Received in OR/WA
JAN 11 2008
State Director's Office

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

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January 11, 2008

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Mr. Edward W. Shepard
Bureau of Land Management State Director
Oregon State Office
P.O. Box 2965
Portland, Oregon 97208

Re: Review of Draft Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts

Ed

Dear Mr. Shepard:

The National Oceanic and Atmospheric Administration (NOAA) is pleased to provide comments on the draft environmental impact statement (DEIS) for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (BLM) Districts of Salem, Eugene, Coos Bay, Roseburg, and Medford Districts, and the Klamath Falls Resource Area of the Lakeview District, dated August, 2007. According to the DEIS, the BLM proposes to revise the resource management plans for each of the districts, and provide guidance for future management of approximately 2.6 million acres of public and tribal land in the coastal mountains and on the west slope of the Cascade Mountains in Oregon.

In August, 2007, a team from the Northwest Region of NOAA's National Marine Fisheries Service (NMFS) met with a team of your staff to discuss potential issues with the DEIS analyses, provide a list of preliminary comments, and request additional information on various aspects of the analyses. The comments provided at the August meeting should be considered and incorporated into the final environmental impact statement (FEIS), as appropriate.

In addition to those previously provided comments, NMFS has enclosed additional comments that have arisen following a thorough review of the DEIS. The comments are based on a review by my Habitat Conservation Division staff, as well as by staff of NMFS' Northwest Fisheries Science Center (NWFSC). The NMFS is providing these comments due to our responsibilities to manage, conserve, and protect marine and coastal living resources as provided under the Endangered Species Act (ESA), the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and the Fish and Wildlife Coordination Act. In all cases, the comments are relevant, either directly or indirectly, to NMFS' responsibilities under the aforementioned statutes, and are consistent with the agency's regulatory obligation to its trust resources.

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These comments do not satisfy the obligation of the BLM to consult under the ESA or MSA on the selected alternative. The following species of Pacific salmon and steelhead that are listed or proposed for listing under the ESA occur within the planning area for the proposed action: Lower Columbia River and Upper Willamette River Chinook salmon; Southern Oregon/Northern California Coast, Oregon Coast, and Lower Columbia River coho salmon; Columbia River chum salmon; and Upper Willamette River and Lower Columbia River steelhead. All of the above species are listed as threatened, except for Oregon Coast coho salmon, which are proposed for listing as threatened. NMFS has also designated critical habitat for all of the above listed species except Lower Columbia River coho salmon. Essential fish habitat also has been designated under the MSA for Chinook salmon and coho salmon within the planning area.

The following is a summary of the major issues with the DEIS and with the preferred alternative that NMFS found in its review of the DEIS:

1. The DEIS does not contain a coherent and cohesive conservation strategy for anadromous fish and their habitat in any of the action alternatives. A clearly defined, scientifically-robust strategy is essential to conserving these resources.
2. The riparian management scenario proposed in the preferred alternative would not adequately maintain and restore the riparian and aquatic habitat conditions and processes that are critical to the conservation of anadromous fish.
3. The action alternatives do not include well-defined management objectives for fish habitat or firm standards and guidelines, both of which are needed to ensure adequate conservation of anadromous fish.
4. The action alternatives rely on reach-scale analysis and management, and thus do not accommodate the watershed-scale analysis and conservation that are the underpinnings of conservation biology for anadromous fish.
5. Several of the critically important analyses (i.e., fish productivity, large wood, shade, peak flow) rely heavily on models that in some cases have not been fully documented, and in other cases have not been adequately validated for the entire plan area. This introduces considerable uncertainty into the analyses.
6. There are a number of assumptions or methods associated with the modeling exercises listed in number 5 above that do not comport with the findings of published scientific literature. These assumptions and methods cascade through the analyses, leading to some conclusions that likely are erroneous.

A substantial amount of work must be completed to ensure that the FEIS adequately describes the existing environment and adequately analyzes and discloses impacts to the environment that would arise from the proposed action. We expect that many of these issues, which are discussed in greater detail in the enclosure associated with this letter, will be important for the eventual consultations under the ESA and the MSA on the selected alternative.

NMFS staff has begun to formulate a framework that would help to address some of the issues that are listed above and described more fully in the enclosure. Although we are severely limited in staff resources, we would welcome the opportunity to work closely with your staff to incorporate this framework into the proposed action before release of the FEIS. The key

elements of this comprehensive conservation strategy for anadromous fish, which are described in detail at the beginning of the enclosure, are listed below:

1. Identification and differential management of a network of aquatic-emphasis watersheds for fish recovery, public water supply, and water quality.
2. Use of watershed-scale assessment and planning to guide land management actions.
3. Protection of current high-quality fish habitat, in addition to restoration of habitat with high intrinsic geomorphic potential as is planned.
4. Adjusted riparian management areas (RMAs) with more conservative management in aquatic-emphasis watersheds.
5. Increased specificity of objectives for conservation of anadromous fish habitat.
6. Standards and guidelines that are mandatory, but are selected based on type of management action and site conditions.
7. Clearer pathways for plan implementation, monitoring, and adaptive management.

NMFS appreciates the opportunity to comment on this DEIS and looks forward to continuing to provide BLM with assistance on development of the FEIS. Please direct questions regarding this letter to Dr. Kim Kratz of my staff in the Habitat Conservation Division of NMFS Northwest Region at 503.231.2155.

Sincerely,

Michael Ilhan
for D. Robert Lohn
Regional Administrator

Enclosure Comments on Draft Environmental Impact Statement for the Western Oregon Plan Revisions

cc: Linda Goodman, USFS
Elin Miller, EPA
Kemper McMaster, USFWS

Comments of National Marine Fisheries Service, Northwest Region
Draft Environmental Impact Statement (DEIS) for the Western Oregon Plan Revisions (WOPR)
January 11, 2008

The below comments begin with an overview of how well the preferred alternative (Alternative 2) in the August, 2007, draft environmental impact statement (DEIS) for the Western Oregon Plan Revisions (WOPR) of the Bureau of Land Management (BLM) meets the conservation needs of anadromous fish at the landscape scale. This analysis is followed by a list of key elements needed for a successful conservation strategy for anadromous fish. The list is followed by comments organized according to the chapters of the DEIS, and by references.

GENERAL COMMENTS ON CONSERVATION OF ANADROMOUS FISH

The following species of Pacific salmon and steelhead that NMFS has listed or proposed for listing under the ESA occur within the planning area for the proposed action: Lower Columbia River and Upper Willamette River Chinook salmon; Southern Oregon/Northern California Coast, Oregon Coast, and Lower Columbia River coho salmon; Columbia River chum salmon; and Upper Willamette River and Lower Columbia River steelhead. All of the above species are listed as threatened, except for Oregon Coast coho salmon, which are proposed for listing as threatened. NMFS has also designated critical habitat for all of the above listed species except Lower Columbia River coho salmon. Essential fish habitat also has been designated under the MSA for Chinook salmon and coho salmon within the planning area.

The preferred alternative (Alternative 2) does not include a coherent and cohesive conservation strategy for anadromous fish, including those that are listed or proposed for listing as threatened in the WOPR area. BLM's Land Use Planning Handbook (H-1601-1) includes the following statement under Special Status Species, Land Use Plan Decisions (Appendix C, p. 4) that indicates the need to develop a conservation strategy for threatened and endangered species:

> Given the legal mandate to conserve threatened or endangered species and BLM's policy to conserve all special status species, land use planning strategies, desired outcomes, and decisions should result in a reasonable conservation strategy for these species. Land use plan decisions should be clear and sufficiently detailed to enhance habitat or prevent avoidable loss of habitat pending the development and implementation of implementation-level plans. This may include identifying stipulations or criteria that would be applied to implementation actions. Land use plan decisions should be consistent with BLM's mandate to recover listed species and should be consistent with objectives and recommended actions in approved recovery plans, conservation agreements and strategies, MOUs, and applicable biological opinions for threatened and endangered species.

The Purpose and Need statement on p. XLIV states that "In accord with the Endangered Species Act, the plans will use the BLM's authorities for managing the lands it administers in the

planning area to conserve habitat needed from these lands for the survival and recovery of species listed as threatened or endangered under the Endangered Species Act." The section does not explain how the WOPR will "conserve" this habitat.

Other sections of the DEIS include some information that pertains to conservation strategy – such as ecological objectives – but the information is not tied together as a cohesive strategy to accomplish this end. Below is a list of objectives for Alternative 2 related to fish conservation, which we compiled from the Fish section on p. 34, the Water Quality section on p. 57, and the Riparian Management Area section on p. 81:

- Restore stream complexity.
- Restore access to stream channels for all life stages of fish species.
- Prevent livestock from causing trampling disturbances to spawning beds where federally-listed salmonid fish species occur.
- Maintain and restore water quality.
- Maintain and restore the proper functioning condition of riparian and wetland areas to provide shade, sediment filtering, and surface and streambank stabilization.
- Maintain or promote the development of mature or structurally complex forests.
- Provide for the riparian and aquatic conditions that supply stream channels with shade, sediment filtering, leaf litter and large wood, and root masses that stabilize streambanks.
- Maintain and restore water quality.

There are some additional objectives for particular BLM districts or areas subject to special management, such as the Klamath and Coquille Resource Areas. These are special cases NMFS is not analyzing in this part of its review due to the need to focus on core issues because of insufficient time and staff resources.

Other sections of the DEIS include information about a restoration strategy based on areas with high IP for rearing. Taken together, these components do not comprise a suitable conservation strategy for the following reasons:

- There is no centralized description of a conservation strategy for anadromous fish that would include all of the relevant ecological objectives, management actions to protect and restore fish habitat at the watershed scale, and provisions for: (1) Implementation, effectiveness, and validation monitoring; and (2) adaptive management.

- There is no analysis of the status of fish populations in plan area lands, such as abundance, distribution, diversity or productivity; location of particularly important spawning or rearing areas; or connectivity between populations and population segments.

- With the arguable exception of the objective for mature and structurally complex forests in riparian areas, the objectives listed above do not include descriptions of what constitutes desired conditions or levels of functional processes (*i.e.*, desired future conditions or DFCs). The objective for mature and structurally complex forests in riparian areas, if pursued aggressively, is likely to sharply reduce recruitment of wood

pieces from non-mature trees that are able to form pools and trap sediment in the small streams that are most numerous on plan area lands. Please see an extensive discussion of this issue under Chapter 4 – Environmental Consequences/Fish/Large Wood-Fish Productivity.

- There is no consideration of how management and restoration actions would affect factors limiting anadromous fish populations in their freshwater life-history stages.

- "Proper functioning condition" for riparian areas is not defined.

- There is an objective for stream complexity, but the variable is not defined, and there is no DFC. There are no objectives for other aspects of stream and watershed conditions and processes that may limit populations of anadromous fish.

- The livestock objective is clear, but too narrow, as it implies the only negative effect of livestock grazing is trampling of redds. This objective should also consider streambank stability, the composition, vigor and structure of riparian vegetation, sediment generation, and other factors affected by livestock grazing.

- There are no objectives or DFCs for hydrologic function, sediment generation and routing, stream substrate, stream channel conditions, or nutrients.

- Most land management activities are not constrained by whether or not they would contribute to, delay, or prevent attainment of the objectives listed above.

- There are no provisions for analyzing and understanding watershed-scale conditions and processes that create and maintain fish habitat, or for using this information in planning actions. This is likely to result in uncoordinated actions, planned at the scale of the stream reach, that are unlikely to maintain and restore fish habitat at larger scales.

- There is no strategy for identifying and protecting the functionality of areas of existing high-quality fish habitat at either the reach or the river-basin scale. Due to the patchwork configuration of BLM ownership, and the different management histories of BLM vs. non-Federal lands, many streams on BLM lands likely are functioning as habitat refugia supporting remnant populations of salmon and steelhead due to higher stream channel complexity, lower fine sediment loads, and higher amounts of stream shade.

- Land management actions at the site scale are not constrained by mandatory standards and guidelines that would ensure that actions meet aquatic habitat objectives, but by best management practices (BMPs), the selection of which is optional for individual actions. The DEIS states on p. 1135 that the BMPs are intended to "reduce nonpoint source pollution to the maximum extent practicable" and "to meet water quality objectives when implementing management actions." Meeting water quality objectives (which in this case are Oregon water quality standards) would, in some cases, support the conservation of anadromous fish, but may not be sufficient to achieve levels of habitat protection and

restoration needed to recover threatened species. Besides improving water quality, conserving anadromous fish will require standards and guidelines supporting the maintenance and restoration of landscape, watershed, hydrologic, riparian, and instream habitat conditions and processes. Without adequate aquatic management objectives and firm standards and guidelines to establish sideboards, there is no assurance that individual actions completed under the WOPR will maintain and restores anadromous fish populations.

- The proposed stream restoration strategy focuses on stream reaches with high IP for rearing, but does not address larger scales (*i.e.*, river basin or landscape), other than including a description of a general action to give priority to high-priority fish populations that have been defined in recovery plans (p. 34). There is no strategy for areas where recovery plans have not been completed.

NMFS expects that many of the above issues will surface in the eventual ESA and MSA consultations on the selected alternative, and recommends that the FEIS address all of the issues in the above bullet list. Regarding the scale issue, the river basin is the scale most relevant to the metapopulation structure of Pacific salmon (National Research Council 1996). Healthy populations of salmonid fishes use habitats throughout watersheds (Naiman *et al.* 1992), and riverine conditions reflect biological, geological and hydrological processes operating at the watershed level (Nehlsen *et al.* 1997, Bisson *et al.* 1997). Most land management effects on streams and rivers are carried downstream readily, and some can travel upstream as well (*e.g.*, channel head cutting). Also, watershed divides provide clear boundaries for analyzing the combined effects of multiple activities (National Research Council 1996).

A watershed perspective is needed to identify and assess biological habitat refugia and highly productive habitat patches, and to assess connectivity between these areas and between fish population segments (Sedell *et al.* 1990, Naiman *et al.* 1992, Li *et al.* 1995, Bisson *et al.* 1997). For these reasons, habitat conservation and restoration strategies are most likely to be effective if carried out at the scale of the watershed (or composites of multiple watersheds in a specie's range; Reeves *et al.* 1995, Frissell and Bayles 1996), not the stream reach (Reeves and Sedell 1992, Botkin *et al.* 1995, National Research Council 1996, Nehlsen *et al.* 1997).

As described in previous meetings, NMFS would like to work with BLM to develop the following components of a comprehensive conservation strategy for anadromous fish. According to EPA Region 10, such a strategy would also help meet the requirements of the Clean Water Act:

1. Network of aquatic-emphasis watersheds for fish recovery, public water supply, and water quality.

   NMFS would like to work with the BLM to develop a network of aquatic-emphasis watersheds, that would be managed in a more biologically conservative manner, to provide an adequate level of confidence that habitat essential for recovery will be maintained and improve over time at the watershed scale. This could be done using available information, such as data on: (1) Status of fish populations in plan area lands,

including available information about abundance, distribution, diversity or productivity; and (2) location of particularly important spawning or rearing areas; and connectivity between populations and population segments. The work done by NMFS' technical recovery teams (TRTs) and critical habitat review teams would be highly valuable in this effort.

2. Watershed-scale assessment and planning to guide recovery and other land management actions.

   The selected alternative in the FEIS should commit to continued use of existing Federal watershed analyses, source water protection plans, and local watershed analyses for planning and implementing land management actions, particularly in aquatic emphasis watersheds. The selected alternative should require use of watershed-scale information when planning actions at the reach scale, and updating existing watershed analyses with new information, as it becomes available.

3. Ecological objectives to support aquatic habitat.

   The selected alternative in the FEIS should include a set of objectives specific to aquatic habitats that pertain to watersheds, riparian areas, and instream habitat, and are adequate to maintain and restore anadromous fish populations. The objectives should include descriptions of what constitutes desired conditions or levels of functional processes (*et al.*, DFCs) for hydrologic function, sediment generation and routing, stream substrate, stream channel conditions, or nutrients.

4. Standards and guidelines to aid project development and implementation.

   The selected alternative in the FEIS should include mandatory standards and guidelines to set sidebars for individual actions. Management activities should be constrained under the standards and guidelines depending on whether they would contribute to or delay attainment of the aquatic habitat objectives listed above.

5. Provisions to protect and restore high-quality fish habitats.

   Successful conservation of anadromous fish will require the protection of currently functioning high quality or highly productive fish habitat, at the watershed scale, in addition to restoring habitat with high intrinsic geomorphic potential (IP). Information used to prioritize restoration actions in aquatic-emphasis watersheds should include Federal and local watershed analyses, source water protection plans, and targets in total maximum daily loads (TMDLs) prepared under the Clean Water Act.

6. Adjusted riparian management areas (RMAs).

   NMFS would like to work with BLM to develop a RMA strategy that provides adequate protection and recovery potential for anadromous fish habitats and water quality. Aquatic-emphasis watersheds should have more protective RMAs than other watersheds.

Rather than simple default values, RMA widths should be based on factors relevant to factors forming and maintaining aquatic habitat functions, *et al.*, floodplains, channel migration zones, unstable slopes, site-potential tree heights, shade, bank stability, etc. RMA widths, and the constraints that apply within RMAs, should balance the need to maintain or protect existing aquatic habitat conditions and processes with the need for active restoration in some situations. RMAs should include zones of different management intensity including a zone of total protection to protect bank stability; a zone for protection of shade and litterfall; a zone accommodating both protection of existing values and active management, where needed, to improve aquatic habitat conditions; and a zone for transitioning into upland management strategies.

7. Expanded provisions for plan implementation, monitoring, and adaptive management.

The selected alternative needs to describe a clear framework for linking individual resource management plans (RMPs) to regional-scale conservation efforts, including recovery plans for listed fish species. The selected alternative should also explain how the plans will be implemented in each BLM district, and how the districts will contribute to meeting aquatic habitat objectives at the watershed scale. The BLM should fill in needed details about how implementation, effectiveness, and validation monitoring will be carried out as the plans are implemented, and how it will use adaptive management to respond to new information about plan effectiveness. The BLM should commit to participating in the regional framework for federal land management aquatic effectiveness monitoring. NMFS would like to work with BLM to better define how the individual RMPs would link to other adjacent land management plans (*e.g.*, those of the U.S. Forest Service and affected Indian tribes), and how they tier to project planning and implementation.

CHAPTER 1 – PURPOSE AND NEED

This section provides a rationale for the proposed plan revisions; identifies cooperators, affected laws and guidance; and defines the planning area, issues identified, and the planning process.

The section discusses coordinating plan revisions with draft recovery plans for anadromous fish species listed under the Endangered Species Act (ESA) on p. 5, but the alternatives do not appear to incorporate key elements of draft recovery plans or related recovery planning products (*et al.*, documents from TRTs). The FEIS should explain how BLM will integrate recovery planning for ESA-listed anadromous fish into the plan revision.

The DEIS (p. 23) acknowledges the requirement to consult under section 7 of the ESA on amendments to the individual resource management plans under the proposed action, but does not propose a framework for completing these consultations. Due to past litigation on adoption of Federal forest management plans, it is essential that BLM work closely with NMFS on such a consultation framework.

The DEIS says on p. 24 that draft recovery plans will be incorporated into BLM plan revisions if they are completed before WOPR implementation. NMFS expects that recovery plans for the

Upper Willamette River and Lower Columbia River species of ESA-listed anadromous fish will be proposed in 2008. The FEIS should explain how recovery plans that are completed after WOPR implementation begins would be incorporated into land management actions.

CHAPTER 2 – ALTERNATIVES

Management Common to All Alternatives

Fish

This section (p. 34) consists of a list of three objectives and four management actions that apply to all alternatives. The stated objectives are:

- Restore stream complexity.
- Restore access to stream channels for all life stages of fish species.
- Prevent livestock from causing trampling disturbances to spawning beds where federally listed salmonid fish species occur.

The following management actions are listed:

- Priority for restoration activities would be given to projects in streams with a high intrinsic potential for fish and to high-priority fish populations that have been defined in recovery plans.
- Stream complexity would be restored through the placement of large wood and boulders.
- New and replacement stream-crossing structures on fish-bearing streams would be designed to provide access within stream channels for fish.
- For streams with salmonid species listed under the Endangered Species Act, livestock would not be released into riparian areas until 30 days following the emergence of salmonids from spawning beds.

Considering the complexity of interactions between forest lands and the habitat of anadromous fish, the numerous problems with fish habitat in the plan area, and the range of actions needed to maintain and restore fish habitat, the lists of objectives and management actions seem to be overly simple and incomplete. The lists are not supplemented by additional objectives and management actions for fish or stream habitat in any of the action alternatives, although the alternatives do have short lists of objectives and management actions for riparian areas.

The list of objectives for fish and fish habitat does not include many of the habitat factors limiting populations of anadromous fish that are listed or proposed for listing in the plan area that could be affected by how BLM lands are managed, such as water quality, flow, and substrate conditions. The list of management actions seems to assume that restoration by itself can restore habitat, and misses the importance of not degrading existing habitat quality, and the role of other factors affecting complexity of stream habitat (*et al.*, flow regime, sediment regime, disturbance regime). Adding these features to the FEIS is critical to demonstrating a conservation strategy for anadromous fish. A commitment to address the limiting factors in recovery plans as they are

developed, through habitat protection and restoration, would be a reasonable step for BLM to take pending completion of recovery plans.

Regarding the list of management actions for all alternatives, the FEIS should specify which fish passage standards for new and replacement culverts the BLM will use (NMFS and Oregon Department of Fish and Wildlife each have their own standards; we recommend that BLM commit to meeting NMFS' standards in streams with anadromous fish). Regarding the last management action in the above list, it is unclear how the BLM will know when complete fry emergence has occurred in order to define the 30-day period before release of livestock into areas near streams. NMFS recommends that BLM include a commitment in the FEIS to implement recovery plan actions that are appropriate for Federal lands.

Riparian Areas

The action alternatives (alternatives 1, 2 and 3) include the following two objectives for riparian areas:

- Maintain or promote the development of mature or structurally complex forests.
- Provide for the riparian and aquatic conditions that supply stream channels with shade, sediment filtering, leaf litter and large wood, and root masses that stabilize streambanks.

NMFS commented on the aquatic habitat objectives above under "General Comments on Conservation of Anadromous Fish."

The alternatives share the following management actions for riparian areas:

- Thinning and other silvicultural treatments would be applied along smaller-order streams (generally, first-, second-, and third-order streams) to promote the development of mature forests.
- Thinning and other silvicultural treatments would be applied along larger-order streams (generally, fourth-order and larger streams) to promote the development of structurally complex forests.
- Snags and coarse woody debris would be retained in thinning operations, except for safety or operational reasons (*et al.*, maintaining access to roads and facilities).
- Salvage would not occur in stands that are disturbed by a fire, windstorm, disease, or insect infestations, except to reduce hazards in wildland urban interface areas.
- Timber from thinning and salvage operations would be available for sale, with different amount of emphasis on active management in riparian areas.

The above actions emphasize thinning in riparian areas for all stream sizes, but this will only benefit the habitat of anadromous fish under certain conditions (*et al.*, where there is sufficient instream wood already present to provide habitat functions during the lag between thinning a forest and recruitment of logs from the thinned forest to the stream, and where existing trees are too small to form pools when they fall into streams). Available research (*et al.*, Beechie and Sibley 1997, Bilby and Ward 1989) indicates that trees as small as 5-6 inches in diameter can form pools in small streams. Thinning along along small streams with wood deficits can

significantly reduce recruitment of wood to streams (Beechie *et al.* 2000), and the risks of this happening appear to be significantly increased by the above management actions. NMFS provides additional information about this issue in its review of the DEIS's large wood analyses in later sections of this document.

NMFS recommends that BLM develop criteria for when to thin riparian forests, and additional non-timber management actions to maintain and restore riparian areas – such as correcting damage to riparian vegetation and streambanks due to livestock grazing, invasive plants, recreational activities, and roads.

The Alternatives

Alternative 2

The DEIS provides information about proposed RMAs for Alternative 2 in Table 31 (p. 79-80). Some needed definitions are lacking. What scientific information was used to define the "streambank zone," "water influence zone," and "intermittent, non-fish bearing streams," and how would these zones be delineated in the field?

The only difference we could discern among the action alternatives with respect to objectives and management actions is that Alternative 3 includes a management action not found in the other action alternatives:

- Prescribed burns would be used in areas of high fuel loadings to reduce the potential for uncharacteristic wildfires.

The FEIS should include a discussion of whether or not this action would be useful in the preferred alternative.

CHAPTER 3 – AFFECTED ENVIRONMENT

General Comment

It is confusing to have subchapters on sediment, temperature and stream flow in both the Fish and Water sections of this chapter, especially since the subchapters are only rarely cross-referenced. It is unclear why most of the details are in the Water sections, and the Fish sections are relatively brief. NMFS recommends that the BLM use cross-referencing to minimize duplication between the sections.

Fish

Large Wood

This section, which begins on p. 340, provides a more extensive historical background, literature review, and baseline assessment than any of the other sections within the "Fish" chapter. It

would helpful if the other sections with the Fish chapter provided a similar amount of background information.

The DEIS analysis of large wood examines only five out of 176 fifth-field watersheds within the plan area that contain BLM ownership. Three of the five "representative" watersheds were selected from the Klamath Province, which probably is not representative of BLM lands in other provinces. It is not clear how effective these five watersheds are in characterizing wood delivery or potential impacts of management activities to the 10 listed fish species described in this section. Wood delivery to streams by debris flows is influenced by forest condition, topography and other factors that would vary dramatically between the provinces. The FEIS needs to include a larger sample size of watersheds, well distributed across the plan area and stratified by physiographic province, BLM ownership, and other meaningful geomorphic and watershed variables, that would more accurately model wood recruitment to streams.

The conclusion that only wood >20 inches diameter at breast height is 'functional' is contrary to published relationships between wood size and pool formation (*et al.*, Beechie and Sibley 1997, Bilby and Ward 1989), leading to the erroneous conclusion that significant timber harvest in riparian zones under alternatives 2 and 3 has little effect on habitat for anadromous fish. Other issues with the methodology used for the wood recruitment model that NMFS' staff has previously discussed with BLM's staff include assumptions of site-potential tree heights that seem too low for parts of the WOPR area, and the distances from debris-flow prone streams over which trees can be incorporated into debris flows. NMFS understands that BLM is working on new model runs with different assumptions and input variables, and we encourage BLM to include model runs with smaller minimum tree diameters, and to report the results of these investigations in the FEIS.

Large wood contribution is used as a surrogate for productivity of salmonid fish populations in this analysis. The DEIS states that "improved habitat complexity correlates to improved fish survival and production" (p. 343). This assumption ignores the concept of limiting factors for species' productivity (Wilson and Bossert 1971). Observations where augmenting wood densities did not lead to increases in smolt production (p. 343) substantiate that habitat complexity is not the only limiting factor for anadromous fish. The fish analysis should consider effects of the alternatives on other factors limiting fish populations, such as water temperature, substrate sediment, and passage. Information about limiting factors often is available in proposed recovery plans, TRT products, and Federal or local watershed analyses.

Sediment

This section (p. 355-357) begins with a paragraph about provision of organic matter to streams from vegetation that appears to be out of place. It continues with a brief (<2 pages) summary of various effects of fine sediment and turbidity on salmonid fish and their habitat. NMFS provides some comments on this summary below.

The DEIS states (p. 356) that "The timing of the sediment inputs relative to the biological vulnerability of each fish species is more important than the absolute quantity of sediment." This statement is true only where habitat effects of sediment are transient and very short term (days to

weeks), which is only the case for turbidity effects. In the case of turbidity, it may be reasonable to assume that timing is critical, because sediment delivered and evacuated during non-critical periods is unlikely to kill large numbers of fish. However, the statement seems to assume that sediment deposition in streambeds is short term, and is not coincident in time with incubation of salmonid eggs in spawning gravels. In fact, sediment usually is not so transient in the gravel, and salmonid eggs are incubating during most periods of erosion and fine sediment delivery. Introduction of fine sediments (*et al.*, sand and smaller particles < 2mm in diameter) alters channel morphology and habitat by several mechanisms. The smallest particles travel downstream as wash load, while larger particles may travel as bed load (Richards 1982). Suspended particles and fine bed load can accumulate in spaces between gravel particles (Beschta and Jackson 1979, Lisle 1989), restricting the subsurface movement of water through the gravel and reducing survival of eggs and fry. Fine sediments can also fill pools and interstitial rearing spaces, and can increase turbidity during high flows. This assumption also does not consider indirect effects of increased fine sediment, such as reduced production of invertebrate food organisms (Suttle *et al.* 2004).

The DEIS does not explicitly consider these non-transient sediment effects and bases its analysis only on the proposed increases in road length, rather than total road length. Moreover, the method underestimates surface erosion by at least a factor of two (see discussion under Water, Sediment below). Thus, it remains unclear what the overall effect of forest roads will be under any of the alternatives.

Effects of changes in coarse sediment supply are not considered in the alternatives because all alternatives assume no increase in landslide rates, and therefore no increase in mixed-grain-size sediment supply. This assumption may not be well-supported (see comments about how BLM uses the "timber productivity capability classification" (TPCC) to screen for landslide-prone areas, and withdraws them from general forest management, that pertain to Chapter 3, Water, Sediment on p. 378 of the DEIS). If the possibility of increased landslides due to increased intensity of land management were considered, it would be clear that sediment quantity is of greater importance than timing of erosion for coarse sediments. This is because there is a time lag of years to decades between a change in sediment supply and a change in morphology of a downstream reach (*et al.*, Kelsey 1982b, Madej and Ozaki 1996, Beechie 2001, Beechie *et al.* 2005b), and the amount of sediment determines channel and habitat response. The time lag is due to the time required for sediment to travel from its source to the reach of concern (Kelsey 1982a). Once sediment enters a stream reach, its persistence is partly a function of the sediment transport capacity of the reach (Benda and Dunne 1997b), and both the timing and persistence of changes in the morphology of downstream reaches are related to the rate at which sediment moves through a channel network (Madej and Ozaki 1996). Therefore, timing of erosion is rarely equal to timing of impact on salmonid fish, and erosion timing cannot be considered a reasonable criterion for concluding that erosion has little effect on these fish.

The effects of coarse sediments on fish habitat quality vary, depending on the amount of sediment delivered. In general, increased supply of sediments to lower-gradient reaches increases the amount of fine sediment on streambed surfaces (Dietrich *et al.* 1989), reduces pool depth (Lisle 1982, Madej and Ozaki 1996), and causes channel aggradation (Madej 1982, Lisle 1982) and channel widening (Kelsey 1982b, Madej 1982). Initial increases are accommodated

by deposition of finer sediments into pools (*et al.*, Lisle and Madej 1992, Lisle and Hilton 1992, 1999). Larger increases cause aggradation of the channel bed and channel widening (*et al.*, Lisle 1982; Madej 1982, 1992; Harvey 1987; Pitlick and Thorne 1987; Harvey 1991), and channels may become laterally unstable (Bergstrom 1982, Church 1983). As sediment moves through a reach, the proportion of sediment stored in bars increases rapidly, and then decreases over a few years to a few decades (Lisle 1982, Madej 1987, Madej 1992). Depths of pools may begin to recover while sediment remains within the reach (Madej and Ozaki 1996), but typically do not fully recover until the sediment pulse passes through the reach (Lisle 1982, Collins *et al.* 1994). All of these effects persist for years to decades.

The final three paragraphs of this section (p. 356-7) downplay the effects of sediment on fish and their habitat, including a statement that "....no model can predict the exact mechanism of sediment delivery and instream routing. Therefore, it is not possible to quantify or accurately predict the affects that sediment delivery has on fish species." Yet the DEIS uses a sediment model in the "Water" section of the DEIS to predict routing mechanisms and quantify the amount of sediment transported to streams within the plan area.

NMFS recommends that the FEIS include a modified sediment analysis that avoids the assumption that the timing of sediment delivery is more important than the volume, that considers effects of both the existing road network and proposed roads, and that includes consideration of long-term sediment routing and effects.

Temperature

The effects of water temperature on fish, which are limiting factors for some of the anadromous fish populations in the plan area, are addressed with a striking lack of detail in the Fish section in less than half a page (p. 357). The section includes a table with most of Oregon's numeric water temperature criteria (it is not the complete standard, since the standard includes the beneficial use designations and the antidegradation policy, which the DEIS does not mention). Missing from the table is Oregon's "core cold water" criterion of 60.8 degrees F, which DEQ designated in the North Coast Basin (an upper portion of the Necanicum River, Ecola Creek and Plympton Creek) and Mid-Coast Basin (Siuslaw River) (Oregon Department of Environmental Quality 2003).

This section outlines very general effects of high temperatures on salmonid fish, and gives the total amount of stream miles on BLM lands that are listed by ODEQ water-quality impaired for temperature. NMFS assumes this is for the plan area, although that is not clear; BLM should clarify this in the FEIS. NMFS suggests that this section of the FEIS include a more extensive discussion of the extensive literature on effects of water temperature on listed salmonid fish found in the plan area, including inferences about effects of water temperatures in the plan area on salmonid fish. Suitable reviews that may be helpful include McCullough (1999), Dunham *et al.* (2001), Materna (2001), McCullough *et al.* (2001), and Sauter *et al.* (2001).

Stream Flow

The pattern of stream flow, including the timing and volume of peak and base flows, is another critical environmental attribute for salmonid fish (Spence *et al.* 1996). The Fish section of this

chapter includes only one paragraph about stream flow. The single paragraph poorly describes the affected environment, as it does not describe any conditions within the plan area, does not describe factors that contribute to stream flow problems, and does not outline the BLM's role with respect to stream flows. NMFS recommends this section refer the reader to the more complete analysis in the Water Quantity section of the Water chapter, and that either this or the Water Quantity section describe conditions within the plan area, describe factors that contribute to stream flow problems, and outline the BLM's role with respect to stream flows.

Water

Stream Temperature

The bulk of this section (four of six pages beginning on p. 366) is devoted to building a case for the sizes of the RMAs and proposed management strategies within those RMAs under Alternative 2, as opposed to actually describing the affected environment (*et al.*, status and trends in water temperature in the plan area, and the reasons for those conditions), which is what is needed. This case as it relies heavily on dated literature and unpublished sources, and does not include a broad or representative treatment of the extensive literature on physical controls of stream temperature and how land management affects temperature. Neither does the section demonstrate that the studies and models used are valid and suitable for the diversity of ecoregions and conditions in the WOPR plan area (*et al.*, Lower Columbia River tributaries, Coast Range, Willamette River Basin, Umpqua River Basin, Klamath Mountains, and East and West Cascade Range). Because the BLM has not provided this information, NMFS has limited confidence in the proposed strategy as a tool to avoid increasing water temperature following timber management within riparian areas. NMFS elaborates on the reasons for this statement below.

The analysis in the DEIS relies on canopy closure as a surrogate for stream shade. On p. 367, the DEIS cites Brazier and Brown (1972) to explain how angular canopy density (a measure of vegetation canopy closure) varies with different buffer strip widths up to 100 feet (Fig. 98, p. 367). It is unclear whether the stream sizes, tree types and heights used in this study are applicable to the entire plan area. If they are, how was that determined, and if not, what other information is available?

Also on p. 367, the DEIS cites Park (1991) to demonstrate a relationship between angular canopy density and stream shade (as shown in Fig. 99 on p. 367). This citation is not in the References section of the DEIS; NMFS assumes this should be Park (1993), which the References section in the DEIS has as the SHADOW model. If the BLM is going to use the SHADOW model to support their assertions regarding angular canopy density, stream shade, and water temperature, then it needs to better describe the data set used to develop the model (*et al.*, what streams were used to develop the statistical relationships?); document model validation in the different ecoregions covered by the WOPR; and report confidence limits, assumptions and uncertainties in the FEIS. That will allow for a full evaluation by NMFS, decision-makers and the public.

The strategy for Alternative 2 is to maintain 80% effective or potential shade, whichever is less, in the "primary shade zone." The DEIS does not adequately demonstrate that this 80% shade is a

valid target for the "mature, structurally complex" forests that are the objective for riparian areas, nor does it adequately demonstrate that this amount of shade will maintain and restore water temperatures. On p. 368, the DEIS asserts that shade levels over 80% do not produce measurable decreases in stream temperature. This information is based on Boyd (1996), which is an unpublished master's thesis that was based on limited sampling. NMFS is concerned that the DEIS is relying so heavily on one source for this information. The DEIS has provided no information on the data set used to develop the model, model validation for the different ecoregions covered by the WOPR, confidence limits, assumptions and uncertainties. Also, was Boyd (1996) considering only the 'primary shade zone' in the calculations used for this figure? Other available information suggests that the relationship explained in the DEIS may not be universally true. A recent master's thesis found differences in water temperature between 80% and 100% shade following harvest in riparian areas of Oregon Coast Range streams where retained shade ranged from 51% to 99%, with a mean of 79%, which is essentially the same as BLM's target of 80% (p. 31 and Fig. 3.9 in Fleuret (2006). Based on this information, the uncertainties around BLM's analysis, the requirement for site-potential shade in all total maximum daily loads completed by the Oregon Department of Environmental Quality under the Clean Water Act, a target of site-potential shade, at least in aquatic emphasis areas, would be a better strategy for the selected alternative.

The assertion in the DEIS that areas greater than 100 feet from streams cannot contribute shade to stream is not adequately demonstrated. On p. 368, the DEIS asserts that Fig. 100 demonstrates that "there is marginal improvement in shade for riparian areas wider than 100 feet, because the variables of total solar radiation reaching a stream is (sic) diminished by the blocking ability of a tree's canopy." This is a confusing statement. Fig. 100 does not include widths of riparian areas, and the last clause of the sentence does not have enough information to make sense. NMFS is not confident that riparian areas wider than 100 feet cannot contribute shade. Among other variables, this would depend on stem density and canopy density at various distances from the stream, tree heights, and topography. Water temperatures of three streams in British Columbia, Canada increased by 1.6° C relative to control streams when streamside areas were logged with buffers of 30 m (98 feet) (Kiffney *et al.* 2003). This suggests that buffers essentially the same as the 100 feet cited by the DEIS did not fully protect shade. The analysis in the FEIS needs to consider this additional information.

A discussion of riparian widths for primary and secondary shade zones begins on p. 369 the DEIS. This section relies on information presented in Table 113, which is based on tree heights of only 100 feet or less – considerably shorter than site-potential trees in much of the plan area. How would the sizes of the primary and secondary shade zones change for trees that were as tall as the site potential trees in the plan area (as shown in Fig. 102 on p. 370)? Also, we have not seen data explaining the effects of varying tree retention in the 'secondary shade zone' on effective shade. The BLM should provide this information (*et al.*, the rationale for why retaining 50% canopy in the secondary shade zone is adequate) in the FEIS. The FEIS also should assess the likelihood of blowdown of riparian trees under the various strategies, and analyze how this factor could affect stream shade and water temperatures. Overall, the DEIS has not provided sufficient justification for how its riparian management areas under Alternative 2 would protect stream shade and prevent heating of streams. The BLM should work with NMFS to amend its

RMA delineations and actions to provide a higher level of confidence that its management strategies will maintain and restore shade and stream temperatures.

In order to adequately describe the existing condition, NMFS recommends that this section of the FEIS provide more information about the status and trends of water temperature on BLM lands. Information that could be provided, if it is available to BLM, includes which streams are monitored, status of compliance with the Oregon temperature standard and trends over time, and summaries of results of TMDLs done in the plan area, particularly modeling of natural thermal potential and how this compares to current temperatures. This section in the FEIS should also discuss the status of stream shade on BLM lands, to the extent that information is available to BLM, and discuss how land management has contributed to current shade and water temperature levels. All information about how the proposed management strategies would affect stream shade and temperature should be moved to Chapter 4, Environmental Consequences, in the FEIS.

Sediment

The sediment section contains limited information about the status and trends of sediment in streams within the plan area. Table 115 includes information about potential fine sediment yield from existing roads, but the DEIS does not explain how this information was generated, nor does it explain whether any empirical data is available for lands in the plan area. Table 116 shows ratings of the Oregon Department of Environmental Quality (ODEQ) for sediment in four physiographic provinces occurring in the plan area for 1994 to 2001. On p. 382, the DEIS states that it is unclear how these results apply to BLM lands because of mixed land uses in the watersheds. Do ODEQ sampling stations occur on BLM lands? Additional information on substrate sediment is available from habitat surveys done by Oregon Department of Fish and Wildlife.

On p. 376, the DEIS begins a summary of the results of modeling of how the alternatives would affect delivery of fine sediment into streams. This information would fit better in Chapter 4, Environmental Consequences.

Some of the assumptions that went into the sediment modeling do not appear to be well-supported, including the following:

- An assumption of moderate traffic under all alternatives, when the log traffic logically would vary with the different rates of tree cutting among alternatives.
- An assumption that fine sediment yield would not vary with the varying amounts of timber cutting and slash burning under the different alternatives.
- An assumption that sediment is not delivered to streams from portions of the road that are more than 200 feet from channels. This is problematic if the average cross-drain spacing is 500 feet, which is another assumption of the model (p. I-11106). This will underestimate the length of road connected to streams by a factor of two or more.[1] The

[1] This assumption is not part of the method that the DEIS follows. The Washington Department of Natural Resources' (DNR) watershed analysis methodology states, "If the road drains directly to a stream channel via a ditch or gully: assume 100% delivery from the parts of the road that drain directly to the stream."

DEIS assumes that sediment is not delivered to streams from portions of the road that are more than 200 feet from channels. It may also be appropriate to determine a correction factor that accounts for the percentage of cross-drain culverts that are not functioning at any given point in time, and apply this factor to the analysis.

- The section includes an implicit assumption that BLM's methods for identifying landslide-prone lands and their mitigation measures for these lands are 100% effective, which seems unlikely (see discussion below regarding p. 378).

There may be important ecological implications for the habitat of anadromous fish if the various sediment modeling assumptions are not met. What information does BLM have to support these assumptions? In order to support the results of its modeling exercise, the BLM should explain the basis for these assumptions in the FEIS. NMFS also recommends that BLM complete a sensitivity analysis by running the model with varying log truck traffic and sediment yield based on varying levels of timber harvests, and report the results in the FEIS.

There are other parts of the methodology used for the sediment modeling exercise that may be problematic, but it is difficult to tell due to insufficient information. These potential issues include:

- The method includes an assumption (p. I-1107) that roads not crossing a stream do not deliver sediment, yet also includes an assumption about delivery of sediment from drainage ditches. These ditches can deliver sediment to streams regardless of where the road segment crosses a stream. Also, the validity of the assumption about stream crossings depends heavily on the map resolution for streams used in the analysis. Even the smallest stream channels route fine sediments, and many of these tend not to show up on geographic information system hydrography layers (*et al.*, 1:24,000 blue lines of the U.S. Geological Survey miss a significant portion of the stream network). This means that the analysis likely underestimates the number of road segments hydrologically connected to streams.[2]
- Table 212, p. 760, indicates that Alternative 2, which has the greatest amount of timber cutting, has the lowest projected mileage of new roads. The FEIS should explain how this is possible.
- The DEIS does not explain the derivation of the "ground cover correction factor" (p. I-1107, also called "ground cover density factor" in Table 262 on p.-1107), which applies to cut and fill slopes. Without knowing where the vegetation cover data came from, it is not possible to evaluate the accuracy of the final vegetation correction factor layer. The FEIS should explain the derivation of this factor.

On p. 378, the DEIS describes how BLM uses the "timber productivity capability classification" (TPCC) to screen for landslide-prone areas, and withdraws them from general forest management. This classification is done by silviculture and soil specialists based on the interpretation of aerial photography and ground review. Over 89,937 acres of BLM-

[2] In the DNR watershed analysis methodology, channel locations are determined in the field, with a channel defined as "any drainage depression with a defined bed and banks, extending continuously below the drainage site. The flow regime can be ephemeral, intermittent, or perennial."

administered lands (3.5% of BLM administered lands) are withdrawn due to forest capability or land stability concerns. NMFS would expect the amount of lands susceptible to shallow, rapid landslides alone to be larger than 3.5% of BLM lands in the plan area, considering the amount of steep lands and the stream density in much of the plan area. Since all of the NEPA alternatives rely on this system, and since it is relevant to both the analyses of the risk of sedimentation and of the recruitment of large wood to streams from landslides, the FEIS should provide any evidence BLM has about the effectiveness of the TPCC in identifying landslide-prone lands. The FEIS should also include information about the procedures, decision criteria, and effectiveness of site-specific reviews that can also be used to withdraw areas from harvest due to slope stability concerns.

Ideally, BLM would redo its sediment analysis using a computer-based model that predicts slope stability of potential landslide initiation sites based on slope, topography, rainfall, and other variables, such as SHALSTAB. Papers developing the SHALSTAB model and showing its application include Dietrich et al. 1992, 1993, 1995; Montgomery and Dietrich 1994; and Montgomery et al. 2000. This model works various topographic data sources such as digitized 7.5 minute USGS quadrangle maps with enhanced topographical contours at 10-m intervals. The model assigns to each 10-m topographic cell a relative hazard rating (low, medium, or high).[3] Other slope stability models using similar input variables are also available. If it is not possible to run such models for the entire plan area before the FEIS, then the FEIS should describe a plan to update its slope stability investigations to include computer modeling.

On p. 379-381, the DEIS discusses studies of landslides by the U.S. Forest Service and the Oregon Department of Forestry that occurred during winter storms in 1996, but includes no information about landslides on BLM lands. The FEIS should provide any available information about landslides on lands in the plan area in 1996 or other years.

Water Quantity

The DEIS cites studies done in the 1970s (DEIS, p. 388) by Rothacher (1973) and Harr (1976) to support analysis of management effects on peak flows with 5-year return intervals. Jones (2000) and Bowling and Lettenmaier (1998), which address road effects on peak flows, would also be appropriate references to discuss.

The DEIS concludes (p. 385) that one out of 635 subwatersheds in the rain hydroregion, and only three out of 471 subwatersheds in rain-on-snow hydroregion (p. 387), within the plan area are currently susceptible to peak flow increases. This is an underestimate, because it assumes that baseline peak flow conditions within the plan area are currently functioning naturally. These conclusions also seem difficult to accurately predict in any meaningful way without considering site-specific information regarding the spatial distribution of patch cuts with respect to current conditions. Peak flow analysis in the DEIS (p. 361) considers the largest spatial scale (sixth-field subwatersheds, 10-40 square miles, that is generally acceptable to recognize any change in

[3] Some inner gorges (See Kelsey 1988 for a definition) may not be included in the model results and would need to be identified by field surveys for actual layouts of timber sales, since these features do not typically show up on topographic maps.

magnitude of peak flows, obscuring dispersed localized impacts that may be occurring at a finer scale. The temporal scale of peak flow analysis is relatively short (*et al.*, 5-year return).

The effects of roads are not modeled or considered, even though they often contribute to increased peak flow responses (Johnson 2000, Grant *et al.* in review). The FEIS should include a cumulative effects analysis that examines not only the cumulative decrease in peak flow response at large watershed scales (Grant *et al.* in review), but also the cumulative effects of many small watersheds (*et al.*, < 10 square kilometers) dispersed within target landscapes experiencing increases in peak flows. The gross geomorphic effects of these dispersed increases in magnitude might be small due to resilience of channels (Grant *et al.* in review); however, a variety of effects (*et al.*, fine sediment transport, reduced streambank stability, reduced large wood retention) may result in significant effects to anadromous fish habitat at the stream reach scale.

Peak flow analysis for the rain-dominated hydroregion (p. 384-385) was performed for the DEIS through comparisons to empirical results from paired watershed studies, using OPTIONS modeling and 1996 data from the Interagency Vegetation Mapping Project to estimate amount of disturbance (equivalent clearcut area or ECA). The DEIS compares anticipated ECAs to ECAs that caused peak flow response in small watershed studies (roughly 25 to 2,500 acres) to develop predicted responses in sixth-field watersheds. The DEIS used a 40% ECA threshold to classify sixth-field subwatersheds susceptible to peak flow increases. A regression analysis of twelve previously published Pacific Coast studies by Stednick (1996) suggested a harvest of 25% or more of a watershed can measurably increase annual water yield (although none of the studies examined areas where less than 25% of the watershed had been cut). The BLM should complete sensitivity analysis using a lower ECA threshold, and disclose results in the FEIS. Pending results of this analysis, NMFS recommends a more conservative ECA value (perhaps 20-25%) to be used as the threshold for classifying subwatersheds susceptible to peak flow increases.

Peak flow analysis for the rain-on-snow hydroregion used a process model derived from estimated winter snowpack (from empirical data) and forest cover data. Snow melt was simulated for "average environmental conditions" of a rain storm with a 2-year return interval. Water equivalents from this analysis were converted to rainfall and used to estimate stream flow. This stream flow value was compared to flows for storms with a 5-year return interval. Sixth-field watersheds that exceeded 5-year flows were considered susceptible to peak flow change. NMFS has concerns with the validity and practical application of this analysis, including the extent of the mapped intermittent snow zone, the applicability of gauged watershed data used for comparison, the response metric, and the use of an untested process model when other models and empirical results are available. NMFS recommends that BLM strengthen this analysis by validating this model with a comparison to either empirical evidence from the plan area or with another validated model that is applicable to the plan area.

The DEIS analysis of peak flow response in rain-on-snow hydroregion used a unique process model (Washington Department of Natural Resources 1997), although other more detailed process models (Lewis *et al.* 2001) and spatially distributed dataset models (Bowling and Lettenmaier 1998, Tague and Band 2001) have been developed, validated and published. It is difficult to assess the value of this modeling approach since it represents an untested hypothesis

with a series of untested parameters. NMFS recommends that BLM strengthen this analysis by either applying those validated models in the DEIS or, at a minimum, comparing the WOPR's analytical model with these validated, peer-reviewed models.

The FEIS should provide any available empirical data from within the plan area that supports the validity of the Washington Department of Natural Resources' model for use in this area. As with the rain-dominated region, the effects of existing and new roads should be included in the analysis. Using generalized average environmental conditions (*et al.*, 15 mph wind speed during 2-year storms) does not seem to emulate actual conditions that would develop in such a storm; NMFS recommends using sensitivity analysis to explore responses under higher wind speeds.

CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES

Fish

Large Wood

NMFS questions whether the large reduction in buffer widths along different stream types relative to the No-Action Alternative, particularly for Alternatives 2 and 3, would provide fully functioning riparian and stream ecosystems. The recommended 100-ft buffer for perennial and fish-bearing streams in Alternative 2 (the preferred alternative) is considerably less than the published studies the DEIS cites to justify this width on p. 730. In addition, this buffer does not account for wetlands or sensitive habitats that may require a wider buffer to ensure a fully functioning stream network. Along many streams in the Cascade and Coast Ranges, the 25-foot no-cut buffer consists of a scattered string of alders that may deliver little functional wood.

Fish Productivity

The DEIS fish productivity model makes several erroneous assumptions regarding the 'value' of channel or habitat types for salmon, and these assumptions lead to an erroneous conclusion that smaller streams have less value for salmonid fish than larger rivers. The DEIS fish productivity model incorrectly applied equations relating pool spacing to wood loading, contributing to an erroneous conclusion that the there is little difference in fish productivity across the alternatives.

The DEIS assumes that available habitat is proportional to available channel area (*et al.*, large channels can support more fish than small channels). This assumption is not warranted, because available habitat depends more on channel complexity than channel area. Large, simple (*et al.*, low wood density) channels may support lower densities of fish than small, complex channels. (*et al.*, Beechie *et al.* 2005 found very low densities in large mainstem pools, riffles and glides that had low wood densities).

The DEIS assumes that steelhead avoid unconstrained reaches. This assumption is simplistic as juvenile steelhead are typically observed rearing in unconstrained reaches with coho (*et al.*, Beechie *et al.* 2005a found steelhead rearing throughout the Skagit River mainstem, which is unconstrained). They may be at lower densities in low gradient sections, but this may be more a result of competition with coho than habitat selection.

The DEIS seems to assume that the quality and productivity of fish habitat are controlled solely by physical characteristics. This assumption is unwarranted, because a large amount of evidence supports the hypothesis that fish growth and survival are also dependent on aquatic productivity (*et al.*, prey availability). For example, unconstrained, low gradient channels that have a higher density of prey available will likely have a higher potential to support juvenile coho salmon than a similar stream with low prey density (*et al.*, Kiffney and Roni 2007). Furthermore, high gradient, confined reaches may be actually provide a high level of support for rearing coho and Chinook salmon if prey availability is high.

The DEIS assumes that channels with low geomorphic intrinsic potential (IP) for rearing habitat require less protection than channels with high intrinsic potential. This assumption is also unwarranted in that channels with low IP for juvenile salmonid fish may be important sources of water, sediment, organic matter or nutrients to channels with high intrinsic potential (Rice *et al.* 2001, Kiffney *et al.* 2006). In other words, the intrinsic potential of a river network is likely a result of habitat attributes as defined in the IP model, but also a result of important connections between habitat types and basal productivity. Therefore, conserving, restoring and protecting linkages among habitat and channel types may be a key action needed to increase populations of these fish species.

The DEIS definition of large wood is not the same as the definition of large wood used in the literature cited by the DEIS (Beechie and Sibley 1997) to estimate frequency of pool formation. For example, Beechie and Sibley determined that the minimum pool forming diameter of wood varies as a function of stream size and can be expressed by the equation:

Minimum pool forming wood diameter = 0.028*(Bankfull Width) + 0.0057,

and that pieces < 15 cm (6 in) diameter could form pools. However, the DEIS only considers wood > 50.8 cm (20 in) diameter at breast height (DBH) to be large wood. By excluding all pieces of wood < 20 inches DBH from their analyses, the DEIS grossly underestimates the importance of wood to the formation of pool habitat, and by extension the importance of riparian forests with trees < 20 inches DBH to instream habitat.

Another critical problem with the FPI (pp. H-1091-1092) is that it uses an incorrect equation (derived from Beechie and Sibley 1997) to estimate that:

The number of pools per channel width = 2.7 - 4.6(slope x LWD/m) + 1.6(slope).

Using this equation, one would erroneously conclude for example that a stream with no wood and a slope of 0.01 will have about 3 pools per channel width, which is extremely high. The equation should read:

number of channel widths per pool = 2.7 - 4.6(slope x LWD/m) + 1.6(slope),

which means that the distance between pools is three channel widths.

Using this inaccurate information, the DEIS erroneously concludes that the pool frequency ranges from a maximum frequency of 2 pools per channel width (with high wood loading) to a minimum frequency of 2.7 + 1.6*Slope (*et al.* about 3 pools per channel width for a stream gradient of 0.01). These results clearly contradict Beechie and Sibley (1997, Table 2 and Figure 3), which shows that fewer wood equals fewer pools, and that when there is no wood, estimate the distance between pools can be as great as 8 channel widths. The cause of this error is that the analysis confuses "pools per channel width" with the distance between pools, measured in channel widths. It is not clear how far this error permeates the DEIS.

Because the DEIS inappropriately applies the data from Beechie and Sibley (1997) to estimate pool frequency, and because these data are applied to estimate the FPI, the FPI appears to be inaccurate, and the conclusion that there is little difference (< 3%) in fish productivity among the four alternatives most likely is erroneous.

The DEIS states (p. 734) "relative proportion of the maximum potential watershed coho salmon productivity ... would increase from the current level of 38% to 2106 levels of 49%...", yet presents no basis or source of these values, nor does it discuss the uncertainty associated with each. Assessing the scientific basis for these claims is virtually impossible without a clear identification of the analytical assumptions underlying each result, and evaluating the meaning of any change is truly impossible without a statement of the confidence intervals surrounding these numbers.

The DEIS assumes that standing stock of wood accumulates without consideration of the reduction of wood from decay, floods, and other processes. This contributes to the conclusion that "large wood contributions would increase over time under all four alternatives..." (p. 729). Proper modeling of wood balance would include balance of inputs vs. outputs, such as decomposition, recognition of (bedrock) bed characteristics making reaches more porous to wood (May and Gresswell 1996, Montgomery 1996), and shifts between hardwoods (fast decomposition) and conifers (slower decomposition), to quantify changes in standing crop of wood in comparison to natural abundances of wood in streams.

There are also problems in defining as important only those trees > 150 feet high and > 20 inches diameter at breast height, so that harvest of any trees smaller than these dimensions has no effect on model outputs (*et al.*, there will be no change in the FPI). This makes it appear that Alternatives 2 and 3 have little effect on recruitment of large wood, and therefore the FPI, relative to the No-Action Alternative or Alternative 1. Thus, for example, the DEIS (p. 113) concludes that the large wood contribution from all four alternatives "Increases to near maximum in long term", and that the large wood contribution from Alternatives 2 and 3 is "slightly less" (than the No-Action Alternative). Both of these statements are incorrect. Alternatives 2 and 3 will substantially decrease the large wood contribution to fish bearing streams relative to the No-Action Alternative, and the decreases will be long-term. This is because thinning will remove wood large enough to form pools from the riparian zone (if the term large wood is defined by its ability to form pools rather than the arbitrary value of >20 inches diameter) (Beechie *et al.* 2000). Alternative 1 will substantially decrease the large wood contribution to fish-bearing streams from non-fish bearing streams relative to the No-Action Alternative.

Also, there is a problem in assigning equal value to wood delivered to fish-bearing streams from debris flows as is wood delivered to streams from direct riparian recruitment or channel migration. Since large wood delivered to fish bearing streams from debris flows occurs infrequently and tends to deposit large piles of wood in and around streams, most of which contributes little to important functions such as pool formation, it may not be appropriate to consider a piece of debris-flow derived wood as functionally equivalent to wood entering streams from other sources. Because the DEIS treats all sources of large wood equally, and estimates long term annual averages, it exaggerates the average amount of functional large wood that will be in streams. For example, a stream could have very little functional wood most years, but a debris flow that deposited a large pile of wood to the stream in a single year would then boost the annual average and potentially make it appear that there was, on average, substantial amounts of functional wood in the stream, when in fact that was not the case.
NMFS recognizes that a considerable amount of work went into the fish productivity model, but for the reasons described above, additional work is needed using: (1) more valid assumptions about functional wood sizes, value of wood from different sources, and wood longevity; (2) the correct equation for the number of pools per channel width; (3) a more realistic view of the totality of factors that may limit fish productivity; and (4) better disclosure of assumptions and methods used to estimate fish response to stream channel changes.

Nutrient Input

This short section (three paragraphs on p. 741) asserts that all four alternatives will maintain a level of allocthonous nutrient input that is similar to current levels, which may not be justified. The DEIS says on p. 741 that "...along non-fish bearing intermittent streams, some localized shifts in vegetation would occur because the riparian management areas would not include all of the areas that provide organic matter inputs to streams." In fact, these streams receive very little protection under Alternative 2 or 3, and organic matter inputs would be reduced. The FEIS should provide a more realistic analysis of the effects of the alternatives on nutrient inputs to non-fish bearing intermittent streams, and discuss how these changes relate to productivity of fish-bearing streams.

Fine Sediment Delivery

The DEIS states on p. 741 that the fine sediment delivery analysis will focus on changes in sediment that would "overwhelm the ability of fish to cope with or avoid the stress" of sediment. This section describes a linear comparison to equate the increase in stream sediment (1%) to a decrease in fish survival (3.4%). Assuming that this relationship is linear and can be applied universally across the plan area tends to over-simplify the variety of conditions found within the plan area. There is no analysis described in this section.

The DEIS (p.741) contends that "...thresholds have not been established for the levels of sediment delivery that would cause impairment to fish." There is a wealth of literature on the effects of fine sediment and aquatic organisms including salmon (*et al.*, Suttle *et al.* 2004), and although true thresholds are difficult to identify, it is certainly possible to establish management targets that avoid most sediment impacts on salmonid fish, their forage organisms, and their

habitat. Such an approach would require an analysis similar in depth to that completed for the in-stream wood issue in the DEIS.

The section concludes that there will be no effect to fish populations from increased sediment loads. This conclusion is based in part on an assumption of no additional landslides under increased intensity of land management due to use of the TPCC. Please see our comments about TPCC under Chapter 3, Fish, Sediment, above. The other basis for the conclusion appears to be reliance on the optional BMPs and the ability of fish to avoid turbidity. Relying on optional practices and potential avoidance behavior of fish does not provide a reasonable level of confidence that anadromous fish and their habitat will not be affected by this sediment.

The BLM should provide additional analysis and documentation for this section in the FEIS to address the issues described above.

Peak Flows

This short section (three paragraphs, p. 743) does not consider the potential effects of increased magnitude, duration, frequency, or timing of peak flows. This section should discuss how increased peak flows may affect the biological communities and primary constituent elements of critical habitat of listed salmonid fish within susceptible subwatersheds, as this is likely to be an issue during site-specific ESA consultations on timber harvest projects completed after WOPR is in effect.

Temperature

This one paragraph section on p. 743 primarily downplays the potential effects of increasing temperature in 31 miles of perennial streams within the Coquille Basin that are currently listed as water quality limited by the ODEQ for temperature. The reference to mitigation provides an optional suggestion to maintain additional canopy within the secondary shade zone, but the DEIS does not provide any meaningful assurance that the mitigation will be applied during project implementation. The FEIS should provide this assurance by modifying the strategy.

Considering that OC coho are proposed for listing as threatened under the ESA, the FEIS should provide a higher level of assurance that it will provide the necessary habitat conditions to maintain and recover their populations. It would be appropriate for the FEIS to make a commitment to complete mitigation, at the very least, that would restore temperatures on its lands within the Coquille Basin.

Based on the information presented above for Chapter 3, Water, Temperature, the preferred alternative (Alternative 2) is likely to increase water temperatures in some fish-bearing streams in the plan area. By increasing water temperatures in some areas, Alternative 2 is likely to increase risks to anadromous fish of: (1) increased adult mortality and reduced gamete survival during pre-spawn holding; (2) reduced growth of alevins or juveniles; (3) reduced competitive success relative to non-salmonid fish; (4) out-migration from unsuitable areas and truncation of spatial distribution; (5) increased disease virulence, and reduced disease resistance; (6) delay, prevention, or reversal of smoltification; and (7) potentially harmful interactions with other

habitat stressors (Zaugg and McClain 1972, Adams *et al.* 1975, Zaugg and Wagner 1973, Zaugg 1981, Reeves et. al. 1987, Berman 1990, Marine 1992, 2004, McCullough 1999, Dunham *et al.* 2001, Materna 2001, McCullough *et al.* 2001, Sauter *et al.* 2001, Marine and Cech 2004). This is one of the reasons NMFS is recommending that BLM work with us and EPA to amend the RMA delineations and management strategies in the selected alternative.

Water

Peak Water Flow

Streams are most susceptible to change in peak flows at scales smaller than sixth field watersheds (Grant *et al.* in review). Thus, individual logged reaches within a sixth field watershed could have peak flow increases that are masked by uncut reaches sharing the same sixth field watershed. The cumulative effects of multiple small watersheds having increased peak flows may include limited stream geomorphic change, since most small watersheds are dominated by large particle size (Grant *et al.* in review), but could increase fine sediment transport, with downstream deposition. The DEIS uses the sixth field as the scale for its analysis and therefore does not acknowledge the potential compounding effects of increased peak flows from multiple smaller subwatersheds.

Empirical and modeling studies summarized in Grant *et al.* (in review) suggest that at a minimum road-related processes increase peak flows; modeling studies for Washington suggest an approximate doubling of harvest-only effects (Grant *et al.* in review, p. 15). Road effects are not included in the DEIS analyses for either hydroregion. The FEIS should include the effects of road-related changes in peak flows for both hydroregions.

The DEIS analyzes only the magnitude of peak flows. It would also be appropriate to also consider the frequency and duration of peak flows and their effects to stream processes and the biological community. Lewis *et al.* (2001) found that the return interval for the largest peak flows was halved following clearcutting. Thus the largest peak flows did not increase in size, but doubled in frequency, "roughly doubling the geomorphic work on the channel."

Timing of peak flow changes should also be considered in the analysis. Lewis *et al.* (2001) found that peak flows increased after clearcut logging, but the increase was only significant at the beginning of the rainy season, when the soil is driest. These potential changes may have considerable effects on salmonid fish due to adults spawning at this time. Many of the changes in peak flow measured following harvest are within the yearly range of flows in studied watersheds (Grant *et al.* in review), complicating the ability to detect changes. However, the full range of flow responses should be considered to determine whether substantive changes in flow regime would occur following logging.

There are a number of reasons that the results of both paired small watershed studies and process models, such as those used in the DEIS, should be interpreted cautiously. The sample size described in the meta-analysis by Grant *et al.* (in review) relevant to the plan area is small (*et al.*, n=3 for 40-80% ECA rain-dominated systems), with a large amount of variability. Grant et al (in review) state that peak flow responses can be highly variable due to management factors

including roads, types and arrangements of harvest (*et al.*, clearcut vs. thinning, clumped vs. dispersed), as well as landscape pattern (Grant *et al.* in review, p. 53). Hydrologic process models (Lewis *et al.* 2001) and spatially distributed dataset models (Bowling and Lettenmaier 1998, Tague and Band 2001) have been developed and used in the Pacific Northwest and can incorporate some of these parameters. Rain-on-snow modeling used in the DEIS analysis apparently did not incorporate these parameters.

The FEIS should provide a validation or accuracy assessment for the peak flow models used in the analysis. The variability across the plan area and the fact that both analyses are untested within the plan area create low confidence that the results are reliable and accurate. Coupling these factors with the use of the largest spatial scale suitable to detect changes in peak flows further reduces confidence in the analysis.

Water Quality – Shade

Based on the information presented above for Chapter 3, Water, Temperature, NMFS disagrees with the assertion on p. 754 that under Alternatives 2 and 3, the riparian management areas along permanently flowing non-fish-bearing and fish-bearing streams would fully retain the shade that is necessary to block sunlight from reaching the streams and increasing their temperature.

Water Quality – Sediment

The DEIS asserts on p. 758 that sediment generation by overland flows (the mechanism for sediment from cutting and yarding timber) is not an issue because of high water infiltration in forest soils. The DEIS should provide references for this assertion in the FEIS. Log yarding and subsequent site preparation (*et al.*, prescribed burning, scarification prior to planting) can increase soil exposure, runoff, and surface erosion (Chamberlin *et al.* 1991). The magnitude of effects depends on the type of equipment used; the location (*et al.* proximity to stream channels), extent, and type of disturbance; slope; soil types; the time required for revegetation; and whether runoff can be concentrated by roads or other features. Under Alternative 2, ground disturbing activities will occur as close as 25 feet to perennial (including fish-bearing) streams, or up to the bank of intermittent streams not subject to debris flows. Because buffer widths needed for sediment filtration vary from 100 to 300 feet or more depending on slope, parent rock type, and other factors (Spence *et al.* 1996 p. 219, FEMAT 1993 p. V-38), NMFS predicts that Alternative 2 will increase fine sediment yield to streams in the plan area. Stream-side buffers are not effective in removing sediment carried in channelized flows (including intermittent streams) that originate outside of the buffer and continue through it (Belt *et al.* 1992).

The DEIS also asserts (p. 763) that shallow landslides will not increase over the next 10 years under any alternative because of the TPCC, and because of site-specific review of proposed activities. However, the DEIS has not provided information about the effectiveness of the TPCC withdrawals, or about the procedures, decision criteria, and effectiveness of the site-specific reviews. Because of the increased amount of timber harvesting under Alternative 2, NMFS assumes the risks of sedimentation from landslides will also increase.

Probable increases in sedimentation under Alternative 2 would increase risks that egg to fry survival of anadromous fish will be reduced, that pool volume and interstitial habitat that support rearing juveniles will be degraded, and that production of invertebrate forage organisms will decrease in affected stream reaches (Chapman and McLeod 1987, Gregory *et al.* 1987, Bjornn and Reiser 1991, Hicks *et al.* 1991).

NMFS recommends that the FEIS disclose the potential effects described above. Adjustments to the preferred alternative likely are needed to ensure that fine sediment yields are not increased in watersheds that are important to anadromous fish. As stated earlier, NMFS is willing to work with BLM to develop these adjustments.

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