in Puget Sound is Essential Fish Habitat (EFH) and critical near shore habitat for Puget Sound Chinook. Its properly functioning condition is important for salmon and bull trout recovery. Beach nourishment can contribute to enhancement of EFH and salmonid critical habitat.

Conservation Measures:

1. Beach nourishment will be part of a restoration plan considering near shore transport processes.
2. Beach nourishment must demonstrate appropriate grain size profile for target species and sediment supplementation rate by estimated sediment erosion rate for site and drift cell reach.
3. When placing material in areas known to have forage fish spawning, the applicant will adhere to Corps timing windows protective of forage fish: http://www.nws.usace.army.mil/publicmenu/DOCUMENTS/REG/work_windows_-_all_marine_&_estuarine2.pdf
4. When placing material on known surf smelt spawning beaches a spawning survey will be conducted prior to placing material.
5. Material may not originate from floodplain gravel mining.

7. Hardened Fords for Livestock Crossings of Streams and Fencing

Description:

In many areas in Washington State livestock access to streams has degraded riparian corridors and in-stream habitat. Riparian vegetation is negatively affected by livestock grazing and trampling. Generally the result is increased and chronic sedimentation and reduced riparian functions including shading and recruitment of large woody debris.

To improve riparian conditions in areas used for livestock grazing, the Corps

proposes to permit installation of hardened fords for livestock crossing and construction or replacement of riparian fences.

Conservation Measures:

1. Fences will be installed (or are already existing and functioning) along with all new fords to limit access of livestock to riparian areas. Fenced off riparian areas will be maximized and planted with native vegetation.
2. Fords will be located where stream banks are naturally low.
3. Fords will not be constructed within known or suspected spawning areas (*e.g.* pool tailouts where spawning may occur).
4. Fords will be monitored to determine if the ford is a low flow fish passage barrier. If the ford appears to be a barrier measures to address this problem will be discussed with the Services. Solutions may include installation of sills or groins.
5. Fences at fords will not inhibit upstream or downstream movement of fish or significantly impede bedload movement. Where appropriate, construct fences at fords to allow passage of large wood and other debris.
6. If necessary fords will be armored with rock, banks and approaches only, to reduce chronic sedimentation.
7. If necessary, five feet of stream bank on either side of the ford and approach lanes can be stabilized with angular rock to reduce chronic sedimentation.
8. Livestock fords will not be located in areas where compaction or other damage can occur to sensitive soils and vegetation (*e.g.,* wetlands) due to congregating livestock.
9. The ford will be sized between 10 and 20 feet in the upstream-downstream direction.
10. The use of pressure treated lumber for fence posts in areas with frequent water contact will be avoided. Alternative materials including steel, concrete, and rot resistant wood like locust will be used.

Excluded Activities:

The use of pavement, concrete or individual pavers is not allowed for the construction of hardened fords.

Placement of material will be limited to banks and approaches.

8. Irrigation Screen Installation and Replacement

Description

The Corps proposes this action category for improvement of existing legal water diversions. Irrigation screen installation and replacement include installing, replacing, or upgrading off-channel screens to improve fish passage or prevent fish entrapment in irrigation canals, for water diversions up to 20 cfs. Larger screen structures require design coordination and approval by NMFS or WDFW engineers. This action also includes the removal of diversion structures that are less than six feet high and that impound less than 15 acre-feet of water.

Construction would involve use of heavy equipment, such as excavators, backhoes, front-end loaders, dump trucks, and bulldozers. Heavy machinery may enter the channel under the conditions described below, Conservation Measures: Equipment.

Conservation Measures:

1. All fish screens will be sized to match the water user's documented or estimated historic water use or legal water right, whichever is less. Water diversion rates shall not exceed the design capacity of the screen, as calculated by following NMFS Anadromous Salmonid Passage Facility Design manual.
2. Irrigation diversion intake and return points will be designed (to the greatest degree possible) to prevent all native fish life stages from swimming or being entrained into the irrigation system.
3. Screens, including screens installed in temporary and permanent pump intakes, will be designed to meet standards in the most current version of the NMFS Anadromous Salmonid Passage Facility Design manual.
4. Abandoned ditches and other similar structures will be converted into off channel habitat where possible. If this is not practicable, they will be plugged or backfilled, as appropriate, to prevent fish from getting trapped in them.
5. When making improvements to pressurized irrigation systems, install a totalizing flow meter capable of measuring rate and duty of water use. For non-pressurized systems, install a staff gage or other measuring device capable of measuring instantaneous rate of water flow[3], ensuring that the measuring device does not compromise fish passage at the site.
6. For diversion removal the dewatering will follow the Dewatering and Fish Capture Protocol in Appendix D. Re-watering of the construction site occurs at such a rate as to minimize loss of surface water downstream as the construction site streambed absorbs water.

9. Debris and Structure Removal

Description

The Corps proposes to remove manmade debris and structures from freshwater and marine habitats. Examples of structures or debris that could be removed include derelict vessels, bank protection and shore armoring, creosote treated timbers, piers, ramps, and boat launches.

1. Removal methods for derelict vessels may include use of floatation bags or slings (hydraulic jetting can be used to place slings); cutting up and disposing of

[3] This may require development of a rating curve or installation of standardized flume to be able to convert the staff gage heights to discharge.

the hull at an approved disposal site; use of a crane and heavy equipment to transport all or part of the vessel away; or sinking (all toxic material and liquids must be removed first).
2. Structures that extend into the water (e.g. docks, floats, piling, or piers) are generally removed using a barge with a clamshell bucket or crane assembly. Creosote-treated piling should be pulled out or cut off at the mud line and covered with clean sediments.
3. Shoreline structures and debris such as boat ramps, bank protection, shore armoring, creosote-treated logs or timbers, derelict buildings or other material are generally removed using land-based equipment and taken to an upland disposal site.

Conservation Measures:

1. If the removal involves the use of hydraulic jetting for sling placement and the vessel or debris is embedded more than three feet in bottom sediments, work will be accomplished during the marine or freshwater work windows.
2. All toxic materials such as fuel and oil will be removed from the vessel before it is towed or removed.
3. Creosote-treated timbers and materials containing asbestos will be disposed of at an approved facility.
4. In the marine environment, beach nourishment with appropriately sized substrate may accompany the removal of shore line armoring.
5. After removing bank protection, the bank will be revegetated with native species.
6. After removing hard bank protection like rip-rap or sheet piling the bank may be stabilized with soft stabilization methods as in "General CM Frequently Associated with Some Restoration Actions # 7".

Excluded Activities:

Removal of vessels in contaminated sediments or in Superfund sites.
Removal of vessels in eelgrass, kelp beds or other macroalgae in a documented herring or forage fish spawning area.

Excluded Restoration Actions:

- Channel redesigns that alter the planform (sinuosity and meander pattern), cross-section (maximum depth, width to depth ratio) and profile (slopes) of channel reaches. However, meander reconstruction and minor alterations of the channel planform which would be achieved by methods described above like LWD and boulder placement are covered.
- Creation of artificial spawning and production channels that need periodic maintenance.

General Conservation Measures that Apply to all Proposed Restoration Actions

No in-water activities are permitted in bull trout spawning and rearing areas in eastern Washington (Table 3).

1. Pre-Construction/Surveying

1. All organic material that has to be cleared for access will remain on site.
2. The removal of riparian vegetation for access will be minimized and estimated in the SPIF.
3. The number of temporary access roads will be minimized and roads will be designed to avoid adverse effects like creating excessive erosion.
4. Temporary access-ways across slopes greater than 30% will be avoided. If temporary access needs to cross slopes greater than 30% it will be indicated in the SPIF.
5. No permanent access-ways will be built. All temporary access-ways will be removed (including gravel surfaces) and planted after project completion.
6. New temporary stream crossings will avoid potential spawning habitat (i.e. pool tailouts) and pools to the maximum extent possible. They will minimize sedimentation impacts by using BMPs like mats and boards to cross a stream. BMPs will be listed by each applicant in SPIF. After project completion temporary stream crossings will be abandoned and the stream channel restored where necessary.
7. Boundaries of clearing limits associated with site access and construction will be marked to avoid or minimize disturbance of riparian vegetation, wetlands and other sensitive sites.
8. A Pollution and Erosion Control Plan, commensurate with the size of the project, must be prepared and carried out to prevent pollution caused by surveying or construction operations.
9. A supply of emergency erosion control materials will be on hand and temporary erosion controls will be installed and maintained in place until site restoration is complete.

2. General

1. Work windows will be applied to avoid and minimize impacts to listed salmonids and forage fish.
2. Electrofishing is not proposed in the vicinity of redds from which fry may not have emerged, or in areas where adult salmonids may be holding prior to spawning.
3. Sandbags may be placed to temporarily keep fish out of work areas. Sandbags will be removed after completion of project.
4. Temporary roads in wet or flooded areas will be abandoned and restored by the end of the in-water work period.
5. Existing roadways or travel paths will be used whenever possible.
6. Any large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration.

7. When construction is finished, the construction area will be cleaned up and rehabilitated (replanted and reseeded) as necessary to renew ecosystem processes that form and maintain productive fish habitats.
8. Work below the OHW or mean higher high tide line will be completed during preferred in-water work windows, when listed salmonids or forage fish are least likely to be present in the action area. Exceptions will be requested in the SPIF.
9. If listed fish are likely to be present, the project sponsor will assess what is less impacting to fish, isolation of the in-water work area or work in the wet, see below "6. Isolation of Work Site".
10. Prepare a Work Area Isolation Plan for all work below the bankfull elevation requiring flow diversion or isolation. Include the sequencing and schedule of dewatering and rewatering activities, plan view of all isolation elements, as well as a list of equipment and materials to adequately provide appropriate redundancy of all key plan functions (e.g., an operational, properly sized backup pump and/or generator). This standard material does not need to be submitted with a SPIF. However, it needs to be available to the Services at their request.
11. Any water intakes used for the project, including pumps used to dewater the work isolation area, will have a fish screen installed, operated and maintained according to NMFS' fish screen criteria (NMFS 1997).
12. The site will be stabilized during any significant break in work.
13. Project operations will cease under high flow conditions that may inundate the project area, except as necessary to avoid or minimize resource damage.
14. All discharge water created by construction (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) will be treated to avoid negative water quality and quantity impacts. Removal of fines may be accomplished with bioswales; concrete washout with altered pH, may be infiltrated.

3. Equipment

1. Heavy equipment will be limited to that with the least adverse effects on the environment (e.g., minimally-sized, low ground pressure equipment).
2. When not in use, vehicles and equipment that contain oil, fuel, and/or chemicals will be stored in a staging area located at least 150 feet from the Corps' jurisdictional boundary of wetlands and waterbodies. If possible staging is located at least 300 feet away from the Corps' jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces to prevent spills from reaching ground water. Where moving equipment daily at least 150 feet of waterbodies would create unacceptable levels of disturbance (multiple stream crossings, multiple passes over sensitive vegetation) a closer staging location with an adequate spill prevention plan may be proposed.
3. When conducting in-water or bank work, hydraulic lines will be filled with vegetable oil for the duration of the project to minimize impacts of potential spills and leaks.
4. Spill prevention and clean-up kits will be on site when heavy equipment is operating within 25' of the water.

5. To the extent feasible, work requiring use of heavy equipment will be completed by working from the top of the bank.
6. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities around the water.
7. Equipment will cross the stream in the wet only under the following conditions:
    a. equipment is free of external petroleum-based products, soil and debris has been removed from the drive mechanisms and undercarriage; and
    b. substrate is bedrock or coarse; and
    c. in soft bottom streams mats or logs are used to drive across to minimize compaction; and
    d. stream crossings will be performed at right angle if possible; and
    e. no stream crossings will be performed at spawning sites when spawners are present or eggs or alevins could be in the gravel; and
    f. the number of crossings will be minimized.

4. Planting and Erosion Control

1. Within seven calendar days of project completion, any disturbed bank and riparian areas shall be protected using native vegetation or other erosion control measures as appropriate. For erosion control, sterile grasses may be used in lieu of native seed mixes.
2. If native riparian vegetation has to be disturbed it will be replanted with native herbaceous and/or woody vegetation after project completion. Planting will be completed between October 1 and April 15 of the year following construction. Plantings will be maintained as necessary for three years to ensure 50 % herbaceous and/or 70 % woody cover in year three, whatever is applicable. For all areas greater than 0.5 of an acre, a final monitoring report will be submitted to the Corps in year three. Failure to achieve the 50% herbaceous and 70 % woody cover in year three will require the applicant to submit a plan with follow up measures to achieve standards or reasons to modify standards.
3. Fencing will be installed as necessary to prevent access to revegetated sites by livestock, beavers or unauthorized persons. Beaver fencing will be installed around individual plants where necessary.

5. Water Quality

1. Landward erosion control methods shall be used to prevent silt-laden water from entering waters of the U.S. These may include, but are not limited to, straw bales, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas.
2. Wastewater from project activities and water removed from within the work area shall be routed to an area landward of the ordinary high water line in an upland disposal site to allow removal of fine sediment and other contaminants prior to being discharged to the waters of the U.S.
3. All waste material such as construction debris, silt, excess dirt or overburden resulting from this project will generally be deposited above the limits of flood water in an upland disposal site. However, material from pushup dikes may be

used to restore microtopography, e.g. filling drainage channels.

4. If high flow or high tide conditions that may cause siltation are encountered during this project, work shall stop until the flow subsides.
5. Measures shall be taken to ensure that no petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into waters of the U.S.
6. A spill prevention plan will be prepared for every project that utilizes motorized equipment or vehicles. Plan will be available to Service by request.
7. An erosion control plan will be prepared for every project that results in ground disturbance. Plan will be available to Service by request.

6. Isolation of Work Site

To reduce impacts to listed fish and water quality, major habitat restoration projects would be performed in isolation from flowing waters whenever possible. Examples of activities that may be done in the water include placing wood and rock structures that require very little in-water excavation, small scale work in systems with sand or coarser grained substrate and work in rock bottom systems. The choice and rational on whether or not to isolate the worksite needs to be included in the SPIF. The focus needs to be on minimization of impacts on water quality, listed salmonids and forage fish. If worksite isolation and fish capture and removal is the least impacting method, the applicant will follow procedures outlined in Appendix D.

When working in the wet some turbidity monitoring may be required, subject to discussions between applicant and the Services. Turbidity monitoring generally is required when working in streams with more than 40 percent fines (silt/clay) in the substrate. Turbidity will be monitored only when turbidity generating work takes place, for example, pulling the culvert in the wet, reintroducing water. The applicant will measure the duration and extent of the turbidity plume (visible turbidity above background) generated. The data will be submitted to the Services.

Measurements of concentration preferably in mg/l are very helpful for the Services. Turbidity measurements are used by the Services to develop procedures to minimize turbidity and estimate take for future projects. If you can provide turbidity measurements in mg/l (NTUs are also less helpful for purposes of comparison with literature values) the Services will greatly appreciate your data.

General Conservation Measures Frequently Associated with some of the Proposed Restoration Actions

Bank stabilization, Redirection of Flow, Riparian Invasive Plant Removal and small scale Nutrient Enhancement are frequently associated with restoration actions proposed under this programmatic. For example, riparian enhancements often require some level of bank treatment and invasive plant removal; the installation of LWD often is associated with nutrient enhancement. Neither riparian invasive plant removal nor nutrient enhancement are regulated by the Corps. However, if they are part of a project otherwise covered by this programmatic, they must follow the guidelines below:

7. Installation of Bank Stabilization Features:

Description: In many riparian areas anthropogenic activities have led to streambank degradation and accelerated erosion. This usually leads to lack of cover, growth of invasive plants, reduction in pool habitat, and increased fine sediment input and accumulation, which all negatively affect salmonids. Projects that improve riparian habitat conditions for salmonids, such as riparian plantings or side channel construction/reactivation, may utilize the bank stabilization techniques listed below. For a detailed description of each technique refer to Integrated Streambank Protection Guidelines (Cramer et al. 2003).

All restoration/enhancement projects that employ bank stabilization need to have restoration as their primary purpose and need to address the cause of the habitat degradation. Streambank stabilization can not be the only proposed component, but rather a conservation measure applied to help a primary action like removal of bank protection and installation of riparian revegetation to succeed.

a. **Bank Protection Engineered Log Jams (ELJs)**

Description: The goal of bank protection ELJs is to protect a section of natural stream bank that may be vulnerable to accelerated erosion resulting from project activities or existing infrastructure that have altered the natural stream flow. Bank protection ELJs can be placed intermittently as a series of flow defectors or as a continuous revetment (Herrera 2006b). Examples in the Pacific Northwest include the Elwha River in Washington and Johnson Creek in Portland, Oregon.

b. **Groins/Spur Dikes**

Description: Groins are large roughness elements that project from the bank into the channel. Different from barbs, groins extend above the high-flow water-surface elevation. Usually they are constructed in a series to provide continuous bankline roughness.

Groins must be constructed exclusively from wood with minimal anchor rock. Constructing less permanent (compared to rock) wood groins will ensure that in the long-term the groins do not interfere with natural river dynamics and provide maximal habitat.

c. **Barbs/Vanes/Bendway Weirs**

Description: Barbs, vanes, and bendway weirs are low-elevation structures that project from a bank into the channel. They are angled upstream to redirect flow away from the bank. They increase channel roughness and reduce water

velocity near the bank. Barbs have to be constructed from wood with minimal anchor rock. Wooden barbs within the active river channel may be used to allow soft bank treatments such as reshaping and native plantings to mature. Constructing less permanent (compared to rock) wood groins will ensure that in the long-term the groins do not interfere with natural river dynamics and provide maximal habitat.

d. **Rootwad Toes**
Description: Rootwad toes are structural features that prevent erosion at the toe of a streambank. The toe refers to that portion of the steambank that extends from the channel bottom up to the lower limit of vegetation. Rootwad toes can provide the foundation for soft upper-bank treatments such as bank reshaping and soil reinforcement. Rootwad toes provide better fish habitat and have a shorter life span than rock toes.

e. **Bank Reshaping**
Description: Reducing the angle of the bank slope without changing the location of its toe. However, the toe may be reinforced with rootwads or coir logs.

f. **Soil Reinforcement/Soil Pillows**
Description: Soil layers or lifts encapsulated within natural materials. Often the lifts are used to form a series of stepped terraces along the bank which then are planted with woody vegetation.

g. **Coir Logs**
Description: Coir (coconut fiber) logs are long, sausage-shaped bundles of bound-together coir. They are commonly used as a temporary measure to stabilize the bank toe while riparian vegetation grows.

8. In-Channel Nutrient Supplementation

Description: Salmon and anadromous trout runs in most of the rivers in Washington State are significantly reduced compared to historic levels. This has resulted in a reduction of marine-derived nutrients that feeds the food chain including juvenile salmonids. To provide more nutrients up to historic levels the Corps proposes to permit nutrient supplementation. Salmon carcasses or carcass analogs will be obtained from non-stream sources, generally hatcheries, to distribute in stream systems that have below-historic numbers of salmon carcasses. Distribution of carcasses will follow WDFW technical guidance (the WDFW protocol and guidelines document describes the application of fertilizer however, that action is not covered by this PBA). Distribution of carcasses will occur within the current anadromous zone of a watershed or within areas historically accessible to anadromous fish. Carcasses or analogs will be deployed randomly throughout riparian and stream areas by placing individual or several carcasses on the ground, in the water, or wedging into accumulated wood. Work may entail use of trucks and hand crews.

Conservation Measures:

a. WDFW's technical guidance document "Protocols and Guidelines for Distributing Salmonid Carcasses, Salmon Carcass Analogs, and Delayed

Release Fertilizers to Enhance Stream Productivity in Washington State" (Saldi-Caromile et al. 2004) will be followed.

b. The most recent Co-managers Salmonid Disease Control Policy ((NWIFC and WDFW 2006) Section 2.4.5. Carcass Transfer Requirements will be followed.
c. Nutrient enhancement will be covered only, if a recovery document, watershed plan, or best available science identifies nutrient deficiency as one of the limiting factors.
d. Salmon carcass deployment will not be conducted in areas where documented grizzly bear sightings have occurred within the last 4 weeks.

9. Riparian Invasive Plant Removal

Description:

Functioning riparian corridors provide many essential benefits to salmonids including shade and recruitment of Large Woody Debris (LWD). In many areas in Washington State riparian corridors have been disrupted by anthropogenic activities and subsequently taken over by non-native invasive vegetation. To re-establish native vegetation the following guidelines will be used to treat invasive plant infestations in riparian areas using biological controls, mechanical methods, and chemical herbicides. The following five herbicides are proposed under this action category: Clopyralid, Glyphosate, Imazapyr, Metsulfuron, and Sulfometuron.

Clopyralid - Clopyralid is a relatively new and very selective herbicide. It is toxic to some members of only three plant families: the composites (Compositae), the legumes (Fabaceae), and the buckwheats (Polygonaceae). Clopyralid is very effective against knapweeds, hawkweeds and Canada thistle at applications rates of 0.10 to 0.375 pounds per acre. Clopyralid is a WSSA Group 4 herbicide. Its selectivity makes it an attractive alternate herbicide on sites with non-target species that are sensitive to other herbicides.

Aquatic labled Glyphosate - Glyphosate is a non-selective, broad-spectrum herbicide that is labeled for a wide variety of uses. It is absorbed by leaves and translocated throughout the plant, and disrupts the photosynthetic process. The herbicide affects a wide variety of plants, including grasses and many broadleaf species, and has the potential to eliminate desirable as well as undesirable vegetation. Glyphosate is a WSSA Group 9 herbicide. Some plant selectivity can be achieved by using a wick applicator to directly apply glyphosate to the target plant, thereby avoiding desirable vegetation.

Imazapyr - Imazapyr is used for pre- and post-emergent control of annual and perennial grasses and broadleaf weeds, brush, vines, and many deciduous trees. Imazapyr is absorbed by the leaves and through the root system, disrupting amino acid biosynthesis. Effects may not be seen for two weeks. Complete plant kill may take several weeks. Imazapyr is a WSSA Group 2 herbicide. It can be used in ground broadcast, spot and localized, cut stump, frill and girdle, and tree injection applications at 0.5 to 1.5 lbs active ingredient per acre per year not to exceed 1.5 lbs per acre per year. The imazapyr formulation of Arsenal® herbicide is registered for use in non-crop sites for selective and total weed control.

Metsulfuron methyl - Metsulfuron methyl is used for the control of brush and certain woody plants, annual and perennial broadleaf weeds, and annual grasses.

Metsulfuron methyl is absorbed through the roots and foliage and inhibits cell division in the roots and shoots. Metsulfuron methyl is a WSSA Group 2 herbicide. Application should be made before or during active growth periods at a rate of 0.33 to 2.0 ounces per acre.
Sulfometuron methyl - Sulfometuron methyl is a non-selective herbicide used primarily to control broadleaf weeds and grasses. Its primary use is for noxious weed control. Sulfometuron methyl is WSSA Group 2 herbicide. Application rates for most plants range from 0.023 to 0.38 ounces per acre.

Treatment of an invasive plant site may include one or more of the following treatment methods: Stem injection; squirt with backpack or hand-held sprayers, squirt bottles, wicking or wiping. Application with sprayers mounted on or towed by trucks is not proposed. A combination of treatments may occur to achieve effective control or eradication of an invasive plant species at many sites. All herbicide applications will comply with label instructions, and may be further restricted as stated below. Treatment methods were selected due to their low potential for adversely affecting aquatic species, while facilitating riparian restoration through invasive plant control. Herbicides were selected due to their low toxicity to aquatic species and application methods were selected for their low potential for contaminating soils, thereby minimizing the risk of herbicides leaching to streams. Methods, tools, and project design criteria are summarized in Table 1, and subsequently discussed in more detail.

Table 1: Summary of methods, tools, and conservation measures for invasive plant treatment

Methods	Tools	Conservation Measures
Manual & Mechanical Treatment	Various tools listed below	- Minimize work from channel - Minimize ground disturbance - All methods allowed to bankfull of perennial streams, and in intermittent/ephemeral streams - Hand pulling allowed to emergent plants
Hand pulling	Non-motorized tools (weed wrenches, etc)	
Seed clipping	String trimmer or hand-held blade	- Transport only daily fuel supply for chainsaws and string trimmers to project site - Do not fuel chainsaws and string trimmers within 100 feet of water
Stabbing	Shovel, hoe, or similar hand tool	
Girdling	Chainsaw, axe, or similar hand-held tool.	
Cutting	String trimmer or hand-held blade	
Solarization	Plastic, geotextile, cardboard, or similar ground cover material	
Herbicide Treatment	Selective application techniques for clopyralid, aquatic labeled glyphosate, imazapyr (aquatic and non-aquatic labeled), metsulfuron methyl, sulfometuron methyl	- Only daily quantities of herbicide transported to project site - Do not apply herbicides if rain is predicted within 24 hours - Emergent treatment restricted to knotweed with aquatic labeled glyphosate - No treatment of submerged aquatic plants - Spill prevention, cleaning, and storage requirements - Use only LI 700, Agri-Dex, or an equivalent when adding surfactants to formulations

Methods	Tools	Conservation Measures
Stem injection	Appropriate syringes/injectors	- Knotweed applicators will be familiar with appropriate methods - Knotweed injection will use only aquatic labeled glyphosate (up to 100 percent concentration) - Emergent knotweed stems > 0.75 inches will be injected
Cut-stump and Hack & squirt	Backpack or hand-held sprayers, squirt bottles, and wiping applicators (brush, fabric, etc) Axe, hatchet, machete, drill, chainsaw, or other hand-held tool. Squirt bottles, backpack sprayer, or other hand-held spray bottle. Also tree injector and pellet gun.	- Herbicides to be used are imazapyr, metsulfuron methyl, and glyphosate - Application with aquatic glyphosate and aquatic imazapyr allowed to water's edge, and bankfull level for metsulfuron methyl, non-aquatic imazapyr
Wicking, wiping	Sponge, wick, or similar absorbent material	- Herbicides to be used are clopyralid, aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl - Application with aquatic glyphosate and aquatic imazapyr allowed to water's edge, and to bankfull level for clopyralid, and sulfometuron methyl
Spot spray	Backpack, hand-pumped, or hand-held spray bottles	- Herbicides to be used are clopyralid, aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl - Spray of aquatic glyphosate, metsulfuron, and sulfometuron allowed to bankfull level. Hand-held spray application (no backpack spray) of aquatic glyphosate, imazapyr metsulfuron, and sulfometuron allowed within intermittent or ephemeral channels - No spray of clopyralid within 15 feet of perennial (flowing water in summer) stream bankfull level. - No spray of clopyralid in intermittent/ephemeral streams - Hand-held spray application (no backpack spray) of aquatic glyphosate and aquatic imazapyr to 15 feet of waters' edge in perennial channels - Drift minimized by 200-800 μm droplet size, and wind speeds consistent with label or local agency requirements, whichever is less
Biological Control	Insects, parasites, or pathogens	- State and U.S. Animal & Plant Health Inspections Service approved - Agents with direct adverse effects to non-target organisms not used
Site Restoration		
Site preparation	Rakes, shovels, hoes, and similar non-motorized hand tools.	- Minimize ground disturbance by clearing only area necessary for effective planting
Planting & seeding	Rakes, shovels, hoes, and similar non-motorized hand tools.	

1. Manual and Mechanical
   a. Hand Pulling – Uprooting is performed either by hand or using hand (non-motorized) tools. Generally appropriate for non-rhizome forming, tap-rooted species or species which produce only from seed. Treatment occurs when plant growth stage and soil conditions allow, and prior to seed-set for annual species. Hand pulling of emergent invasive plants is included.
   b. Seed Clipping – Seed heads are cut, bagged, and removed from the area. The remainder of plant is left intact, but is likely to be treated with another method.

c. Stabbing – Some invasive plants can be severely weakened or killed by severing or injuring the carbohydrate storage structure at the base of the plant. Depending on species, this structure may be a root corm, storage rhizome, or taproot. Can be accomplished with shovel, hoe, or similar hand tool.
d. Girdling – A strip of bark is removed around the base of susceptible woody species. The vascular cambium, or inner bark, which translocates carbohydrates between roots and leaves, is removed
e. Cutting – Removal of the above-ground portion of an invasive plant by cutting with chainsaw, handsaw, pruning shears, or similar hand held device. Also includes mowing or cutting with a string-trimmer type machine, which does not have wheels or contact the ground.
f. Solar deprevation (ground cover) – Invasive plant infestations may be covered with plastic, geotextile, cardboard, or other ground cover material to kill the plant and roots, or reduce plant vigor prior to treatment with another method.

2. Herbicide Treatments
   a. Do not apply herbicides in areas where listed plants may be present. Botanical surveys must be conducted in locations that could support listed plants before any vegetation treatment (including manual and mechanical) is conducted.
   b. Stem Injection – Stems of actively growing species are injected with herbicide, usually near the base of the plant.
   c. Cut-Stump – Herbicide is applied by spray, squirt, wicking, or wiping to the stump of a plant (usually a shrub or tree) shortly after the shoot or trunk is cut down.
   d. Wicking & Wiping – Use a sponge or wick to wipe herbicide onto foliage, stems, or trunk. Use of wicking and wiping method reduces the possibility affecting non-target plants.
   e. Spot Application – Herbicide is directly sprayed onto target plants only, and spraying of desirable, non-target vegetation is avoided. Includes backpack and hand-pumped spray or squirt bottles, which can target very small plants or parts of plants (foliage, stems, or trunk).
   f. Hack & Squirt – Woody species are cut using a saw or axe, or drilled; herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment.
3. Biological Controls
   a. Biological control is the inoculation of an infestation site with insects, parasites, or pathogens that specifically target the invasive plant species of concern. Treatment of invasive plant infestations with biological controls is a gradual process requiring several years to reach full effectiveness. Subsequent treatment with other methods may also occur.
   b. Site preparation and competitive planting and seeding
      i. Invasive plant infestation sites treated using one or more of the above stated methods may be revegetated by planting cuttings, seedlings, or seeding.
      ii. Site preparation can involve removal of litter and duff layer suitable to allow proper soil to seed/root contact. This will be accomplished by scuffing or scalping micro-sites (generally less than 1 square meter) with hand tools within the larger planting/seeding site.

Method Specific Conservation Measures

1. Manual and Mechanical Methods
   a. Minimize treating invasive plants on streambanks when listed aquatic species are present, or likely to be present.
   b. Use the least ground-disturbing method that results in effective invasive plant treatment.
2. Fuel handling
   a. Transport no more than a one day supply of fuel for chainsaws and string-trimmers into riparian areas.
   b. Fueling of chainsaws and string-trimmers will not occur within 100 feet of surface waters.
3. Herbicides General Criteria
   a. Only daily-use quantities of herbicides will be transported to the project site.
   b. Use only LI 700®, Agri-Dex®, or an equivalent when adding surfactants to formulations.
   c. Do not apply herbicides if precipitation is predicted within 24 hours.
   d. Only herbicide application methods for plants emergent from water are stem injection, wicking or wiping, and hand-held spray bottle application of glyphosate to knotweed. No application to submerged aquatic vegetation with any herbicide is included.
   e. Areas used for mixing herbicides will be placed where an accidental spill will not run into surface waters or result in groundwater contamination. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing refilling.
   f. Equipment cleaning and storage and disposal of rinsates and containers will follow all applicable state and Federal laws.
4. Knotweed stem-injection
   a. Individuals will be familiar with proper glyphosate stem-injection methodology prior to treatment.
   b. Only aquatic glyphosate formulations will be used. The formulation can be used at up to 100 percent concentration for the stem injection method. The formulation will be diluted to 50 percent or less active ingredient when applied directly to fresh stem cuts using wicking or wiping, and up to the percentage allowed by label instructions when applied to foliage using low pressure hand-held spot spray applicators.
   c. Larger emergent knotweed can be treated with glyphosate by stem injection, and smaller emergent knotweed by wicking/wiping and spot spray with hand-held sprayers. Wicking or wiping and hand-held spray bottle application of glyphosate allowed to emergent knotweed plants less than 4 to 5 feet tall, and usually smaller.
   d. Emergent plants with stems over 0.75 inch in diameter will be treated by stem injection.
   e. Most knotweed patches are expected to have overland access. However, some sites may only be reached by water travel, either by wading or inflatable raft (or kayak). The following measures will be used to reduce the risk of a spill during water transport:

i. No more than 2.5 gallons of glyphosate will be transported per person or raft, and typically it will be one gallon or less.
ii. Glyphosate will be carried in 1 gallon or smaller plastic containers. The containers will be wrapped in plastic bags and then sealed in a dry-bag. If transported by water craft, the dry-bag will be secured to the watercraft.

5. Cut-stump and hack & squirt
   a. Herbicides to be used are imazapyr, metsulfuron methyl, and aquatic labeled glyphosate.
   b. Application with aquatic labeled glyphosate and aquatic labeled imazapyr allowed to waters' edge, and to bankfull level for metsulfuron methyl and imazapyr not labeled for aquatic use.
6. Wicking and wiping
   a. Herbicides to be used are clopyralid, aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl.
   b. For perennial streams, wicking and wiping application with aquatic labeled glyphosate and aquatic labeled imazapyr is allowed to waters' edge, and to bankfull level for clopyralid, imazapyr (not aquatic labeled), metsulfuron methyl, and sulfometuron methyl.
   c. For intermittent and ephemeral channels, clopyralid, aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl can be applied to all dry portions of the channel.
7. Spot application
   a. Herbicides to be used are clopyralid, aquatic glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl.
   b. Do not spot spray clopyralid within 15 feet of the bankfull level of perennial streams.
   c. Do not spot spray clopyralid within intermittent or ephemeral channels.
   d. Spot spray using aquatic labeled glyphosate and aquatic labeled imazapyr allowed to within 15 feet of the edge of water with hand-held, hand-pump spray or squirt bottles (no backpack sprayers).
   e. Spot spray using metsulfuron methyl, and sulfometuron methyl allowed to bankfull level of perennial streams with backpack sprayers, hand-pump sprayers, and squirt bottles.
   f. Spot spray of aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl within dry intermittent and ephemeral channels allowed only with hand-held, hand-pumped sprayers and squirt bottles (no backpack sprayers). Excluding backpack spot spray is a conservation measure intended to minimize overspray within channels, and subsequent "first flush" exposures to aquatic resources, while still allowing full efficacy of the treatment.
   g. For foliar backpack spray applications, use only low pressure sprayers producing droplet sizes between 200 and 800 microns to minimize drift.
   h. Backpack spray activities will only occur during conditions with low drift potential, defined as wind velocities greater than two and less than 10 mph, or as stated on herbicide label.

8. Biological Controls
    a. All biological controls used will be U.S. Animal and Plant Health Inspection Service (APHIS) and state approved.
    b. Agents demonstrated to have direct negative effects on non-target organisms will not be released.
9. Site Preparation and Competitive Planting and Seeding
    a. Minimize ground disturbance by clearing only the area necessary for effective planting.
10. Extent of Treatment
    a. Within each sixth field HUC containing listed aquatic species, no more than 10 percent of the total riparian area, measured as adjacent stream length, will be treated within any one year period. This includes 10 percent of flowing streams, and 10 percent of intermittent streams, measured separately.

Table 2 summarizes conservation measures to minimize effects of herbicide application to water quality.

Table 2: Summary of conservation measures to minimize effects to water quality and listed salmonids

Herbicide	**Perennial/flowing channels**		**Dry intermittent and ephemeral channels, and ditches**	
	Spot spray	**Hand/select**	**Spot spray**	**Hand/select**
Clopyralid	15 feet from bankfull	bankfull	Bankfull	allowed through channel/ditch
Glyphosate (aquatic)	[1]15 feet from edge of water	edge of water	allowed through channel/ditch	allowed through channel/ditch
Imazapyr	bankfull	bankfull	allowed through channel/ditch	allowed through channel/ditch
Imazapyr (aquatic)	15 feet from edge of water	edge of water	allowed through channel/ditch	allowed through channel/ditch
Metsulfuron methyl	bankfull	bankfull	allowed through channel/ditch	allowed through channel/ditch
Sulfometuron methyl	bankfull	bankfull	allowed through channel/ditch	allowed through channel/ditch

General Conservation Measures

1. When consistent with label instructions, use water when diluting herbicides prior to application.
2. A spill cleanup kit will be available whenever herbicides are used, transported, or stored.
3. A certified/licensed pesticide applicator will oversee all herbicide application projects.
4. In riparian areas, use only surfactants or adjuvants that do not contain any ingredients on EPA's List 1 or 2, where listing indicates a chemical is of toxicological concern, or is potentially toxic with a high priority for testing

Excluded Activities
Application with sprayers mounted on or towed by trucks is not proposed.
Treatment of submerged aquatic plants is not proposed.

10. Conservation Measures for Bull Trout

BT1. In bull trout local population areas (spawning and early rearing areas), in-water work will only occur during the watershed-specific timing windows identified in Appendix C – WDFW's *Gold and Fish Pamphlet* (WDFW 1999) or more up-to-date, USFWS-approved information. For information on local population areas, refer to the maps in the *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout* (Figures 2-10 for the Puget Sound Management Unit and Figures 2-8 for the Olympic Management Unit). Inwater activities are not included in local population areas in the Columbia River DPS (eastern Washington). Contact the local FWS field office for site-specific work windows in the project area.

BT2. Fish passage structures will not be installed and barriers will not be removed in locations where there are concerns for impacts to bull trout populations from exotic or non-native species.

BT3. In-water work will only occur during the timing windows identified in Appendix C, when the in-water restoration activity occurs in the following water bodies: the Duwamish Waterway, Lake Union and the Ship Canal, Lake Washington, Sammamish Basin, Columbia River Mainstem or in marine nearshore and estuarine areas.

11. Conservation Measures for Non-Fish Species

This section lists specific conservation measures which will be taken in order to reduce impacts to endangered, threatened, and proposed USFWS terrestrial species. Also included are conservation measures to reduce or eliminate impacts to critical habitats for those species with designated and proposed critical habitat. The species and habitats are grouped according to listing status (endangered, threatened, candidate). Within each group, they are listed alphabetically with numbered conservation measures for each species. This list looks long. However, most species occur very localized. Thus, for most consultations only a few of the terrestrial conservation measures will apply. To obtain a county species list go to the USFWS web pages:
Western WA: http://westernwashington.fws.gov/se/SE_List/endangered_Species.asp.
Eastern WA: http://www.fws.gov/easternwashington/county%20species%20lists.htm
To assist you in evaluating the effects of your project, site-specific information of listed species occurrences in Washington State may be obtained from the Washington Department of Fish and Wildlife Priority Habitat and Species Program http://www.wdfw.wa.gov/hab/phspage.htm and from the Washington Department of Natural Resources Natural Heritage Program at http://www.dnr.wa.gov/nhp/.

Endangered Animals

Brown pelican (*Pelecanus occidentalis*)

BP1. Prior to initiating restoration activities which directly alter islands within Grays Harbor and Willapa Bay, contact USFWS: (1) to avoid and minimize impacts to brown pelicans and their roosting islands; and (2) to be not likely to adversely affect or to have no effect on brown pelicans. This includes only islands found within the bays, not those formed at the delta of rivers entering the bays.

BP2. From June 1 to October 31, no explosives will be used within 1 mile of Sand and Goose Islands in Grays Harbor, and Dead Man Island in Willapa Bay.

Columbian white-tailed deer (*Odocoileus virginianus leucurus*)

CWTD1. To avoid and minimize impacts to Columbian white-tailed deer during the fawning period, restoration activities on: Puget Island; the Hunting Islands; Price Island; and 2 miles inland from the Columbia River between 2 miles east of Cathlamet and 2 miles west of the community of Ridgefield, will not occur from June 1 to June 30.

CWTD2. To avoid and minimize impacts to Columbian white-tailed deer and their movements, fencing projects on Puget Island; the Hunting Islands; Price Island; and 2 miles inland from the Columbia River between 2 miles east of Cathlamet and 2 miles west of the community of Ridgefield, will use only three-strand barbed wire.

Gray wolf (*Canis lupus*)

The Rocky Mountain DPS of the grey wolf was delisted on February 27, 2008. The wolf remains listed in the Cascade Mountains (Okanogan, Chelan, Kittitas, Yakima, Whatcom, Skagit, Snohomish, King, Pierce, Lewis, Cowlitz, and Skamania Counties):

GW1. Restoration activities generating noise above ambient levels within 0.25 mile (1 mile for blasting and pile driving) of any known gray wolf den (none known in Washington to date) or rendezvous site, will not occur from March 15 to June 30.

GW2. Restoration activities generating noise above ambient levels or otherwise creating disturbances will not occur within:

(1) 0.25 mile (1.0 mile for blasting and pile driving) of occupied ungulate winter habitat from December 1 to April 15; and
(2) 0.25 mile (1.0 mile for blasting and pile driving) of calving, fawning, or kidding grounds from December 1 to June 15.

GW3. Restoration activities will not increase trail or road densities within gray wolf habitat.

Pygmy rabbit (*Brachylagus idahoensis*)

Prior to initiating restoration activities in the central Columbia Plateau (Douglas, Lincoln, Adams and Grant, counties) in dense, tall stands of sagebrush, consult with USFWS staff and design restoration activities to avoid and minimize impacts to the pygmy rabbit, in order to be not likely to adversely affect or to have no effect on the pygmy rabbit. If any evidence of pygmy rabbit presence is detected on a project outside of these counties, but within the historic range of the pygmy rabbit, USFWS staff will be contacted to determine the best way to avoid and minimize impacts.

Woodland caribou (*Rangifer tarandus caribou*)

WC1. Prior to initiating restoration activities east of the Pend Oreille River in Pend Oreille County at elevations 4,000 feet or above, within the recovery zone (as defined in the Woodland Caribou Recovery Plan, USFWS 1993), contact USFW staff: (1) to avoid and minimize impacts to woodland caribou and their habitats; and (2) to be not likely to adversely affect or to have no effect on woodland caribou.

Endangered plants

Hackelia venusta (showy stickseed)

SST1. Prior to initiating restoration activities in the Wenatchee Mountains in Chelan County, between 984 and 1,600 ft in the Ponderosa Pine Zone, contact USFWS staff: (1) to avoid and minimize impacts to showy stickseed and its habitat; and, (2) to be not likely to adversely affect or have no effect on showy stickseed.

Lomatium bradshawii (Bradshaw's desert-parsley)

Prior to initiating restoration activities in wet meadows and pastures in Clark County, contact USFWS staff: (1) to avoid and minimize impacts to Bradshaw's desert-parsley and its habitat, if present; and (2) to be not likely to adversely affect or to have no effect on Bradshaw's desert-parsley.

Sidalcea oregana var. *calva* (Wenatchee Mountains checker-mallow*)*

Prior to initiating restoration activities in the Icicle and Peshastin creek watersheds and the Camas Creek watershed on the Camas lands in Chelan County, contact USFWS staff: (1) to avoid adverse modification or destruction to designated critical habitat of the Wenatchee Mountains checker-mallow in the Camas and Pendleton Creek watershed of Chelan County; and (2) to be not likely to adversely affect or to have no effect on Wenatchee Mountains checker-mallow.

Threatened Animals

Canada lynx (*Lynx canadensis*)

CL1. Prior to initiating restoration activities in lodgepole pine, cedar/hemlock and sub-alpine forest habitats at or above 3000 ft. in elevation in Asotin, Chelan, Columbia, Cowlitz, Douglas, Ferry, Franklin, Garfield, Grant, King, Kittitas, Klickitat, Lewis, Lincoln, Okanogan, Pend Oreille, Pierce, Skagit, Skamania, Snohomish, Stevens, Walla Walla, Whatcom, Whitman, and Yakima Counties, contact USFWS staff: (1) to avoid and minimize impacts to Canada lynx and snowshoe hare and their habitat; and (2) to be not likely to adversely affect or to have no effect on Canada lynx.

Grizzly bear (*Ursus arctos = U.a. horribilis*)

In Pend Oreille, Stevens, Ferry, Okanogan, Chelan, Kittitas, Yakima, Whatcom, Skagit, Snohomish, King, Pierce, Lewis, Klickitat, Cowlitz, Clark, and Skamania Counties (excluding urban areas):

GB1. Restoration activities generating noise above ambient levels will not occur within 0.25 mile (1.0 mile for blasting and pile driving) of known grizzly bear den sites from November 1 to April 30. Activities within 0.25 mile of a known den site at any time of year will be reviewed by USFWS staff.

GB2. Restoration activities generating noise above ambient levels within 0.25 mile (1.0 mile for blasting and pile driving) of early season grizzly bear foraging areas (e.g., low elevation riparian areas, avalanche chutes) will not occur from March 1 to July 31 if both of the following conditions exist: (1) the activity will affect the same area for more than one day; and (2) the activity is located within core habitat.

GB3. Restoration activities generating noise above ambient levels within 0.25 mile (1.0 mile for blasting and pile driving) of late season grizzly bear foraging areas (e.g., high elevation berry fields, shrub fields, fruit/nut sources) will not occur from July 15 to November 15 if both of the following conditions exist: (1) the activity will affect the same area for more than one day; and (2) the activity is located within core habitat.

GB4. Restoration activities will not degrade or destroy key grizzly bear foraging habitat (e.g., avalanche chutes, berry/shrub fields, fruit/nut sources) when the activity is located within core habitat.

GB5. Restoration activities will not increase trail or road densities within core habitat.

Marbled murrelet (*Brachyramphus marmoratus*)/marbled murrelet critical habitat

MM1. Restoration activities generating noise above ambient levels within 200 feet (1.0 mile for blasting and pile driving) of suitable nesting habitat will

not occur from April 1 to August 5. Any activities (1.0 mile for blasting and pile driving) occurring within 200 feet of suitable nesting habitat from August 6 to September 15 will only occur between two hours after sunrise and two hours before sunset. Aircraft will maintain at least a 250 ft. distance from nesting habitat between August 6 and September 15, and will only fly near nesting habitat between two hours after sunrise and two hours before sunset.

MM2. Activities within potential nesting habitat for the marbled murrelet will not remove or kill trees with suitable platforms, remove suitable platforms, or reduce the suitability of the stand as nesting habitat.

MM3. Activities within potential murrelet nesting habitat in stands of at least one half the site potential tree height will not inhibit the development of the stand into suitable habitat and will not reduce any buffering qualities of the stand for adjacent suitable habitat.

MM4. Activities which modify stands outside of suitable nesting habitat will not impede development of constituent elements or reduce any buffering qualities of the stand for adjacent suitable habitat.

MM5. Activities that are conducted in the marine environment shall not generate underwater sound pressure levels that exceed 150dB re: $1\mu Pa^2/Hz$ (<190 dB_{peak}) at 10 meters. Examples of these types of actions include impact pile driving and use of underwater or nearshore explosives. Explosives are sometimes used to remove or breach dikes and levees.

Northern spotted owl (*Strix occidentalis caurina*)/Northern spotted owl critical habitat

NSO1. Restoration activities will not result in the removal or degradation of suitable nesting or foraging habitat for northern spotted owls or otherwise impact the suitability of owl habitat.

NSO2. Restoration activities generating noise above ambient levels within 200 feet (1.0 mile for the use of explosives and pile driving) of suitable nesting habitat will not occur from March 1 to July 31

NSOCH1. Activities adjacent to critical habitat may involve minimal modification of current high quality suitable habitat, but will not adversely impact constituent elements.

NSOCH2. Activities may modify younger stands adjacent to critical habitat. However, any modification will not impede development of constituent elements or reduce any buffering qualities of the stand for adjacent suitable habitat.

NSOCH3. Activities may modify spotted owl dispersal habitat. However, any modification will not result in the stand no longer being considered dispersal habitat.

Western snowy plover (*Charadrius alexandrinus nivosus*)

WSP1. Restoration activities will not occur within suitable nesting or foraging habitat from March 15 to September 30.

Threatened Plants

Castilleja levisecta (golden paintbrush)

GP1. Prior to initiating restoration activities in Island County, San Juan County, and Thurston County prairies and coastal grasslands where golden paintbrush is likely to occur, contact USFWS staff: (1) to avoid and minimize impacts to golden paintbrush and its habitat; and, (2) to be not likely to adversely affect or to have no effect on golden paintbrush.

Howellia aquatilis (water howellia)

WH1. Prior to initiating restoration activities in or within 50 meters of ephemeral or vernal pool wetlands ringed by primarily deciduous vegetation in Mason, Pierce, Thurston, Clark, and Spokane counties, contact USFWS staff: (1) to avoid and minimize impacts to water howellia and its habitat, if present; and (2) to be not likely to adversely affect or to have no effect on water howellia.

Lupinus sulphureus ssp. *kincaidii* (Kincaid's lupine)

KL1. Prior to initiating restoration activities in grassland habitat near Boistfort, Lewis County, contact USFWS staff: (1) to avoid and minimize impacts to Kincaid's lupine and its habitat; and (2) to be not likely to adversely affect or to have no effect on Kincaid's lupine.

Sidalcea nelsoniana (Nelson's checker-mallow)

NC1. Prior to initiating restoration activities in wetlands, stream corridors, or wet prairies in Lewis and Cowlitz Counties, Washington, contact USFWS staff: (1) to avoid and minimize impacts to Nelson's checker-mallow and its habitat, if present; and (2) to be not likely to adversely affect or to have no effect on Nelson's checker-mallow.

Silene spaldingii (Spalding's silene/catchfly)

SSP1. Prior to initiating restoration activities in Asotin, Lincoln, Spokane, and Whitman counties, in undisturbed prairie on loessal hills, contact USFWS

staff: (1) to avoid and minimize impact to Spalding's silene and its habitat; and (2) to be not likely to adversely affect or to have no effect on Spalding's silene.

Spiranthes diluvialis (Ute ladies'-tresses)

ULT1. Prior to initiating restoration activities in springs, wet meadows, wetlands, river meanders, floodplains, and riparian areas in open shrub lands and grasslands in eastern Washington, contact USFWS staff: (1) to avoid and minimize impacts to Ute ladies'-tresses and its habitat, if present; and (2) to be not likely to adversely affect or to have no effect on Ute ladies'-tresses.

Candidate Animals

Taylors (Edith's) checkerspot (*Euphydryas editha taylori*)

Prior to initiating restoration activities in the Puget Trough, Straits of Juan de Fuca and the San Juan Islands in maritime prairie, Straits shoreline, post-glacial gravelly outwash and mounded prairie habitat, contact USFWS staff (1) to avoid and minimize impacts to Taylors (Edith's) checkerspot and its habitat; and (2) to be not likely to adversely affect or to have no effect on Taylor (Edith's) checkerspot.

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Appendix A: Projection of an Upper Limit of Anadromous Stream Miles Likely to be Affected by Restoration with and In-Steam Component

To inform this upper limit, the Services and the Corps estimated the annual project load over the next five years using data on restoration projects from past years. We used the Washington State PRISM data base to look at data from three watersheds with high restoration activity between 2000 and 2005. These were the Skagit, Yakima and Nisqually (Table 7). When using the data for the Nisqually for estimating restored project miles, we have to be aware of that major estuarine restoration did not have any stream miles associated with it. Even without these estuarine miles, the percent of stream miles restored in the Nisqually in 2001 is above one percent. In the Yakima and Skagit less than 1 percent of anadromous stream miles were restored with actions involving in-stream components like placing in-stream structures or isolating the work site.

Using the around one percent of anadromous stream miles restored per watershed and year as a basis, the Services and the Corps projected a need of five percent of anadromous stream miles per HUC being affected by restoration actions in the future. This upper limit is based on the considerations that: (1) We expect an increase in restoration actions due to the successful completion of many salmonid recovery plans; (2) the recognized need to speed up replacement of culverts; (3) the fact that the downstream impact from sedimentation is not included in the estimates of restored miles; and (4) the fact that probably not all restoration actions are recorded in PRISM. For their analysis, the Services used this, five percent of the anadromous stream miles, as the upper impact limit for projects with in-stream components or in-stream adverse impacts.

Table 7: Percent Stream Miles Restored

Watershed	Chinook Miles	Percent of Chinook Stream miles restored by Projects with in-steam component in 2001	Steelhead Miles	Percent of Steelhead Stream miles restored by Projects with in-stream component in 2001	Restored Miles in 2001	Maximum of Restored Miles with in-stream component in any one year
Yakima			545	0.6	8.9	3.4
Nisqually	87	1.2	160	0.6	1	1
Skagit	374	0.5	367	0.6	23.1	2

Although there is considerable overlap in habitat for bull trout and Chinook salmon, the geographic extent of this programmatic includes many areas that are not used by bull trout and some areas where bull trout are the only listed salmonid. This necessitated a more refined review of the potential effect of the program on bull trout.

In order to estimate the amount of incidental take of bull trout associated with the proposed action, the FWS conducted a review of the number of Corps restoration projects that have gone through Section 7 consultation since 2000 in areas that support bull trout. According to the records, the Corps submitted an average of about 15 restoration projects

per year in western Washington and between 6 and 8 restoration projects annually in eastern Washington to the FWS for consultation. All of these actions included work that was conducted below the OHWM in key recovery habitat for bull trout. Taking into consideration that there may be an increase in restoration activities in the future to meet the legal requirements for fish passage, the Corps estimates that a maximum of 40 projects could be conducted under this programmatic annually (statewide) without affecting Corps delivery timetables. During this same 8-year time period the Corps submitted about 25 restoration projects annually for areas where bull trout occurrence is extremely rare or they are absent altogether.

Based on the fact that the action area does not include lands that are administered by the USFS or BLM and in-water activities are excluded in bull trout spawning areas in eastern Washington, the FWS anticipates that most (more than 95 percent), if not all, of the 40 restoration activities in key recovery habitat for bull trout will be conducted in areas that are used by bull trout for migration, foraging or overwintering. The FWS expects less than five percent of the projects to occur in juvenile rearing reaches. Using an average project length of 0.44 miles[4] plus a 600-foot maximum allowable mixing zone for turbidity, the FWS estimates that program actions could result in short-term construction-related turbidity over approximately 20 miles of bull trout streams annually (0.5 mile project effects multiplied by 40 projects). Further, the FWS anticipates that no more than 25 percent of the projects in bull trout areas (approximately 10 activities) a year will include isolation of the work area and fish handling.

In summary, using these two analyses to project a likely maximum annual workload for COE permitted restoration projects in Washington state results in the following maximum stream miles. In any part of the action area (anywhere in Washington State, except Forest Service and BLM lands) a maximum of five percent annually of anadromous stream miles per fifth field HUC can be affected by restoration actions involving in-stream components or resulting in in-stream effects. Additionally, in key bull trout recovery habitat projects actions involving in-stream components or resulting in in-stream effects will not exceed a total of total 20 miles annually.

[4] Estimated using data from Washington State's Recreation and Conservation PRISM database. The average project length for 37 restoration activities that are recorded in PRSM in the three watersheds used as examples for this Opinion: Yakima, Nisqually, and Skagit between 2000 and 2005 was 0.44 miles.

Appendix B: Species Descriptions

See Appendix A in: USFWS June 2006. Programmatic Biological Assessment for Habitat Restoration Activities of Western Washington Fish and Wildlife Office, Upper Columbia River Basin Office, Central Washington Ecological Services Office, Mid Columbia River Fishery Resource Office.

Appendix C: In-Water Work Windows for Bull Trout, Salmon and Steelhead

MARINE AND ESTUARINE[1] WATERS

SPECIFIC AREA	**NO INWATER WORK**	ALLOWABLE INWATER WORK
Marine Waters (including Puget Sound) [2]	**2/16 through 7/15**	7/16 through 2/15
Duwamish Waterway	**2/16 through 9/30**	10/1 through 2/15

[1] estuaries may be provided separate windows in the future
[2] marine water timing may change in the future

LAKE UNION AND SHIP CANAL

SPECIFIC AREA	**NO INWATER WORK**	ALLOWABLE INWATER WORK
Ship Canal (from the Chittenden Locks to the east end of the Mountlake cut)	**4/16 through 9/30**	10/1 through 4/15
Lake Union	**4/16 through 9/30**	10/1 through 4/15

LAKE WASHINGTON

SPECIFIC AREA	**NO INWATER WORK**	ALLOWABLE INWATER WORK
South of I-90 within 1 mile Mercer Slough or Cedar River	**1/1-7/15 and 8/1-11/15**	7/16 through 7/31and 11/16 through 12/31
South of I-90 further than 1 mile from Mercer Slough or Cedar River	**1/1 through 7/15**	7/16 through 12/31
Between I-90 and SR 520	**5/1 through 7/15**	7/16 through 4/30

North of SR 520, between SR 520 and a line drawn due west from Arrowhead Point	**3/16 through 7/15**	7/16 through 3/15
North of SR 520, north of a line drawn due west from Arrowhead Point	**2/2 through 7/15 and 8/1 through 11/15**	7/16 through 7/31 and 11/16 through 2/1

SAMMAMISH BASIN

SPECIFIC AREA	**NO INWATER WORK**	ALLOWABLE INWATER WORK
Mainstem Sammamish River	**August 1 - November 15 and 2/2 through 7/15**	7/16 through 7/31 and 11/16 through 2/1
Lake Sammamish - further than ½ mile from Issaquah Creek	**January 1 through July 15**	7/16 through 12/31
Lake Sammamish - within ½ mile of Issaquah Creek	**August 1 - November 15 and January 1 - July 15**	7/16 through 7/31 and 11/16 through 12/31
Issaquah Creek	**August 1 through June 14**	June 15 through July 31
Lower Cedar River	**July 1 through August 31**	Sept. 1 through June 30

COLUMBIA RIVER (general) June 1 to October 31

OTHERS

FWS work windows for bull trout (different from Gold and Fish)
6/20/08

Waterbody	Inwater work window for bull trout
King County	
White River (10.0031)	JUL 16 - AUG 15
West Fork Foss River (07.1573)	JUL 16- AUG 31
Pierce County	
Puyallup River (10.0021) Upstream of PSE Electron Powerhouse Outfall	JUL 16 - AUG 15
White River (10.0031)	JUL 16 - AUG 15
Carbon River (10.0413)	JUL 16 - AUG 15
Huckleberry Creek (10.0253)	JUL 16 - AUG 15
West Fork White River (10.0186)	JUL 16 - AUG 15

Snohomish County	
Deer Creek (05.0173) - Upstream of stream mile 0.5 of Skykomish River	AUG 1 - AUG 31
Whatcom County	
Baker River (04.0435) -Mouth of Blum Creek to Nat'l Park Boundary	JULY 16- AUG 15

Use the WDFW work windows unless we have new information.

Appendix D: Dewatering and Fish Capture Protocol

Work to facilitate habitat restoration may occur in isolation from flowing waters or in flowing water depending on site conditions to minimize impacts to salmonids.

If bull trout or other listed salmonids could be present in the vicinity of the project use the following dichotomous key to determine which dewatering protocol and timing window you need to implement for your project. This key references information within the *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout Volumes I and II* (USFWS 2004a; USFWS 2004b), and the *Draft Recovery Plan for the Columbia River Distinct Population Segment of Bull Trout* (USFWS 2002). http://www.fws.gov/pacific/bulltrout/recovery.html. If you have questions, contact the USFWS.

1. Is the project located within a documented or potential bull trout Local Population Area that is excluded from coverage under this programmatic consultation (see Table 3)?
    a. Yes – Dewatering in a documented or potential bull trout Local Population Area in eastern Washington is not covered under this programmatic consultation. Complete an individual section 7 consultation for the project.
    b. No – go to 2

2. Is the project located within a water body where any listed salmonids are likely to be present? For specific bull trout areas where projects are permitted see Table 4.
    a. Yes – go to 3
    b. No - use "Protocol for Dewatering Outside High Likelihood Listed Fish Areas";

3. Is the stream flow at the time of project construction anticipated to be greater than or equal to 5 cubic feet per second **and** is the dewatered stream length (not including the culvert and plunge pool length, if present) greater than or equal to 33 ft?
    a. No - use "Protocol II for Dewatering Outside High Likelihood Listed Fish Areas" (see below);
    b. Yes - use "Protocol I Dewatering Within High Likelihood Listed Fish Areas"; and consult with a USFWS bull trout biologist staff on appropriate timing window.

Table 3: Bull Trout Spawning and Rearing Areas that are ***Excluded*** from the Programmatic[5] (Listed in order of WRIA number)

Management or Recovery Unit	**Core Area**	**Spawning and Rearing Areas Excluded (no in-water work is permitted in these areas)**
Umatilla-Walla Walla River Basin	**Walla Walla Core Area WRIA 32**	Mill Creek and tributaries
		Wolf Fork above Coates Creek
		N Fk Touchet and tributaries upstream of Wolf Fk confluence
		S Fk Touchet River and tributaries above Griffin Creek
Snake River Basin	**Asotin Creek**	N Fk Asotin Creek including Charley and Cougar Creeks – above confluence with Charley Cr
	Tucannon River **WRIA 35**	Tucannon River from confluence with Little Tucannon Upper Tucannon River and tributaries above confluence with Hixon Creek Cummings Creek
Middle Columbia River Basin	**Yakima River Core Area**	**WRIA 37** N and MFk Ahtanum Creek - above the confluence of S Fk S Fk Ahtanum Creek – above confluence with N Fk Ahtanum
		WRIA 38 Rattlesnake Creek – upstream of confluence with Naches River
		WRIA 39 Taneum Creek – upstream of Taneum Campground Upper Yakima – upstream of Lake Easton Dam Cle Elum River – upstream of confluence with Yakima River N Fk Teanaway – upstream of confluence with Yakima River
Upper Columbia River Basin	**Wenatchee River Core Area WRIA 45**	Upper Wenatchee and tributaries above confluence with the Chiwawa, including Nason Cr, Little Wenatchee, White and the Chiwawa Rivers
		Chiwaukum Creek and Icicle Creek– upstream from confluence with the Wenatchee River Ingalls Creek- upstream of confluence with Peshastin Creek
	Entiat River Core Area WRIA 46	Entiat River – above confluence with the Mad River
		Mad River – above confluence with Entiat River
	Methow River Core Area WRIA 48	Upper Methow tributaries - Lost River, Early Winters Cr, W Fk Methow, Goat Cr, and Wolf Cr Chewack River – upstream of Twentymile Cr
		Twisp River and tributaries above confluence of, and including, Little Bridge Creek
		Gold Cr – upstream of confluence with Methow River
Northeast Washington	**Pend Oreille River WRIA 62**	Le Clerc Creek – upstream of mouth

[5] Spawning and rearing areas on lands administered by the U.S. Forest Service or Bureau of Land Management are not listed because these lands are not included in this Programmatic

Table 4: List of streams and marine areas that are important for bull trout recovery and are included in the PBA

Management Unit	Bull Trout Areas
Olympic Peninsula - Marine	Hood Canal and independent tributaries Strait of Juan de Fuca and independent tributaries (includes Bell, Morse, Ennis, Siebert Creeks) Pacific Ocean and independent coastal tributaries (includes Goodman, Mosquito, Cedar, Steamboat, Kalaloch and Joe Creeks, Raft, Moclips and Copalis Rivers) Lower Chehalis River/Grays Harbor and independent Tributaries (includes Humptulips, Wishkah, Wynoochee and Satsop Rivers)
Olympic Peninsula - Freshwater	**Dungeness River** – mouth to RM 10 **Skokomish River** – mouth to head of Cushman Reservoir **Hoh River** – mouth to headwaters **Queets River** – mouth to headwaters **Quinault River** - mouth to headwaters
Puget Sound - Marine	All marine shorelines including North Puget Sound, Main Basin, Whidbey Basin, and South Puget Sound
Puget Sound - Freshwater	Samish River, Whatcom Creek, Squalicum Creek, Duwamish and lower Green River, and Lower Nisqually River including the Nisqually River estuary and McAllister Creek (FMO areas outside of core areas)
	Lake Washington including the following: lower Cedar River; Sammamish River; Lakes Washington, Sammamish, and Union; and Ship Canal
	Nooksack River – mouth to National Forest boundary for north and south fork **Skagit River** – mouth to National Forest boundary **Stillaguamish River** – mouth to headwaters of N Fork; Deer Creek – mouth to National Forest boundary; S Fork and Canyon Cr – mouth to National Forest boundary **Snohomish/Skykomish** – mouth to confluence of Skykomish and Snoqualmie Rivers; Pilchuck River; Snoqualmie River to falls; Tolt River; Skykomish River – mouth to National Forest boundary, including Sultan River, Woods Creek and Wallace River; S Fk Skykomish to National Forest boundary **Puyallup River** – mouth, including Mowich River, to National Park boundary; **Carbon River** – mouth to National Forest boundary; **White River** – mouth to National Forest boundary

Management Unit	Bull Trout Areas
Lower Columbia	**Lewis River** – mouth to RM 75 (Upper Falls), including Swift, Yale, and Mervin Reservoirs **Klickitat River** – mouth to confluence of W FK Klickitat
	Mainstems of the Columbia, Snake, Walla Walla, Pend Oreille, and Grande Ronde Rivers
Middle Columbia River Basin	**Ahtanum Creek** – mouth to confluence of N and S Forks **Naches River** – mouth to confluence of Little Naches and Bumping River **Tieton River** – mouth to Rimrock Lake **Yakima River** – mouth to Easton (RM 203) and Teanaway River
Upper Columbia River Basin	**Wenatchee River** – mouth to confluence of the Chiwawa; **Peshastin Cr** – mouth to confluence of Ingalls Cr; **Chewack River** – confluence with Wenatchee to RM 20; **Beaver Cr** – mouth to Blue Buck Cr **Entiat River** – mouth to confluence with Mad River **Methow River** – mouth to confluence of Lost River
Northeast Washington Pend Oreille River	**Pend Oreille River**; **Tacoma Cr** - mouth to Little Tacoma; **Small Creek** – mouth to forks; **Sullivan Creek** to and including Sullivan Lake
Walla Walla River Basin	**Touchet River** – mouth to forks; **S Fk Touchet River** – to confluence of Griffin Cr **N Fk Touchet** to Wolf Fork; **Wolf Fork** to confluence of Coates Cr **Mill Creek** and tributaries
Snake River Basin	Mainstem **Snake and Grande Ronde Rivers**; **Asotin Creek** – mouth to confluence of N Fk Asotin and Charley Cr; **Tucannon River** – mouth to confluence of Hixon Cr

Protocol I - Dewatering Within High Likelihood Listed Fish Areas

A. Fish Capture – General Guidelines

1. Fish Capture Methods
   a. Minnow traps. Optional. Traps may be left in place prior to dewatering and may be used in conjunction with seining. Once dewatering starts, minnow traps should only be used if there is someone present to check the traps every few hours, and remove the traps once the water level becomes too low.
   b. Seining. Required. Use seine with mesh of a size to ensure entrapment of the residing ESA-listed fish and age classes.
   c. Sanctuary dip nets. Required. Use in conjunction with other methods as area is dewatered.
   d. Electrofishing. Optional. Use electrofishing only after other means of fish capture have been exhausted or where other means of fish capture are not be

feasible. Applicants shall adhere to NMFS Backpack Electrofishing Guidelines (NMFS 2000).

2. Fish capture operations will be conducted by or under the supervision of a fishery biologist experienced in such efforts and all staff working with the capture operation must have the necessary knowledge, skills, and abilities to ensure the safe handling of all ESA-listed fish.

3. The applicant must obtain any other Federal, State and local permits and authorizations necessary for the conduct of fish capture activities.

4. A description of any capture and release effort will be included in a post-project report, including the name and address of the supervisory fish biologist, methods used to isolate the work area and minimize disturbances to ESA-listed species, stream conditions before and following placement and removal of barriers; the means of fish removal; the number and size of fish removed by species and age class; condition upon release of all fish handled; and any incidence of observed injury or mortality.

5. Storage and Release. ESA-listed fish must be handled with extreme care and kept in water at all times during transfer procedures. The transfer of ESA-listed fish must be conducted using a sanctuary net that holds water during transfer, whenever necessary to prevent the added stress of an out-of-water transfer. A healthy environment for non-ESA listed fish shall be provided by large buckets (five gallon minimum to prevent overcrowding) and minimal handling of fish. The water temperature in the transfer buckets shall not exceed the temperature of cold pool water in the subject stream. Retain fish the minimum time possible to ensure that stress is minimized, temperatures do not rise, and dissolved oxygen remains suitable. Release fish as near as possible to the isolated reach in a pool or area that provides cover and flow refuge.

B. Dewater Instream Work Area and Fish Capture

Fish screen. Except for gravity diversions that have gradual and small outfall drops directly into water, all water intake structures must have a fish screen installed, operated, and maintained in accordance with NMFS Guidelines (NMFS 1997; Chapter 11 in NMFS 2008).

The sequence for stream flow diversion will be:
Note: this sequence will take one 24-hour period prior to construction to complete (of which 12 hours are for staged dewatering with 6 hours overnight). We suggest you start in the morning the day before project construction is scheduled and leave the reach dewatered overnight according to instruction below.

1. Install flow conveyance devices (pumps, discharge lines, gravity drain lines, conduits, and channels), but do not divert flow.
2. Install upstream barrier. Allow water to flow over upstream barrier.

3. Install block net at upstream end of work area. Block nets will be checked every 4 hours, 24 hours a day. If any fish are impinged or killed on the nets they will be checked hourly.
4. Reduce flow over upstream barrier by one-third for a minimum of 6 hours.
5. Inspect as discharge is diminishing and in dewatered areas for stranded and trapped fish and remove them with sanctuary dip nets.
6. Reduce flow over upstream barrier by an additional one-third for a minimum of 6 hours.
7. Again, inspect dewatered areas for stranded and trapped fish and remove them with sanctuary dip nets.
8. Leave the project area in a stable, low flow (one third of flow) condition, overnight, allowing fish to leave the area volitionally.
9. In the morning, remove any remaining fish from the area to be dewatered using seines and/or hand held sanctuary dip-nets.
10. Divert upstream flow completely.
11. Install downstream barrier if necessary (only in low gradient, backwatered reaches).
12. If water remains within the work area; seine, dip net, and lastly electrofish (if using this technique), the project area until catch rates have reached no fish for 3 consecutive passes. Move rocks as needed to flush fish and effectively electrofish the work area.
13. If needed, pump water out of isolated pools within the project area to a temporary storage and treatment site or into upland areas and filter through vegetation prior to reentering the stream channel. Continue to seine, dip net and electrofish while pumping.
14. If fish continue to be captured, shut pump off before average water depths reach one foot. Continue to seine, dip net and electrofish until no fish are caught for 3 consecutive passes.
15. Pump dry and check substrate for remaining fish.
16. Continue to pump water from the project area as needed for the duration of the project.

The diversion structure is typically a temporary dam built just upstream of the project site with sand bags that are filled with clean gravel or stream/floodplain rock and covered with plastic sheeting. A portable bladder dam or other non-erosive diversion technologies may be used to contain stream flow. Mining of stream or floodplain rock can be used for diversion dam construction if it does not result in significant additional floodplain or stream disturbance. Often gravel has to be moved to key in logs in which case it makes sense to use this gravel for the diversion structure.

The temporary bypass system must consist of non-erosive techniques, such as a pipe or a plastic-lined channel, both of which must be sized large enough to accommodate the predicted peak flow rate during construction. In cases of channel rerouting, water can be diverted to one side of the existing channel.

Dissipate flow at the outfall of the bypass system to diffuse erosive energy of the flow. Place the outflow in an area that minimizes or prevents damage to riparian vegetation. If the diversion inlet is a gravity diversion and is not screened to allow for downstream passage of fish, place diversion outlet in a location that facilitates gradual and safe reentry of fish into the stream channel.

C. Rewater Instream Work Area

Remove stream diversion and restore stream flow. Heavy machinery operating from the bank may be used to aid in removal of diversion structures. Slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden increase in stream turbidity. Look downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

All stream diversion devices, equipment, pipe, and conduits will be removed and disturbed soil and vegetation will be restored after the diversion is no longer needed.

Protocol II - Dewatering Outside High Likelihood Listed Fish Areas

If bull trout or other listed salmonids are captured at any time during the dewatering process, immediately notify a USFWS bull trout biologist or NMFS biologist and obtain guidance to either continue to dewater and remove fish or stop activities and re-water the project site.

Normal guidance:

1. If you encounter listed fish at or prior to step 3 switch to Protocol I
2. If you encounter listed fish after step 3, continue to dewater and remove fish, paying close attention to presence of additional listed salmonids.

A. Fish Capture – General Guidelines

1. Fish Capture Methods
    a. Minnow traps. Optional. Traps may be left in place prior to dewatering and may be used in conjunction with seining. Once dewatering starts, minnow traps should only be used if there is someone present to check the traps every few hours, and remove the traps once the water level becomes too low.
    b. Seining. Required. Use seine with mesh of such a size to ensure entrapment of the residing ESA-listed fish and age classes.
    c. Sanctuary dip nets. Required. Use in conjunction with other methods as area is dewatered.
    d. Electrofishing. Optional. Use electrofishing only after other means of fish capture have been exhausted or where other means of fish capture are not be feasible. Applicants shall adhere to NMFS Backpack Electrofishing Guidelines.

2. Fish capture operations will be conducted by or under the supervision of a fishery biologist experienced in such efforts and all staff working with the seining operation must have the necessary knowledge, skills, and abilities to ensure the safe handling of all ESA-listed fish.

3. The applicant must obtain any other Federal, State and local permits and authorizations necessary for the conduct of fish capture activities.

4. A description of any seine and release effort will be included in a post-project report, including the name and address of the supervisory fish biologist, methods used to isolate the work area and minimize disturbances to ESA-listed species, stream conditions before and following placement and removal of barriers; the means of fish removal; the number and size of fish removed by species; conditions upon release of all fish handled; and any incidence of observed injury or mortality.

5. Storage and Release. Fish must be handled with extreme care and kept in water to the maximum extent possible during transfer procedures. A healthy environment for the stressed fish shall be provided by large buckets (five gallon minimum to prevent overcrowding) and minimal handling of fish. The temperature of the water shall not exceed the temperature in large deep holding pools of the subject system. The transfer of any ESA-listed fish must be conducted using a sanctuary net that holds water during transfer, to prevent the added stress of an out-of-water transfer. Retain fish the minimum time possible to ensure that stress is minimized, temperatures do not rise, and dissolved oxygen remains suitable. Release fish as near as possible to the isolated reach in a pool or area that provides cover and flow refuge.

B. Dewater Instream Work Area and Fish Capture

Fish screen. Except for gravity diversions that have gradual and small outfall drops directly into water, all water intake structures must have a fish screen installed, operated, and maintained in accordance with the NMFS Guidelines (NMFS 1997; Chapter 11 in NMFS 2008).

The sequence for stream flow diversion would be as follows:

1. Install flow conveyance devices (pumps, discharge lines, gravity drain lines, conduits, and channels), but do not divert flow.
2. Install block net at upstream end or work area.
3. Seine and dip net through the entire project area in a downstream direction, starting at the upstream end; thereby moving fish out of the project area. Then, if necessary electrofish.
4. Install upstream barrier and divert upstream flow completely.
5. Capture any remaining fish using hand held dip-nets.

6. Install downstream barrier if necessary (only in low gradient backwatered reaches).
7. If water remains within the work area; seine and dip net, if necessary electrofish the project area until catch rates have reached no fish for 3 consecutive passes.
8. Pump water out of isolated pools within the project area to a temporary storage and treatment site or into upland areas and filter through vegetation prior to re-entering the stream channel. Continue to seine, dip net, or electrofish while pumping.
9. If fish continue to be captured, shut pump off before average water depths reach one foot. Continue to seine, dip net, or electrofish until no fish are caught for 3 consecutive passes.
10. Pump dry and check substrate for remaining fish and remove them.
11. Continue to pump water from the project area as needed for the duration of the project.

The diversion structure is typically a temporary dam built just upstream of the project site with sand bags that are filled with clean gravel or stream/floodplain rock and covered with plastic sheeting. A portable bladder dam or other non-erosive diversion technologies may be used to contain stream flow. Mining of stream or floodplain rock can be used for diversion dam construction if it does not result in significant additional floodplain or stream disturbance. Often gravel has to be moved to key in logs in which case it makes sense to use this gravel for the diversion structure.

The temporary bypass system must consist of non-erosive techniques, such as a pipe or a plastic-lined channel, both of which must be sized large enough to accommodate the predicted peak flow rate during construction. In cases of channel rerouting, water can be diverted to one side of the existing channel.

Dissipate flow at the outfall of the bypass system to diffuse erosive energy of the flow. Place the outflow in an area that minimizes or prevents damage to riparian vegetation. If the diversion inlet is a gravity diversion and is not screened to allow for downstream passage of fish, place diversion outlet in a location that facilitates gradual and safe reentry of fish into the stream channel.

C. Rewater Instream Work Area

Remove stream diversion and restore stream flow. Heavy machinery operating from the bank may be used to aid in removal of diversion structures. Slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden increase in stream turbidity. Look downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

All stream diversion devices, equipment, pipe, and conduits will be removed and disturbed soil and vegetation will be restored after the diversion is no longer needed.

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Appendix E: Anadromous Stream Miles per 5th Field Watershed

				Stream Miles used by each Species						
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1701021501	Priest River / Gold Creek	NE WA	62	2.71						**2.71**
1701021502	Priest River / Sullivan-Granite Creek	NE WA	62	31.17						**31.17**
1701021503	Priest River / Kallispell Creek	NE WA	62	3.47						**3.47**
1701021504	Upper West Fork Priest River	NE WA	62	10.70						**10.70**
1701021601	Upper Pend Oreille River	NE WA	62	141.24						**141.24**
1701021602	Middle Pend Oreille River	NE WA	62	92.04						**92.04**
1701021603	Lower Pend Oreille River	NE WA	62	120.15						**120.15**
1702000503	Lower Foster Creek	Central Columbia Plateau	50					0.80	0.80	**0.80**
1702000504	Maintstem Columbia	Central Columbia Plateau	50	4.08				0.11	0.11	**4.08**
1702000505	Maintstem Columbia	Central Columbia Plateau	50	36.71				0.34	1.70	**36.71**
1702000601	Upper Okanogan River	Upper Columbia	49						38.17	**38.17**
1702000602	Okanogan River / Bonaparte Creek	Upper Columbia	49						20.55	**20.55**
1702000603	Salmon Creek	Upper Columbia	49	4.79					4.01	**4.79**
1702000604	Okanogan River / Omak Creek	Upper Columbia	49						50.14	**50.14**
1702000605	Lower Okanogan River	Upper Columbia	49						27.20	**27.20**
1702000704	Lower Silkameen River	Upper Columbia	49						3.78	**3.78**
1702000801	Methow / Lost River	Upper Columbia	48	31.11				7.78	7.36	**31.11**
1702000802	Upper Methow River	Upper Columbia	48	43.43				21.43	20.77	**43.43**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1702000803	Upper Chewuch River	Upper Columbia	48	24.11				19.01	19.69	**24.11**
1702000804	Lower Chewuch River	Upper Columbia	48	49.07				29.05	30.28	**49.07**
1702000805	Twisp River	Upper Columbia	48	64.63				32.71	39.99	**64.63**
1702000806	Middle Methow River	Upper Columbia	48	86.42				49.82	60.74	**86.42**
1702000807	Lower Methow River	Upper Columbia	48	56.98				36.75	49.28	**56.98**
1702001001	Entiat River	Upper Columbia	46	64.41				46.29	60.32	**64.41**
1702001002	Columbia River	Upper Columbia	40	53.26				4.14	4.75	**53.26**
1702001003	Columbia River	Upper Columbia	40	32.22				0.25	29.61	**32.22**
1702001004	Columbia River	Upper Columbia	40	28.75					9.25	**28.75**
1702001101	Wenatchee / White River	Upper Columbia	45	54.11				34.30	34.86	**54.11**
1702001102	Chiwawa River	Upper Columbia	45	51.93				51.38	42.95	**51.93**
1702001103	Nason / Tumwater Creek	Upper Columbia	45	61.22				48.76	63.94	**63.94**
1702001104	Icicle / Tumwater Creek	Upper Columbia	45	59.58				13.11	23.41	**59.58**
1702001105	Lower Wenatchee River	Upper Columbia	45	41.64				33.11	63.55	**63.55**
1702001604	Columbia River at Hanson Creek	Mid Columbia	36	34.61					0.09	**34.61**
1702001605	Columbia River at Priest Rapids	Mid Columbia	36	31.23						**31.23**
1702001606	Columbia River at Zintel Canyon	Mid Columbia	36	31.67			0.01	0.01	0.85	**31.67**
1703000101	Upper Yakima River	Mid Columbia	39	161.88					48.12	**161.88**
1703000102	Teanaway River	Mid Columbia	39	89.50					77.74	**89.50**
1703000103	Middle Upper Yakima	Mid Columbia	39	229.35					116.85	**229.35**
1703000104	Umtanum / Wenas Creek	Mid Columbia	39	53.01					41.97	**53.01**
1703000201	Little Naches River	Mid Columbia	39	104.17					87.14	**104.17**
1703000202	Naches River / Rattlesnake Creek	Mid Columbia	39	82.14					84.03	**84.03**
1703000203	Naches / Tieton River	Mid Columbia	39	166.02					89.36	**166.02**
1703000301	Ahtanum Creek	Mid Columbia	37	81.77					90.28	**90.28**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1703000302	Lower Yakima River	Mid Columbia	37	11.35					14.72	**14.72**
1703000303	Upper Toppenish Creek	Mid Columbia	37						111.31	**111.31**
1703000304	Yakima River	Mid Columbia	37	34.17					122.09	**122.09**
1703000305	Satus Creek	Mid Columbia	37						112.28	**112.28**
1703000306	Yakima River / Spring Creek	Mid Columbia	37	82.43					95.52	**95.52**
1703000307	Lower Yakima/Cold Creek	Mid Columbia	37	22.91					22.90	**22.91**
1706010301	Lower Snake River / Rogersburg	Lower Snake	35	2.87			7.34	7.34		**7.34**
1706010302	Asotin Creek	Lower Snake	35	82.14						**82.14**
1706010303	Snake River / Captain John Creek	Lower Snake	35	14.21			29.33	29.21		**29.33**
1706010603	Wenaha River	Grande Ronde	35	31.62				8.33		**31.62**
1706010606	Lower Joseph Creek	Grande Ronde	35						9.26	**9.26**
1706010607	Lower Grande Ronde River	Grande Ronde	35	48.69			37.56	39.21		**48.69**
1706010701	Alpowa Creek	Grande Ronde	35						21.79	**21.79**
1706010702	Lower Snake / Steptoe Canyon	Lower Snake	35	31.57			31.57	31.52		**31.57**
1706010703	Deadman Creek	Lower Snake	35						45.59	**45.59**
1706010704	Flat Creek	Lower Snake	35						18.86	**18.86**
1706010705	Pataha Creek	Lower Snake	35	10.79						**10.79**
1706010706	Upper Tucannon River	Lower Snake	35	80.97			5.85	47.45		**80.97**
1706010707	Lower Tucannon River	Lower Snake	35	11.78			11.77	11.77		**11.78**
1706010708	Penawawa Creek	Lower Snake	35	47.68			47.61	47.61		**47.68**
1706010808	Lower Palouse River	Lower Snake	35	7.75			7.64	0.21		**7.75**
1706011001	Walker Creek	Lower Snake	33	29.19			29.15	29.15		**29.19**
1706011003	McCoy Creek	Lower Snake	33	19.32			19.34	19.34		**19.34**
1706011004	Mouth of Snake River	Lower Snake	33	11.58			11.68	11.93		**11.93**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1707010101	Columbia R / Upper Lake Wallula	Mid Columbia	32	9.13						**9.13**
1707010102	Columbia R / Lower Lake Wallula	Mid Columbia	32	11.24					0.63	**11.24**
1707010105	Columbia R / Glade Creek	Mid Columbia	31	0.82						**0.82**
1707010106	Columbia R / Upper Lake Umatilla	Mid Columbia	31	2.66						**2.66**
1707010109	Columbia R / Middle Lake Umatilla	Mid Columbia	31	9.42					5.42	**9.42**
1707010110	Columbia R / Alder Creek	Mid Columbia	31						11.70	**11.70**
1707010111	Columbia R / Pine Creek	Mid Columbia	31						7.13	**7.13**
1707010112	Columbia R / Wood Gulch	Mid Columbia	31						10.90	**10.90**
1707010113	Columbia R / Rock Creek	Mid Columbia	31						60.31	**60.31**
1707010114	Columbia R / Lower Lake Umatilla	Mid Columbia	31	12.08					5.01	**12.08**
1707010202	Mill Creek	Mid Columbia	32	37.75					45.58	**45.58**
1707010203	Upper Touchet River	Mid Columbia	32	90.22					119.02	**119.02**
1707010204	Middle Touchet River	Mid Columbia	32	39.58					50.73	**50.73**
1707010205	Middle Touchet River	Mid Columbia	32	0.25					0.25	**0.25**
1707010207	Lower Touchet River	Mid Columbia	32	40.94					40.89	**40.94**
1707010208	Cottonwood Creek	Mid Columbia	32	10.55					40.71	**40.71**
1707010209	Pine Creek	Mid Columbia	32	0.25					5.51	**5.51**
1707010210	Dry Creek	Mid Columbia	32	13.84					43.70	**43.70**
1707010211	Lower Walla Walla River	Mid Columbia	32	37.01					50.63	**50.63**
1707010501	Mid Columbia/Hood River	Mid Columbia	30	8.21						**8.21**
1707010504	Mid Columbia / Mill Creek	Mid Columbia	30	13.51	0.15				0.22	**13.51**
1707010509	White Salmon River	Mid Columbia	29	21.91	13.11	2.36			34.03	**34.03**
1707010510	Little White Salmon River	Mid Columbia	29	1.14	3.52	0.27			4.28	**4.28**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1707010511	Wind River	Mid Columbia	29	5.57	1.32	3.29			1.49	**5.57**
1707010512	Mid Columbia / Grays Creek	Mid Columbia	29	9.47	75.82	51.26			126.82	**126.82**
1707010513	Mid Columbia / Eagle Creek	Mid Columbia	29	4.98	3.71	0.91			7.30	**7.30**
1707010601	Upper Klickitat River	Mid Columbia	30	156.29					74.50	**156.29**
1707010602	Middle Klickitat River	Mid Columbia	30	158.77					58.10	**158.77**
1707010603	Little Klickitat River	Mid Columbia	30	56.78					40.95	**56.78**
1707010604	Lower Klickitat River	Mid Columbia	30	127.32					64.18	**127.32**
1708000106	Washougal River	Lower Columbia	28	4.66	78.51	29.66			129.06	**129.06**
1708000107	Columbia Gorge Tributaries	Lower Columbia	28	24.76	46.52	3.43			36.93	**46.52**
1708000109	Salmon Creek	Lower Columbia	28	14.31						**14.31**
1708000201	Upper Lewis River	Lower Columbia	27	15.59						**15.59**
1708000202	Muddy River	Lower Columbia	27	13.29						**13.29**
1708000203	Swift Reservoir	Lower Columbia	27	23.26						**23.26**
1708000204	Yale Reservoir	Lower Columbia	27	17.14						**17.14**
1708000205	East Fork Lewis River	Lower Columbia	27	0.20	68.12	22.18			145.34	**145.34**
1708000206	Lower Lewis River	Lower Columbia	27	34.14	78.72	45.40			88.84	**88.84**
1708000301	Kalama River	Lower Columbia	27	11.51	26.91	54.67			127.54	**127.54**
1708000304	Germany Creek	Lower Columbia			89.82	48.16				**89.82**
1708000305	Skamokawa Creek	Lower Columbia			108.04	37.62				**108.04**
1708000307	Columbia River	Lower Columbia			8.77	3.15			2.58	**8.77**
1708000401	Headwaters of Cowlitz River	Lower Columbia	26		8.29	7.39			7.75	**8.29**
1708000402	Upper Cowlitz River	Lower Columbia	26		37.65	24.21			34.92	**37.65**
1708000403	Cowlitz Valley Frontal	Lower Columbia	26		71.16	36.15			59.16	**71.16**
1708000404	Upper Cispus River	Lower Columbia	26		21.17	20.63			21.83	**21.83**
1708000405	Lower Cispus River	Lower Columbia	26		45.92	26.33			44.76	**45.92**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1708000501	Tilton River	Lower Columbia	26		65.54	28.70			66.44	**66.44**
1708000502	Riffe Reservoir	Lower Columbia	26		66.66	31.01			43.74	**66.66**
1708000503	Jackson Prairie	Lower Columbia	26		145.20	67.62			134.30	**145.20**
1708000504	Toutle River	Lower Columbia	26		28.01	2.32			49.28	**49.28**
1708000505	Green River	Lower Columbia	26		69.41	29.71			71.48	**71.48**
1708000506	South Fork Toutle River	Lower Columbia	26		90.76	34.92			79.33	**90.76**
1708000507	East Willapa	Lower Columbia	26		212.55	114.87			209.89	**212.55**
1708000508	Coweeman	Lower Columbia	26		129.10	61.25			121.73	**129.10**
1708000603	Grays Bay / Elokoman	Lower Columbia			110.68	45.38				**110.68**
1708000604	Crooked Creek	Lower Columbia			51.71	16.39				**51.71**
1708000605	Columbia River	Lower Columbia			27.17	15.63				**27.17**
1709001204	Salmon Creek	Lower Columbia			127.10	40.76			131.79	**131.79**
1709001205	Columbia River	Lower Columbia			2.28	0.76			1.94	**2.28**
1710010107	Goodman / Mosquito Creek	Olympic Peninsula	20	11.04						**11.04**
1710010108	Hoh River	Olympic Peninsula	20	120.03						**120.03**
1710010201	Queets River	Olympic Peninsula	21	103.92						**103.92**
1710010202	Clearwater River	Olympic Peninsula	21	35.24						**35.24**
1710010203	Lower Quinault/Raft River	Olympic Peninsula	21	42.82						**42.82**
1710010204	Upper Quinault River	Olympic Peninsula	21	69.82						**69.82**
1710010206	Moclips / Copalis River	Olympic Peninsula	21	58.17						**58.17**
1710010302	Newaukum River	Lower Columbia							0.10	**0.10**
1710010303	Skookumchuck River	Puget Sound				11.18			0.49	**11.18**
1710010304	Upper Chehalis River	SW WA Coastal	23	19.21						**19.21**
1710010401	Cloquallum River	SW WA	22	20.54						**20.54**
1710010402	Lower Chehalis River	SW WA Coastal	22	59.48						**59.48**
1710010403	Wynootchee River	SW WA Coastal	22	65.88						**65.88**
1710010404	Wishkah River	SW WA Coastal	22	54.99						**54.99**
1710010501	Humptullips River	SW WA Coastal	22	120.48						**120.48**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1710010601	Naselle River	Lower Columbia				0.33				**0.33**
1711000101	Upper Chilliwack River	Puget Sound	1	15.86						**15.86**
1711000102	Middle Chilliwack River	Puget Sound	1	5.52						**5.52**
1711000103	Lower Chilliwack River	Puget Sound	1	16.40						**16.40**
1711000201	Bellingham Bay	Puget Sound	1			40.91			18.75	**40.91**
1711000202	Samish River	Puget Sound	3	9.88		18.95			59.45	**59.45**
1711000204	Birch Bay	Puget Sound	1			25.66			37.24	**37.24**
1711000401	Upper North Fork Nooksack River	Puget Sound	1	39.66		14.36			33.73	**39.66**
1711000402	Middle Fork Nooksack River	Puget Sound	1	34.71		47.33			18.04	**47.33**
1711000403	South Fork Nooksack River	Puget Sound	1	77.53		72.33			78.09	**78.09**
1711000404	Lower North Fork Nooksack River	Puget Sound	1	52.86		100.37			81.42	**100.37**
1711000405	Nooksack River	Puget Sound	1	36.89		2.72			113.25	**113.25**
1711000501	Ross Lake	Puget Sound	4	55.08						**55.08**
1711000502	Lightning Creek	Puget Sound	4	22.49						**22.49**
1711000503	Ruby Creek	Puget Sound	4	30.52						**30.52**
1711000504	Skagit River / Gorge Lake	Puget Sound	4	50.32		22.47			7.46	**50.32**
1711000505	Skagit River / Diubsud Creek	Puget Sound	4	33.05		21.57			30.91	**33.05**
1711000506	Cascade River	Puget Sound	4	39.49		35.20			35.96	**39.49**
1711000507	Skagit River/Illabot Creek	Puget Sound	4	46.38		22.49			49.74	**49.74**
1711000508	Baker River	Puget Sound	4	45.81		27.28			41.61	**45.81**
1711000601	Upper Sauk River	Puget Sound	4	71.01		7.65			48.78	**71.01**
1711000602	Upper Suiattle River	Puget Sound	4	40.07		35.75			12.21	**40.07**
1711000603	Lower Suiattle River	Puget Sound	4	43.68		46.96			38.13	**46.96**
1711000604	Lower Sauk River	Puget Sound	4	48.27		87.22			57.48	**87.22**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1711000701	Middle Skagit River / Phinney Creek	Puget Sound	3	118.37		64.54			128.88	**128.88**
1711000702	Middle Skagit River / Nookachamps Creek	Puget Sound	3	65.36		54.33			81.65	**81.65**
1711000801	North Fork Stillaguamish River	Puget Sound	5	96.00		34.29			136.31	**136.31**
1711000802	South Fork Stillaguamish River	Puget Sound	5	106.71		40.06			138.50	**138.50**
1711000803	Lower Stillaguamish River	Puget Sound	5	59.88		26.93			76.04	**76.04**
1711000901	Tye and Beckler River	Puget Sound	7	31.02		40.70			33.07	**40.70**
1711000902	Skykomish River Forks	Puget Sound	7	61.92		33.96			65.52	**65.52**
1711000903	Skykomish River / Wallace River	Puget Sound	7	29.32		9.78			46.57	**46.57**
1711000904	Sultan River	Puget Sound	7	9.81		39.94			10.20	**39.94**
1711000905	Skykomish River / Woods Creek	Puget Sound	7	39.14		35.20			60.97	**60.97**
1711001003	Middle Fork Snoqualmie River	Puget Sound	7	16.77		54.30			65.47	**65.47**
1711001004	Lower Snoqualmie River	Puget Sound	7	44.97		37.63			83.28	**83.28**
1711001101	Pilchuck River	Puget Sound	7	45.14		61.27			67.18	**67.18**
1711001102	Snohomish River	Puget Sound	7	46.91		37.18			65.22	**65.22**
1711001201	Cedar River	Puget Sound	8	69.93		36.61			42.62	**69.93**
1711001202	Lake Sammamish	Puget Sound	8	7.78		64.93			34.53	**64.93**
1711001203	Lake Washington	Puget Sound	8	0.11		64.08			43.08	**64.08**
1711001204	Sammamish River	Puget Sound	8	13.35		12.04			48.29	**48.29**
1711001301	Upper Green River	Puget Sound	9			26.46			26.22	**26.46**
1711001302	Middle Green River	Puget Sound	9	11.85		103.54			12.12	**103.54**
1711001303	Lower Green River	Puget Sound	9	44.45		44.81			108.24	**108.24**
1711001401	Upper White River	Puget Sound	10	109.51		62.22			48.05	**109.51**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1711001402	Lower White River	Puget Sound	10	56.37		50.06			74.57	**74.57**
1711001403	Carbon River	Puget Sound	10	54.26		47.74			55.35	**55.35**
1711001404	Upper Puyallup River	Puget Sound	10	81.52		29.97			45.68	**81.52**
1711001405	Lower Puyallup River	Puget Sound	10	17.91		43.86			46.86	**46.86**
1711001502	Mashel / Ohop River	Puget Sound	11	10.04		42.66			66.27	**66.27**
1711001503	Lower Nisqually River	Puget Sound	11	27.83		24.68			93.60	**93.60**
1711001601	Prairie Creek	Puget Sound	13			27.20			36.60	**36.60**
1711001602	Deshutes River	Puget Sound	13			56.98			26.72	**56.98**
1711001701	Skokomish River	Puget Sound	16	117.15		1.12			86.41	**117.15**
1711001802	Lower West Hood Canal Frontal	Puget Sound	16			3.83			5.38	**5.38**
1711001803	Hamma Hamma River	Puget Sound	16	8.37		8.06			4.40	**8.37**
1711001804	Duckabush River	Puget Sound	16	2.12		13.55			9.37	**13.55**
1711001805	Dosewallips River	Puget Sound	16	5.62		2.83			14.61	**14.61**
1711001806	Big Quilcene River	Puget Sound	17	0.73		0.76			6.91	**6.91**
1711001807	Upper Hood Canal Frontal	Puget Sound	17	0.04		28.16			34.98	**34.98**
1711001808	Hood Canal	Puget Sound	15			11.22			76.11	**76.11**
1711001900	Kennedy / Goldsborough	Puget Sound	14			27.95			116.32	**116.32**
1711001901	Kitsap Peninsula / Puget Sound	Puget Sound	15			9.35			80.65	**80.65**
1711001902	Puget Sound / Prairie Creek	Puget Sound	13			0.87			20.63	**20.63**
1711001903	North Puget Sound / Tulalip Creek	Puget Sound	7			22.31				**22.31**
1711001904	Puget Sound / East Passage	Puget Sound	8			0.81			3.07	**3.07**
1711001906	Chambers Creek	Puget Sound	12			24.63			16.75	**24.63**
1711001908	Port Ludlow / Chimakum Creek	Puget Sound	17			3.65			21.18	**21.18**

Stream Miles used by each Species										
HUC5	**Watershed Name**	**Geographic Area**	**WRIA**	**Bull Trout**	**Coho**	**Chinook**	**FallCH**	**SpringCH**	**Steel-head**	**MAX**
1711002001	Discovery Bay	Puget Sound	17			5.01			15.13	**15.13**
1711002002	Sequim Bay	Puget Sound	17	0.59					8.92	**8.92**
1711002003	Dungeness River	Puget Sound	18	73.22					58.23	**73.22**
1711002004	Port Angeles Harbor	Puget Sound	18	16.29					53.91	**53.91**
1711002007	Elwha River	Olympic Peninsula	18	79.69						**79.69**

Appendix F: Documentation for Anadromous Miles per 5th Field Watershed

Documentation for WA State Listed Salmonid Distribution Project
1/7/08, B. Seekins, NOAA Fisheries, NW Region, Portland, OR

Processing and analysis was done at NOAA Fisheries (NW Region, Portland, OR) using ArcGIS (ArcInfo level), version 9.2.

Project specifications stated that mileage by 5th field hydrologic units for specific distribution types (See below) is needed for the following listed ESUs / DPSs;

Chinook;	Puget Sound Chinook
	Lower Columbia River Chinook
	Upper Columbia Spring Chinook
	Snake River Fall Chinook
	Snake River Spring / Summer Chinook
Coho;	Lower Columbia River Coho
Steelhead	Lower Columbia River Steelhead
	Middle Columbia River Steelhead
	Upper Columbia River Steelhead
	Snake River Steelhead
	Puget Sound Steelhead

Data Sources;
The Washington Lakes and Rivers Information System (WLRIS) Fish Distribution data at 1:24,000 was obtained as a geodatabase from WA Department of Fish & Wildlife in December 2007.
Relevant categorizations in WDFW data are the "Distribution Type" and the "Use Type". While 'Distribution Type' was used to query data, 'Use Type' was used only as an alternative way of categorizing the data that was queried.

The Washington State boundary GIS data obtained from the Interior Columbia Basin Ecosytem Management Project (ICBEMP) was used.
The 5th field HUC data at NOAA Fisheries, NW Regional Office dated 8/14/06 was used. NOAA Fisheries combined hydrologic units from the Regional Ecosystem Office (REO) and a consortium effort headed by the Idaho Department of Water Resources. An 'Intersect' was run to obtain the data set that has the 5th field hydrologic unit boundaries that fall only within Washington state boundaries.

Procedures;
It was specified that the mainstem Columbia River should NOT be included in the mileage. To accommodate that need, a 'ColRmainstm' field was added with 'Y' values to indicate the lines that represent the Columbia River mainstem for each of the species. 'N' for No values were added to indicate lines that are not in the mainstem of the Columbia River. Some judgment calls were needed where there were branched sections of the Columbia River.

Initially a query was run on the fish distribution data specifying the GIS Species Code that in some cases includes runs or the Fish Program tabular species codes (depending on whether the run needs to be indicated). The query also called the fish distribution segments that are not considered to be part of the Columbia River mainstem.

This distribution data was clipped using the appropriate ESU or DPS boundary.
Then a query was built on Distribution Type to extract the types of interest from the clipped file.

The query pulled data from the following distribution types of interest;

10 = Documented
11 = Transported – Documented
13 = Artificial – Documented
20 = Presumed
21 = Transported – Presumed
23 = Artificial – Presumed

The other categories of distribution types that were NOT of interest were;
Potential, Transported Potential, Artificial – Potential, Undetected,
Undetected – AFS 2000 Protocol, Documented – Historic,

The WDFW fish distribution data had overlapping segments of rivers and streams to accommodate the distribution of different species and runs. This became an issue where there were multiple runs included in the ESU / DPS and therefore the same segment of stream was sometimes used by multiple runs. These overlapping lines had to be eliminated so that the mileage could be calculated accurately. A field called 'Dissolve' was added to the attributes of the clipped fish distribution and populated with a '1' value for all records. Then, a 'Dissolve'was run using this field in order to get a distribution data set without overlapping lines.

An 'Intersect' was run with the dissolved data set and the HUC 5 data for Washington state. The resultant file has streams combined with the HUC data including attributes that indicate the HUC name and number.
An attribute is added for the mileage calculation and the calculation is made using 'Calculate Geometry'.

In the attribute table, the 'HUC5' field was selected and a 'Summarize' was run. The 'First' was checked under the 'HUC5_Name' and under 'Miles', 'Sum' was checked. This resulted in a table that gives the mileage for each 5th field hydrologic unit along with the name and number for that unit.

The table was opened in Excel, the column widths were adjusted to be more readable, and the table was saved in Excel format.

In ArcGIS software, 2 map images as .pdf files were generated and exported for each ESU / DPS using the result file from the 'Intersect' process mentioned above. One map image showed the data categorized by Distribution Type and the other by the Use Type.

Total Mileage for each ESU / DPS was calculated and a mileage table for all of them was constructed.

Discrepancies that were noted were;

L. Columbia River Chinook; A small segment of distribution data in the Naselle River 5th field HUC should have fallen outside the ESU boundary but due to data quality did not. The segment record was deleted from the GIS data layer and from the table called 'CKLCRcheck' in order to give an improved calculation of the mileage.

There were 5th field hydrologic units that are included in an ESU / DPS but have no fish distribution within them according to the criteria for this project. In these cases, the hydrologic unit is not listed in the mileage table. Examples of this are found in the Upper Columbia R. steelhead DPS where many of the HUC5s (in the southern part of the DPS) have no distribution in them since the mainstem Columbia River was not included in the mileage calculation.