PEER REVIEW OF WHITE PAPERS PREPARED IN 2006 FOR HYDRAULIC PROJECT APPROVAL HABITAT CONSERVATION PLAN:

SMALL-SCALE MINERAL PROSPECTING
OVERWATER STRUCTURES AND NON-STRUCTURAL PILINGS
BANK PROTECTION/STABILIZATION
WATER CROSSINGS

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for the
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Executive Summary

The Washington Department of Fish and Wildlife has the responsibility to “preserve, protect, perpetuate, and manage” the fish, wildlife, and shellfish resources of the state, including their habitat. The state Hydraulic Project Approval authority (RCW 77.55), administered by WDFW, is the primary tool for protecting and managing fish and shellfish habitat. The Hydraulic Project Approval authority requires that any work that will “use, obstruct, divert, or change the natural flow or bed” of state waters, saltwater or freshwater, must be conducted under the terms of a permit (Hydraulic Project Approval or HPA) issued by WDFW.

In order to assure the HPA program is in compliance with the Endangered Species Act (ESA) WDFW is developing a Habitat Conservation Plan (HCP). As part of the HCP development process, WDFW commissioned the development of four white papers in 2006 to summarize the state of the science relative to five hydraulic project types: Small-Scale Mineral Prospecting and Mining, Overwater Structures and Non-Structural Pilings, Bank Protection/Stabilization, and Water Crossings. To assure that these white papers are accurate and complete, WDFW commissioned PH2 Consulting Services LLC to coordinate a peer review of each one. The results of that peer review are the subject of this paper.

Five to seven experts in each topic were selected to conduct the review. Upon receipt of all comments, those for each white paper were combined and provided to each reviewer of that white paper. A meeting was convened for each white paper after reviewers had time to review the comments of other reviewers. Discussion of important topics for each white paper at these post-review meetings elicited additional comments.

Major issues the reviewers raised for the white papers are:

- Inadequate editing to assure consistency within and between white papers,
- Lack of consistent format, leading to variable and incomplete treatment of the various topics,
- Lack of a clear link between the subject activity of each paper and effects on potentially covered species,
- Inadequate treatment of operation and maintenance impacts,
- Lack of definition and inconsistent use of key term,
- Lack of definition and inconsistent treatment of cumulative impacts,
- Differential treatment of saltwater and freshwater aspects of the various impact mechanisms, and
- Inadequate presentation of recommended mitigation measures.

1. INTRODUCTION

The Revised Code of Washington (RCW) at RCW 77.04.012 directs the Washington Department of Fish and Wildlife (WDFW) to "preserve, protect, perpetuate, and manage" the fish, wildlife, and shellfish resources of the state. This mandate necessitates that the habitat that these resources rely upon must be properly protected and managed. The most important tool for doing so for fish and shellfish is the state Hydraulic Project Approval authority (RCW 77.55). The Hydraulic Project Approval authority requires that any work that will "use, obstruct, divert, or change the natural flow or bed of state waters" must be conducted under the terms of a permit (Hydraulic Project Approval or HPA) issued by WDFW. It applies to all fresh and saltwater areas of the state.

WDFW issues HPAs with conditions for the protection of fish and shellfish, including their habitats. Over 4000 individual HPAs are issued annually, with additional work approved under different general approvals. Activities subject to regulation under the Hydraulic Project Approval authority range, for example, from simple gold panning to construction of a major naval homeport facility.

To ensure that the HPA program is in compliance with the federal Endangered Species Act (ESA), WDFW has initiated an effort to develop a Habitat Conservation Plan (HCP) to support its application for an Incidental Take Permit (ITP) as provided in section 10 of ESA. The application must be approved by the National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries; sometimes referred to herein as NMFS) and United States Fish and Wildlife Service (USFWS), collectively referenced as "the Services."

Extensive of administrative rules (Washington Administrative Code [WAC] 220-110) guide implementation of the Hydraulic Project Approval authority. The rules include the major conditions, called technical provisions, that are commonly incorporated into HPAs. These rules, last comprehensively revised in 1994, will be an important element of the HCP. In preparation of the HCP, the rules will be reviewed and may be revised to help ensue adequate protection of fish, shellfish, and their habitats.

Revised WACs must be based on the most recent and best science. In order to assure this, in 2006 WDFW contracted with Anchor Environmental and its sub-contractors to complete four white papers to evaluate the potential impacts, potential for take (as defined under ESA), potential mitigation and conservation measures, and data gaps for five hydraulic project types types: small-scale mineral prospecting, overwater structures, non-structural pilings, water crossings, and bank protection. Overwater structures and non-structural pilings were addressed in a single white paper. White papers on other relevant activities will be completed in 2007.

The Services recommend that information prepared in support of a HCP undergo technical (peer) review to ensure that it is accurate, complete, and adequately rigorous. The peer review of the four white papers prepared in 2006 is the subject of this report. Objectives of the peer review were to:

- Provide the scientific community with a venue for reviewing the documents and methods developed in support of the HCP.
- Identify potential shortcomings in the information or additional relevant information.
- Assess the adequacy of management and mitigation measures presented in the white papers and identify additional management and mitigation measures suggested by the reviewers.

The results of the peer review are the subject of this report.

Following the Introduction, the peer reviewers' comments on each white paper will be summarized in turn, along with a summary of the most important issues raised.

1.1 Reviewer Selection Process

The peer review coordinator (coordinator) was presented an initial list of technical experts as potential peer reviewers for each white paper as recommended by WDFW staff members. Others were added to the initial list based on peer review coordinator, tribal, and other recommendations. Potential reviewers came from academia, Washington treaty Indian tribes, the Services, other federal agencies, private industry, and state government agencies other than WDFW.

Each potential reviewer was contacted by email and regular mail and asked if he or she would be willing to participate in the peer review and to submit a copy of his or her resume, Curriculum Vitae, or other showing of expertise to review the white paper. Those who did not respond to the initial contact were subsequently contacted by telephone. Several potential reviewers did not respond to any of the contacts.

Initially, the intent was to select from three to five reviewers for each paper. Because of the favorable response, however, it was decided to add additional reviewers.

It is important that the peer review process not be tainted by even the appearance of bias among the reviewers. Each potential reviewer was asked to respond to a series of questions that would have disclosed any bias or appearance of bias. None of the potential panelists was disqualified on this basis.

1.2 Review Panels

Twenty-one individuals participated in the review; two individuals each reviewed two of the white papers. The number of reviewers that actually participated ranged from five to seven per white paper. The reviewers for each white paper are listed in Table 1.

Table 1
Technical experts selected to review the four white papers

White Paper	Name	Affiliation
Small-Scale Mineral Prospecting	Bret Harvey	United States Forest Service, California
	Aaron Prussian	United States Forest Service, Alaska
	Michal Rechner	Washington Department of Natural Resources (DNR)
	Thom Seal	Newmont Mining Company, Nevada
	Sheri Sears	Colville Confederated Tribes
Overwater Structures and Non-Structural Pilings	Jim Brennan	Washington Sea Grant (WSG)
	Carol Cloen	Washington Department of Natural Resources (DNR)
	Kurt Fresh	National Oceanic and Atmospheric Administration—Fisheries Service (NOAA Fisheries)
	Tom Ostrom	Suquamish Tribe
	Charles “Si” Simenstad	University of Washington (UW)
	Emily Teachout	United States Fish and Wildlife Service (USFWS)
Bank Protection/Stabilization	James Brennan	WSG
	Stephanie Ehinger	NOAA Fisheries
	Doug Myers	Puget Sound Partnership
	Ken Schlatter	Washington Department of Transportation (DOT)
	Hugh Shipman	Washington Department of Ecology
	Charles “Si” Simenstad	UW
	Larry Wasserman	Swinomish Indian Tribal Community
Water Crossings	Scott Anderson	NOAA Fisheries
	Kirstin Holsman	People for Puget Sound
	Russ Ladley	Puyallup Tribe
	Neil Rickard	DOT/NOAA Fisheries
	Ken Schlatter	DOT

1.3 The Review Process

Following distribution of the white papers to the selected reviewers, three pre-review meetings were held in mid-June; each selected reviewer was asked to attend any one of the three. The purpose of the meetings was to:

- Explain how the white papers fit into the overall HCP development process.
- Describe the peer review process.
- Explain how the reviewers' comments will be utilized.
- Present reviewers with the Microsoft Word table in which to submit their comments.
- Review the time lines.
- Answer any questions reviewers might have.

A summary of the pre-review meetings is presented as Appendix B.

Reviewers were asked to submit their comments by the end of July. Following receipt of the comments for each white paper, the peer review coordinator combined all comments into one table for each white paper. The combined comments tables for each of the four white papers are individually presented in Appendices C through F.

Each of the reviewers was provided a copy of the combined comments table for the paper(s) they reviewed and asked to provide any additional comments they might have in light of comments made by other reviewers. In mid-September, a post-review meeting was held for each white paper. Reviewers were asked to attend the meeting for their white paper and most were able to do so in person. At the meetings, areas of disagreement among reviewers were identified and discussed. Additional areas of disagreement were identified as reviewers considered the comments made by others (which they of course did not have when the conducted their initial review). Most areas of disagreement were resolved, but a few remained. The most significant disagreements were in regard to the Small-Scale Mineral Prospecting paper. Remaining areas of disagreement are identified in the discussion for each white paper in sections 2 through 5. A summary of the post-review meetings is included in Appendix G.

The discussions of the individual white papers in this report include a summary of the written comments submitted by the reviewers as well as those made at the wrap-up meetings.

Additional white papers on other HPA topics are being developed in 2007; still other might be prepared in 2008. These will also need to go through a peer review process. A number of lessons were learned during this review process that will facilitate future peer reviews. They are presented in Appendix H.

1.4 Final Report Preparation Process

The peer review coordinator is the author of this final report. A draft of the final report was presented to each of the peer reviewers for their comments. They were particularly asked to determine if the report adequately and accurately recorded the areas of agreement and disagreement, especially as related to the mitigation and conservation measures. Reviewer's comments in this regard were considered and incorporated as appropriate in the final report.

1.5 Comments/Criticisms Applicable to All White Papers

There were several reviewers' comments/criticisms that applied generally to all four of the white papers:

- There were numerous literature citation problems. Many citations went to a secondary rather than the primary sources—which apparently were not consulted by the authors; reviewers were unable to locate and consult many documents—some because the citation was not accurately provided; gray literature was cited when refereed citations were available; gray literature generally seemed to be considered of the same quality as refereed literature; important information sources were not cited; and information in some references was erroneously characterized.
- Numerous authors were apparently involved in each white paper, and the papers generally suffered from a lack of appropriate editing to achieve consistency and cohesiveness within and between papers.
- There was a general lack of consistency in approach between and within the different white papers, especially with respect to cumulative effects and proposed mitigation measures.
- Several key terms were not defined, were misused, and/or used variously by different authors between, and even within, white papers: "mitigation," "cumulative effects," "compensation," "minimize", and others.
- Except for the Small-Scale Mineral Prospecting white paper, which only discussed freshwater areas, freshwater and marine or estuarine areas were variably addressed. In many cases freshwater was discussed to the complete exclusion of the others and vice versa; in same instances it was not possible to determine which area the discussion was in reference to; lakes were often totally excluded; some discussions of one area could have been extrapolated to others, but were not; and in some cases reviewers felt that extrapolation from one to the other that was made was inappropriate.
- The working definition of cumulative impacts was offered for only one paper, but was too general to be of much value. Cumulative impacts were addressed differently between, and in some cases within, sections of each white paper. Since "cumulative impacts" was not defined or not well defined, reviewers tended to use their own definition and commented accordingly, which then compounded the problem.

- The white papers did a poor job of discussing how the activity that was the subject of the white paper triggered the various impact mechanisms and carrying that through to effects on fish and shellfish species potentially to be covered by the HCP.
- Proposed mitigation measures generally were not presented in any organized fashion. As summarized in section 11 of each white paper, they did not include all that were mentioned throughout the text, did not seem to flow from the discussions of impacts, and in some cases generally seemed to be simply a "grab bag."
- The conceptual framework presented for impact assessment was not helpful.
- White papers would have benefited from a discussion of mitigation sequencing, with protection, conservation, mitigation, and management strategies organized in terms of that sequencing.
- Although not endorsed unanimously, many reviewers felt, since much of the paper was based on professional judgment, that identification of the individual authors and their qualifications would have been helpful.
- The same basic formation on the distribution, habitat requirements, and biology of the potentially covered fish and shellfish species was presented in each of the papers. Many reviewers felt there were too many errors in the distributions, habitat requirements, and biology tables for them to be useful.

1.6 Format for Presentation of White Paper Peer Review Comments

The rest of the body of this report is a summary of the peer reviewers' major comments on each white paper, including those submitted in their written comments as well as those made verbally at the post-review meetings. Comments by the reviewers were submitted by section and sub-section per the table within which they were to submit their comments to the peer review coordinator. This summary follows the same format.

Unless a comment reported herein is in the general format of "one reviewer commented (or noted) that . . ." it is intended to represent the consensus of the reviewers. A comment in this format does not necessarily mean that others disagreed; but just that only one reviewer made that particular point.

To facilitate referencing back and forth between this report and the white paper, the numbering in this section equates to the numbering in the white paper, with a 2 in front. Thus, for example, 2.1 in this report equates to 1 Introduction in the white paper; 2.7.3.1 equates to 7.3.1 Excavation Holes. Reviewers did not comment on every section of the white paper and those sections without comments are not included in this paper. As a result, the numbers in this paper are in order, but not strictly sequential.

1.7 "Crosswalk" With Previous Recommendations for Mitigation Measures

In 2006, the author of this report prepared *Identification of Discrepancies Between Existing Hydraulic Code Rules and Statutory Requirements, State and Agency Policies and Procedures, Other Administrative Guidance and Technical Guidance Documents* in support of WDFW's Hydraulic Project Approval HCP development process. This earlier report recommended WAC amendments necessary to comply with the legal requirements and administrative and policy guidance in the reviewed documents. Appendix I of this report establishes a crosswalk between the conservation and mitigation measures recommended by the white paper authors and peer reviewers and those of the 2006 report.

2 Peer Review of Small-Scale Mineral Prospecting White Paper

Five people reviewed the Small-Scale Mineral Prospecting white paper. Their individual qualifications can be found in Appendix A. The written comments and those made at the post-review meeting are summarized below following a brief statement of the key issues that reviewers raised. Reviewers' written comments are reprinted in their entirety in Appendix C. Note that since this report includes written and verbal comments by the reviewers, all comments summarized below will not be found in Appendix C.

Reviewers' comments on the white paper follow the listing of key issues raised by reviewers, beginning with the EXECUTIVE SUMMARY. Comments on tables and figures are reported at the appropriate place in the text.

Key Issues Raised by Reviewers

1. One reviewer commented several times that:

- Only directed studies of small-scale mineral prospecting should be used, Inferences from other studies are inappropriate, biased, and unprofessional.
- No regulatory changes should be considered for small-scale mineral prospecting until directed studies are completed and show the need.
- The white paper is unscientific, biased, and represents a pre-determined political agenda.

Other reviewers did not concur in this assessment.

2. WDFW provided the authors with 57 HPAs issued during 2006 for small-scale mineral prospecting operations that were not covered by the standard provisions in the Gold and Fish pamphlet. These were only a sample and do not represent all HPAs issued in 2006 for small-scale mineral prospecting. However, they were misused in several places in the white paper to characterize small-scale mineral prospecting throughout the state.

3. Because of its linearity and simplicity, reviewers generally did not think the conceptual framework for assessment was helpful or appropriate to discussion of the impacts of small-scale mineral prospecting. In some cases it may even have reduced the clarity of the white paper.

4. The authors generally satisfactorily reviewed the literature relative to the seven impact mechanisms. However, most of the relevant fish studies are of salmonids. They did not adequately use their professional expertise to extrapolate to potentially covered non-salmonid species.

5. Reviewers expressed disagreement about many of the conclusions the authors reached about the effects of small-scale mineral prospecting on fish and shellfish. WDFW presently has little information on the distribution and extent of mineral prospecting

activity. The authors did not take this into account. Therefore, reviewers thought many conclusions were not supportable.

6. One study of the impacts of wading by anglers was erroneously characterized as wading by miners. While this was probably an inadvertent error, it may cast doubt on use of the literature and conclusions reached elsewhere. This was especially significant in this white paper as much of the literature relied upon is not directly related to small-scale mineral prospecting and because one reviewer felt use of such literature is not appropriate.

7. The studies were often described as to their effect on “fish,” “salmonids,” or “potentially covered species.” It would have been much more helpful to know the actual species involved.

8. The authors acknowledge that risk of take for the various impact mechanisms depends in part on the size of the stream. In the mitigation measures section, they recommend that regulation be based on stream size. It would have been helpful had this aspect been taken into account in discussing impacts and in risk assessment.

9. Some Gold and Fish pamphlet contents and requirements were mis-stated. It was erroneously stated that:

a. All streams in the state have an approved work window (many have no work window but require an individual HPA; some are closed to mineral prospecting).
b. It requires prospectors to avoid shellfish beds and fish spawning areas (it requires that eggs and fry be avoided—not spawning areas).
c. It **requests** that small-scale mineral prospecting avoid disturbing fish eggs and fry and avoid streams closed for spawning purposes (it **requires** avoidance of eggs and fry at all times mineral prospecting is allowed. It does not **request** avoidance of streams closed for spawning purposes, but requires an individual HPA for any mineral prospecting activity proposed outside of the specified work windows.

10. Two mitigation recommendations were essentially the same and should have been combined. They call for work windows that are appropriately protective of fish and eggs. If this is accomplished, several other recommendations become unnecessary. The text noted several shortcomings of the present Gold and Fish pamphlet, but the authors had no recommendations to address the shortcomings.

EXECUTIVE SUMMARY

The executive summary should essentially be a stand-alone document stating the key points of the document. Some reviewers noted that this executive summary does not do that.

In this section and throughout the report, the usual reference is to small-scale mineral prospecting. In RCW 77.55.011(14), small-scale mineral prospecting is defined as "the use of only the following methods: Pans; nonmotorized sluice boxes; concentrators; and minirocker boxes for the discovery and recovery of minerals." However, this paper also considers the use of dredges. The distinction between the statutory definition and the subject matter of the paper should have been made explicit. In this report, "prospecting" usually refers to both prospecting and mining.

One reviewer introduced a theme of comments that were restated a number of times throughout the reviewer's comments. As the comments were similar throughout the document, they are summarized here and noted in the rest of the document when the reviewer addressed information specific to the section of the paper.

- The reviewer's position is that it is inappropriate to make any inferences on impacts of small-scale mineral prospecting or appropriate conservation or mitigation measures from studies not directly related to small-scale mineral prospecting. Professional judgment should not be used to make inferences from papers not specifically related to small-scale mineral prospecting. For example, the reviewer felt that studies that showed significant impacts on eggs and alevins in salmonid redds from wading was not relevant to prospecting because the wading was by fishermen, not miners. There must be a clear path from the science to the impact and to the recommended measure. Inferences from other studies are biased, inappropriate, and unprofessional.
- The reviewer felt that there should be no additional conservation or mitigation measures applied to small-scale mineral prospecting until sufficient directed studies of small-scale mineral prospecting are completed and the measures are shown to be necessary.
- The reviewer stated several times that the white paper is an unscientific "white wash" paper, is biased, and represents a pre-determined political agenda.

During the post review meeting to discuss the comments, the other reviewers disagreed with this point of view. They felt it would be ideal to have information specific to small-scale mineral prospecting, but that relying solely on such information is not realistic. They stated that one must apply professional judgment to the most applicable science and proceed accordingly, recognizing the shortcomings of using professional judgment. They did not agree that the white paper represented a white wash, was biased, or politically motivated.

With respect to Table ES-1. One reviewer stated that only studies from small-scale mineral prospecting should be used.

2.1 Introduction

One reviewer stated that specific scientific studies must be undertaken to demonstrate an activity would result in "take." Inferences from non-related studies are biased, inappropriate, unprofessional, and not sound science.

2.2 Objectives

One reviewer commented that estimating circumstances, mechanisms, and risk of incidental take from best available information is not sound science. Only a specific scientific study will be sound science. This reviewer also commented that the only way to reduce potential risk of take is to prohibit the activity

2.3 Methodology

One reviewer commented that internet searches using Google are not scientifically sound. An appropriate literature review of scientific works includes an exhaustive review of professional journals on the subject through "for fee" abstract services. (Coordinator's note: The authors refer to documents secured as a result of keyword searches on the internet and in "other literature databases." It would have been helpful had these other literature databases been named.)

This reviewer also commented that the white paper is more like a "white wash," referencing that WDFW staff had commented on a draft of the paper. The reviewer referred to the staff as having "political opinions with an agenda" and stated that the white paper was an "unscientific opinion concluded and expressed by the authors of woven fragments of science pieced together and taken out of context to support a predetermined conclusion supported by those that funded this work."

Regarding Table 1, one reviewer stated that kokanee above Chief Joseph Dam should be included; it is a tribal sensitive species and being considered for ESA listing. (Coordinators note: sockeye salmon includes both anadromous and resident forms.) Green sturgeon should be noted as federally threatened. Table 1 refers to potentially covered freshwater and anadromous fish "and wildlife" species. No wildlife species are included in the table and none are being considered for inclusion in the HCP.

2.4 Activity Description

One reviewer commented that the 1999 Gold and Fish pamphlet has served as the HPA for 8 years and wondered if there was any sound science that showed an endangered or threatened species has been taken when a small-scale prospector was following permit guidelines.

2.4.1 Definitions of Small-Scale Mineral Prospecting

It is unclear from this section whether or not suction dredges are included in the definition of small-scale mineral prospecting. It should have been made clear that they are not included in the definition, but are considered in this white paper as they were included in the 1999 Gold and Fish pamphlet.

2.4.2 Gold and Fish Pamphlet

Here, and elsewhere in the report, it is erroneously stated that every stream in the state has an allowable work window. Some streams are closed to small-scale mineral prospecting; others require an individual HPA for any prospecting.

One reviewer thought this sub-section is good, but needs to list citations of references for scientific studies based upon species before, during, and after prospecting using the Gold and Fish pamphlet as a HPA.

Table 2 shows highbanking/suction dredging as a combination activity for class III. The text in 2.4.2 states "Aggregate is supplied to the highbanker by means other than suction dredging." This is not clear.

2.4.3 Other HPA Permitting Options

One reviewer commented that the text in this section and Table 2, referencing where Class I and Class II mineral prospecting activity can take place, use the phrase "200 ft landward of OHWL (Ordinary High Water Line)." The reviewer suggested that this should be stated as "**past** 200 ft landward of OHWL" to avoid possible misinterpretation.

2.4.4 Environmental Setting and Geographic Location of Small-Scale Mineral Prospecting Activities.

In the text of this section and in tables 3 and 4, the authors use 57 individual Hydraulic Project Approvals (HPAs) provided them by WDFW to reflect overall statewide mineral prospecting distribution and frequency of use of the four classes of equipment. These HPAs were only a sample and do not represent all HPAs issued for prospecting activities. They do not reflect the broader interpretation made by the authors that they reflect statewide distribution of prospecting effort.

Since activities occurring under the Gold and Fish pamphlet are not tracked, it is not possible to determine the geographic scope of mineral prospecting in the state with any degree of confidence.

2.5 Species and habitat use

The term "work windows" should be defined.

One reviewer noted that Table 5 does not contain the potentially covered species by county as per the table title--it just lists the county, work window, and WRIAs (Watershed Resources Inventory Areas). Another reviewer felt that the authors should use only "covered species" in tables 6 and 7 and list the status of each (as they did in Table 1). It was also noted that the contractor for this white paper wrote the three other white papers that were developed in 2006 as well. There are minor discrepancies in the species distribution data among them.

With respect to Table 6, one reviewer commented that it is unclear what "Columbia and Snake Rivers" means for white sturgeon, mountain suckers, and sockeye salmon. Specifically, are WRIAs that include those rivers included in the range or just the portions of those rivers that occur within the WRIAs listed? The information presented in Table 6 Range of Potentially Covered Freshwater and Anadromous Species is a sub-set of information on all 52 potentially covered species (others are marine fishes) that was presented in the other three white papers. Reviewers of the other papers commented that there are much better references for juvenile fish distribution than Wydoski and Whitney (2003).

With respect to Table 7 Habitat Requirements of Potentially Covered Species the genus is misspelled for both dace species (it should be rhinichthys). Another reviewer stated that the table should use only "covered species" and should list the status of each. Still another reviewer noted that redband trout on the east side of the Cascades are able to tolerate higher stream temperatures and lower oxygen levels than the coastal form of the rainbow trout as recorded in the table. This native species evolved with the warmer stream conditions found in many Eastern Washington streams. They are being recovered in several streams and lakes and rapidly replacing the stocking of coastal rainbow trout. Steelhead in the Okanogan enter the streams for spring spawning and fry emerge in July.

Table 7 was presented in all four white papers. Reviewers of the other white papers generally found the table not useful. It is too brief to be of value and there are too many inaccuracies and inadequacies to point out individually. If this is to provide important indicators of habitat and other dependencies, someone who is more knowledgeable needs to provide this information. This was particularly true for marine and estuarine species, which is not a concern for this white paper, but pertained to anadromous and freshwater species as well.

2.6 Conceptual Framework for Assessing Impacts

Reviewers generally did not see the reasons for or the value of this section and thought the framework overly simplistic. It seems that the "habitat processes" box doesn't fit well and that the framework should split after the habitat structure box, leading to both the habitat processes and ecological functions. An explanation of how this section is pertinent to the development of the seven impact pathways would have been helpful. As written, there is little discussion about the relationship between the impact pathways and the impact mechanisms or why the framework is relevant.

One reviewer noted that Figure 2 Conceptual Framework for Assessment is a conceptual model, not a scientific study.

2.7 Direct and Indirect Impacts

In the discussions of the various impact mechanisms, the available literature on the effects of the particular mechanism on fish and shellfish is discussed. For most mechanisms, there is no effective or succinct conclusion as to how potentially covered species might be impacted. Furthermore, it is difficult to attribute a level of significance to the discussed direct and indirect impacts since WDFW does not collect comprehensive information on the distribution and intensity of mineral prospecting effort.

It would have been helpful had the discussion of impacts been in relation to stream size, at least in a qualitative sense. In much of the discussion, the authors did not give any indication of the size or other characteristics of the streams that were studied. The information is finally given in Table 14 near the end of the report. It would have been more helpful in assessing the impacts relative to Washington streams if it had been presented along with the discussion of the studies.

Paragraph 1 states that "The following discussion describes the impact mechanisms and how each mechanism is linked to essential life-history traits or particular habitat requirements of potentially covered species." But in large part the white paper does not effectively link to potentially covered species. Many sections make no effort at all to do so.

One reviewer commented that the white paper does not present any sound scientific link with small-scale mineral prospecting and the conceptual impact pathways. This reviewer also disagreed that it was acceptable to use related research as a surrogate when directed research was not available. The reviewer stated that in the white paper there are no quotes from the scientific literature cited—only generalizations and inferences, conceptual models, associated mechanisms, and surrogates. There is not a clear path from the conceptual model to sound science.

With respect to Table 9, it was noted that several items listed as literature cited are not listed as literature reviewed. One reviewer stated that only sound scientific studies from small-scale mineral prospecting should be used.

2.7.1 Excavation/Entrainment

One reviewer felt that the sentence in the first paragraph: "Entrainment of biological resources is likely a greater issue with suction dredging than with other techniques" is too subjective given that the scope and extent of prospecting activity in the state is unknown. It would be accurate if the comparison were an individual dredge as compared to an individual of the other technique types. As stated, the sentence seems to refer to the broader context of overall dredging activity (in Washington) as compared to overall activity of other techniques. Without information on the extent of use of the various types of equipment, it is not possible to state that suction dredging in the broader context is the greater issue.

2.7.2 Wading

In this discussion the authors erroneously describe a study of impacts on incubating salmonid eggs and fry from wading by anglers as being wading associated with mineral prospecting operations. While this likely is an inadvertent error, it can cause one to question their reporting of other studies.

This section should also have discussed that wading likely impacts the macroinvertebrate food source and thus indirectly affects potentially covered species. Or it could reference the Prey Base Alterations section and have the discussion there. But there is no such discussion either here or in the Prey Base Alteration section (7.6).

2.7.3 Substrate Modification/Channel Hydraulics

As in some other sections, this section sometimes refers to studies of "fish" and "salmonids." It would have been more meaningful if the species had been named. It also mentions the likely impact on "potentially covered species." It would have been more meaningful to name which of the potentially covered species might be impacted.

2.7.3.1 Excavation Holes

The sentence "Substrate changes in two California streams, as a result of small-scale mining activities, influenced macroinvertebrate density and diversity (Harvey 1986)" would seem to be more appropriate with respect to 2.7.6 Prey Base Alterations.

There is a reference to the potential for dewatering and stranding of fish in created depressions or holes and their susceptibility to predation. It should also have mentioned the possibility of increased temperatures in such areas and the potential lethal effects.

One reviewer noted the acknowledgment that “limited scientific information is available regarding the effect of mineral prospecting on stranding,” and “no observations of stranding have been reported in the literature to date.” The reviewer stated that without scientific studies, there is no clear path to any recommended measure. The reviewer cited as an example of sound science the finding (paragraph 7.3.2 in the white paper) that salmonid fish have been documented to spawn in previously dredged areas. After citing this finding, the authors of the white paper state it has been postulated that such spawning may be less successful in such areas due to the loosely consolidated nature of the tailings. The reviewer noted there is not a clear path from sound science to the postulation. Similarly, the reviewer noted lack of sound science in the authors’ statement that harm can come to eggs and pre-emergent fry if sediment is deposited after spawning. This reviewer went on to make the general observation that the white paper has too many instances of “can,” “could,” “ may,” “ has the potential,” and the like, leading to inferences that are inappropriate, without a clear path, and with an unprofessional judgment resulting. The reviewer concluded that this is not sound science.

This reviewer noted further that the several NOAA Fisheries Biological Opinions that are cited are not sound science

2.7.3.2 Deposition of Tailings

The sentence in the first paragraph “The benefit or impact of this material in the stream channel will depend upon the particle size and the depth of deposition” is unclear because "benefit or impact" is a disjunction. The authors here and throughout the white paper often use “impact” with a negative connotation. Since an impact can be positive or negative, it would have been more appropriate and clearer had they explicitly stated “negative impact” when that was the meaning, as is the case here.

Harvey (1986) provides clear evidence of a negative response of riffle sculpins to elevated substrate embeddeness due to dredging. This result should be relevant to at least some of the potentially covered fishes, e.g., Cottus marginatus. One reviewer noted examples of citations that do not provide direct evidence for a statement

The meaning of the last sentence in paragraph 5 is unclear; lack of water exchange through a spawning nest (redd) wouldn’t reduce survival and production **of** juvenile year classes. It would reduce survival from egg to emergence (which presumably, absent any compensatory mortality, would reduce survival **to** juvenile and all subsequent life stages).

Referencing the first sentence in paragraph 6, also important to the likelihood that small-scale mineral prospecting will generate sufficient levels of sediment to reduce survival would be the total quantity of material moved and the location of the mineral prospecting activity in relation to spawning areas.

Gold & Fish doesn't request prospectors avoid disturbing eggs and avoid closed streams as stated in paragraph 7; it requires that they do.

The last sentence states "In all cases, the effects appear to be short in duration." But even short duration effects can have direct, indirect, and cumulative effects. Since the scope and extent of the activity is unknown, the statement may not be supportable.

2.7.3.3 Channel Morphology

The meaning of the statement that Miller et al. (2001) and Bolton and Shellberg (2001) papers are "incorporated by reference" is unclear. The statement (referencing Knutson and Naef 1997) that seventy percent of structural diversity within a stream is derived from root wads, trees, and limbs that fall into the stream is too generalized.

The authors attribute a finding that silt layers remained observable a year following suction dredging to Harvey (1986). One reviewer disagreed that there was such a finding reported in that paper.

One reviewer suggested Suttle et al. (2004) for additional information on the influence of substrate embeddedness on invertebrates (Suttle, K. B., Power, M. E., Levine, J. M., and McNeely, C. 2004. How fine sediment in riverbeds impairs growth and survival of juvenile salmonids. Ecological Applications 14:969-974). The reviewer also noted that the issue might be less about overall abundance than about differences in vulnerability to predation by fish.

Another reviewer noted that the findings of high incidence of stream damage from suction dredging (Table 10) indicate that a high level of compliance monitoring and enforcement will be necessary in Washington.

Also regarding Table 10, a third reviewer noted that more sound science is needed. This reviewer noted that there is not a clear path or direct quote from cited literature to potential alterations to channel morphology resulting from mineral prospecting activities.

2.7.4 Water Quality Modifications

The Ecology study on the Similkameen River also looked at contaminants. That aspect of the study should have been described here. The discussions on the impacts from metals, water temperature, and petroleum products are scattered within different sub-sections. They would have been better presented and understood had they been separate discussions for each of the three.

There are several examples throughout this section of conclusions that are difficult to support given the unknown distribution and extent of small-scale mineral prospecting activity throughout the state.

Water quality modifications are dependent on the existing level of contamination in the water and sediments. In areas, such as the upper Columbia River and below Hanford, that have high levels of contamination, disturbance can re-suspend heavy metals and other contaminants and transport them downstream. One reviewer recommended such areas be closed to mineral prospecting. Another suggested there might be an opportunity for miners to participate in cleanup of contaminated areas.

The authors refer to the dredges in the Alaska studies of effects of dredging on water quality as "large" and "small." Specific sizes would be more meaningful. Harvey (1986) includes turbidity information that should have been included.

2.7.4.1 Suspended Solids Impacts on Fish

It should be noted that at least in some circumstances, predation can be reduced by increased turbidity (per Gregory, R. S. and Levings, C. D. 1998. Turbidity reduces predation on migrating juvenile Pacific Salmon. Trans. Am. Fish. Soc. 127:275-285). There is a statement (paragraph 6) that there is a sublethal threat of harassment resulting from suspended solids because feeding patterns may be affected and fish are likely to avoid areas of increased turbidity, but the nature of this threat is not stated or the species of fish involved.

In paragraph 6 is the statement "Specific to small-scale mining, NMFS concluded potential increases in turbidity as a result of suction dredge activities in Lolo Creek, Idaho, would have negligible impacts on listed steelhead trout and their habitats (NMFS 2006o)." This would be much more meaningful if the nature of Lolo Creek was described and there was some indication of the nature and magnitude of the mineral prospecting activity. Also in this paragraph "NMFS found that elevated turbidity can cause direct mortality." The conclusion that there would be negligible impact seems at odds with the findings the authors present. To evaluate this, it would be necessary to know the levels of turbidity reached and the duration.

One reviewer commented that the available evidence suggests that biologically meaningful negative effects on populations, in many settings, are not likely, assuming commonly observed dredge densities. Another commented that this is not a supportable conclusion in Washington given the lack of information on distribution and extent of activity.

There is also the possibility, especially in smaller streams, that there could be a negative effect on primary production from elevated levels of suspended solids. This should have been discussed.

One reviewer cited the lack of sound scientific studies comparing the effects of small-scale mineral prospecting with winter and spring runoff effects on water quality. The reviewer also noted there is no clear path from the reviewed literature to impacts cause by small-scale mineral prospecting. The reviewer specifically pointed out the authors' reference to Biological Opinions (BOs) and the conclusion that activities that allow considerable increase in suspended sediment have a high risk of incidental take, and stated that there is not a clear path from the BOs to incidental take. The reviewer further stated that BOs are not sound science. They are just opinions and inferences and they are biased.

2.7.4.2 Suspended Solids Impacts on Invertebrates

The authors state "Water temperature has not been found to be affected by small-scale gold mining operations (Stern 1988; Hassler et al. 1986)". One reviewer noted that small pools created by mineral prospecting activities have the potential to overheat and kill stranded organisms.

One reviewer noted again that conclusions regarding effect of turbidity on mollusks and primary production might not be supportable due to lack of information on scope and extent of small-scale mineral prospecting in Washington. Another noted that it is not sound science to infer potential effects based either on the life history characteristics of the potentially covered invertebrate species or other similar shellfish species as the authors do in this section.

2.7.5 Channel Dewatering/Obstructions

It should also be noted that channel dewatering can also lead to overheating of the water and the potential secondary lethal and sublethal effects of that.

The conclusion that the risk of take due to upstream passage delay of migrating fish is considered low (because of the Gold and Fish pamphlet requirement that no more than half the stream channel be blocked by a diversion) is too general. Blocking half a stream in many cases can effectively preclude upstream passage of salmonids. One reviewer noted that the Gold and Fish pamphlet requirement seems adequate.

2.7.6 Prey base alteration

The authors cite Harvey et al. (1982), noting that they found the effects of dredging on invertebrates to be localized. Harvey et al. (1982) is a non-refereed laboratory report. The information that was included in the laboratory report was also in Harvey (1986), a refereed journal article that should have been cited instead.

The authors cite NMFS (2006o) as concluding that dredging on LoLo Creek, Idaho would not likely affect availability of fish food, in part because almost all food of juvenile salmonid fish is related to water column drift. This is suspect because salmonid fishes feed heavily from the benthos under certain conditions. With the exception of terrestrial insects, drifting invertebrates come from the benthos.

The impact of wading on food resource should be included as a potential negative impact on the prey base.

In the second paragraph the authors seem to be saying depleting the population of invertebrates is acceptable if they do not go below severe depletion. Even if there is not severe depletion, the distribution of prey and therefore the feeding areas of fishes can be adversely impacted.

Referencing the studies in Idaho (seventh paragraph) that showed low injury or mortality of macroinvertebrates that passed through a 3-in dredge, one reviewer noted that the severity of negative impacts on invertebrates differs significantly depending on dredge size. Two-inch dredges are more commonly used in Washington. If there are not similar studies for 2-in dredges, this should be listed as a data gap.

2.7.7 Disturbance

"Channel disturbance" during instream activity is mentioned but there is no definition of what this is. This is the only place this is mentioned in discussions of disturbance. Elsewhere (e.g., Table 8) this mechanism is called "human disturbance" and described as human disturbance (e.g., noise) along the channel during small-scale prospecting.

2.8 Cumulative Impacts of Small-Scale Mineral Prospecting

The authors present a very minimal discussion of cumulative impacts. "Cumulative impacts" is a rather generic term and can mean many things. The authors present a general working definition, but a specific definition of what they mean by the term would have been helpful. One reviewer suggested that the Council on Environmental Quality definition should have been used.

The paper should have made some attempt to discuss the potential interaction of small-scale mineral prospecting and other non-related activities that may contribute to cumulative impacts; some of this discussion should have been at the watershed level. One reviewer commented that there should have been consideration of the interaction between water temperature and effects of dredging. More generically, all the discussion of effects in the white paper is centered on individual impact mechanisms. Doing so ignores synergistic effects of all seven mechanisms working together and may underestimate total impact.

The authors' reference to potential for significant portions of creeks to be mined highlights the need for understanding the scope and extent of small-scale mineral prospecting in order to determine potential impacts.

One reviewer referred to two statements in the section (in paragraph 3) and cited them as not being based on sound science, inappropriate, not following a clear path, and unprofessional in judgment:

- "in the absence of restrictions on the number of dredges operating within a stream, the potential for cumulative impacts remains," and
- "small stream size, degraded baseline habitat conditions, and the number of mineral prospecting operations in a stream are all factors that might increase the likelihood of cumulative impacts from small-scale mining."

Regarding Table 11, this reviewer commented on the need for sound science, to not make inferences, and to study small-scale mineral prospecting.

2.9 Potential for Take and Qualification of Risk

Since there is no adequate explanation of how the determinations summarized in Table 12 were made, it is difficult to evaluate them. Furthermore, assessment of risk is hampered by the fact the WDFW does not have data on distribution and extent of small-scale mineral prospecting activity.

One reviewer noted that, being based on "general considerations" and "can be interpreted," Table 12 is not based on sound science, is inappropriate and unprofessional in judgment. There is a need to do sound science, not make inferences, to study small-scale mineral prospecting, and scientifically determine the potential for incidental take. This reviewer objected that the statement "small-scale mineral prospecting has the potential to generate considerable risk of take when the cumulative impacts of multiple permits are considered" is bad inappropriate.

Another reviewer commented that the statement "potential impacts associated with suction dredging are generally short term," might not be supportable. The potential exists for activities in compliance with the Gold and Fish pamphlet to work for the entire work window. Dredges may also impact overlapping life stages of potentially covered species.

2.9.1 Evaluation of Gold and Fish pamphlet Restrictions and Risk of Take

The authors state that the Gold and Fish pamphlet lacks clarity. One reviewer commented that it should be made clear and written to a high school level of vocabulary.

2.9.2 Evaluation of Relative Risk of Take

The first sentence following Table 13 notes the factors that relate to the relative risk of take: the type, extent, and duration of mineral prospecting impact, the size of the stream relative to the type and extent of mineral prospecting activity, the presence or absence of the species within the mineral prospecting area, and the life-history stages present when mineral prospecting activities occur. Of these only the type, extent, and duration of mineral prospecting are not fairly well known. This again points out the necessity of gathering such information in order to properly evaluate risks and mitigation measures and supports the need for more site-specific management.

With respect to suspended solids, the authors state that there is a moderate risk of take in small streams and concentrated areas of activity. It seems that the risk potential could easily be high in such areas, particularly with respect to potentially covered invertebrate species.

Based on the fact that research shows only a 30- to 45-day impact on the density and taxonomic distribution of benthic macroinvertebrates, the authors rate the risk of take of potentially covered species as low. This is suspect since 30 to 45 days is as much as one third to one half of the annual growth season for fish, especially in higher elevation streams.

The statement “The Gold and Fish pamphlet requires prospectors to avoid shellfish beds and fish spawning areas” is incorrect. The Gold and Fish pamphlet requires that eggs be avoided—not spawning areas.

The statement “The relative level of risk is directly related to species presence” is not totally correct. For example, adverse impact on spawning areas will adversely impact spawning success of fall-spawning salmonids that have yet to enter the area. In general, negative impacts on habitat are independent of whether or not species that use that habitat are there at the time of impact if they will arrive during the time the negative effects persist.

The authors acknowledge that risk of take depends in part on the size of the stream. It would have been helpful had this aspect been taken into account and risk rated according to some qualitative measure of stream size.

On page 9-14 there is the statement: “Because of the potential overlap between fall spawning fish and permitted mining activities, small-scale mining is most likely to impact several life-history stages of fish, including spawning, egg incubation, adult migration, and emergence of early fall-spawning salmon and char species." Some pygmy whitefish spawn in streams in the fall and should be included.

On page 9-16 there is the statement "Most of the scientific literature addresses suction dredge operations and, clearly, such operations involve the highest risk to potentially covered species." This is true if they mean an individual dredge operation as compared to an individual operation of other gear types. Since there is little information on the statewide number, distribution, or extent of use of the various equipment types, it is not possible to make an overall comparison. Similarly, the last paragraph should clarify that the comparison among classes of equipment is for individual pieces of equipment of the various classes.

One reviewer stated that it has become clear in this white paper, that the authors use unsound science, make inferences, and use assumptions. The reviewer wondered how to scientifically believe "based primarily on the best professional judgment of the analysis team and go beyond the empirical data available in the literature" and "categorizations are intended to be widely applicable to potentially covered species." Table 13 is a result of this biased political agenda and should be discarded pending sound scientific studies. It has no clear path to the spotty science inferred in this document. The classification of "high risk of take" has no clear path, is inappropriate, and reflects unprofessional judgment because it is not based on sound science.

One reviewer commented that registration of small-scale mineral prospecting activity would allow control of the concentration of activity in small streams. One of the other reviewers disagreed with this statement.

Regarding Table 13, one reviewer noted that several of the "high risk" bullet statements refer to "construction timing," which would not be applicable to small-mineral prospecting. Regarding the statement "Salmonid fish eggs are typically buried beneath 8 to 15 inches of gravel depending upon the species and grain size of the available substrate, median egg pocket depth is typically greater than 12 inches deep," one reviewer expressed doubt about the justification for a change in estimated risk based on dredging deeper or shallower that 1 foot. Many of the salmonids and probably all of the non-game species deposit eggs shallower than 1 foot (See: DeVries, P. 1997. Riverine salmonid egg burial depths: review of published data and implications for scour studies. Can. J. Fish. Aquat. Sci. 54:1685-1698). It was also suggested that leaving unstable tailings in stream reaches with fall spawning fish should be listed as "high risk."

Also in reference to Table 13, it is stated that categorization of relative risk is based primarily on the professional judgment of the analysis team. It is difficult to know how much confidence to put into that judgment without knowing the members of the analysis team and their qualifications.

2.10 Data Gaps

One reviewer, referencing the authors' finding of little literature related to small-scale mineral prospecting impact, stated that the information should be collected before there are any recommendations to change the Gold and Fish pamphlet.

2.10.1 Mineral Extraction and Processing Methods

One reviewer suggested that effects on primary and secondary production, stream metabolism, and nutrient retention and processing are important data gaps. Contemporary research in Alaska on the effects of salmon spawning on these parameters might yield some useful information on the effects of substrate turnover from dredges.

The authors note that influence of various suction dredge nozzle sizes has not been addressed. While this is true, there may be some information available from the studies in Alaska as referenced in 7.4 of the white paper, where dredges of different sizes were used.

2.10.2 Direct Impacts of the Covered Activities to Potentially Covered Species

One reviewer stated that the use of inference to consider direct and indirect effects on some species is inappropriate, does not follow a clear path, and is unprofessional in judgment. Nothing should be done relative to regulation of small-scale mineral prospecting until the research is completed. The reviewer stated that the following statements sum up "this unscientific paper": "research is needed," "additional information is necessary to assess the impacts of small-scale mining, "empirical data is lacking and is sorely needed" (10-2), and "is generally lacking in the literature assessments."(10-3)

2.10.3 Indirect Impacts of the Covered Activities to Potentially Covered Species

One reviewer restated the need to conduct scientific studies before recommending any measures.

2.10.4 Cumulative Effects of the Covered Activities to Potentially Covered Species

One reviewer thought the authors should have suggested a specific study design to examine cumulative effects of small-scale mineral prospecting. This reviewer recommended a pairwise comparison of fish and invertebrates in heavily dredged and un-dredged streams. Another said that the statement "Researchers suggest the impacts could increase if dredging occurred in small stream channels" is inappropriate.

2.10.5 Conservation Measures, Best Management Practices, and Mitigation

The authors state the need for effectiveness monitoring. Also needed is compliance monitoring and enforcement.

There is a need for information on the effect of 2-in dredges on macroinvertebrates, analogous to the information on 3-in dredges from the study in Idaho referenced in 7.6 of the white paper.

One reviewer suggested that additional scientific studies should be done on small-scale mineral prospecting before modifying BMPs.

2.10.6 Management Recommendations

It is unclear what is meant by "the need to collect and process information on the process and potential outcomes for use of adaptive management related to small-scale mineral prospecting activities (first bullet)." It is not clear what process and what potential outcomes are referenced.

One reviewer disagreed with the need to track prospecting activity. Alternatively, he suggested that volunteers could do such tracking. All other reviewers felt strongly that a tracking system is needed for determining the impacts of small-scale mineral prospecting, determining appropriate mitigation measures, and effective monitoring and enforcement.

2.11 Habitat Protection, Conservation, Mitigation, and Management Strategies

At different places in the text, the authors made recommendations that are not explicit in the recommendations summarized in Table 15. They are summarized here:

"Reporting life history timing on major channel networks within WRIAs would allow WDFW to easily identify overlap between potential sensitive life-history stages and work windows in each stream, increasing the flexibility to call for extra precautions when necessary to avoid sensitive areas and to institute less restrictive precautions if overlap does not occur in a given stream (first paragraph after Table 16)." One reviewer stated that this is a particularly valuable recommendation for site-specific analysis. Another felt that it does not matter whether the reporting is aggregated by county or WRIA, as long as it is done by tributary or stream reach.

In the text of Section 9.1, the authors noted specific changes needed for the Gold and Fish pamphlet, but did not list them in the Section 11 recommendations.

They noted deficiencies in the Gold and Fish pamphlet:

- It does not provide detailed information concerning potential impacts, such as how to recognize and avoid fish spawning areas, how to recognize when impacts are occurring, or how violating the prospecting rules could affect aquatic organisms and their habitat.
- It does not incorporate specific references to support the discussion of potential adverse impacts. Literature support for specific numbers, distances, or intake screening dimensions used in the pamphlet as minimization measures is lacking.
- For the uninitiated, the pamphlet lacks clarity and the trail of thought is often not clear.

Reviewers submitted comments on some of the specific recommendations as follows:

Recommendation 1. Provide measures in Gold and Fish to help miners identify potential spawning locations.

While this could be done, given the multitude of potentially covered species, teaching prospectors to recognize spawning areas is probably not a realistic expectation. Further, to the extent that work windows are set appropriately, this is unnecessary. Identification of spawning locations of itself would not be a mitigating measure. There would have to be some requirement that such areas be avoided as in Recommendation 3.

Recommendation 2. Provide information by tributary on known spawning areas and timing of spawning or conduct spawning surveys prior to the annual mining period.

One reviewer suggested that conducting the spawning surveys would be the best way to proceed. Others noted the extent of mineral prospecting throughout the state would make this prohibitive. Providing information on location and timing of spawning could be done. As with recommendation 1, however, establishment of appropriate work windows would address the issue. Again, simply providing the information would of itself not provide any protection.

Recommendation 3. Gold and Fish requests miners avoid known spawning areas. It is recommended to preclude mining within 300 ft upstream and 50 ft downstream of spawning areas or shellfish beds.

(The Gold and Fish pamphlet does not request miners avoid known spawning areas. It requires that they suspend operations if fish eggs or fry are encountered.)

Requiring a distance of 50 ft upstream and 300 ft downstream of spawning areas when the species is present during the permit period ("permit period" presumably means" work window") is a good concept. However, appropriate work windows would address this issue for fish. The distance restrictions would still be necessary to protect shellfish, however.

Another comment was that this recommendation could include an effort to quantify current levels of compliance with guidelines (in the Gold and Fish pamphlet).

Recommendation 4. Preclude mining when eggs and alevins are susceptible to disturbance.

To the extent that this is accomplished, several other recommendations are unnecessary (e.g., 1, 2, the part of 3 that is for fish protection). This recommendation and recommendation six seem to be essentially the same, i.e., to establish work windows that appropriately protect fish.

Recommendation 5. Allow mining during daylight hours between 8:00 AM and 7:00 PM.

One reviewer suggested restriction should be to daylight hours, without specifying specific times. Another stated, regarding the authors' rationale for this recommendation, that in many systems a crepuscular peak in salmonid feeding is not a consistent feature.

Recommendation 6. Maintain stream and tributary work windows based on distribution of each of the potentially covered species. Improve documentation and update data on a routine basis.

This and recommendation 4 should be combined.

Recommendation 7. Limit activities on the basis of stream size.

One reviewer thought this recommendation was based on little information. Others thought the recommendation was reasonable.

Recommendation 8. Increase the required distance between dredges to 300 ft.

One reviewer suggested that the distance between dredges should consider the stream size and channel type. A small, steep-gradient stream might need longer distances between dredges than a larger stream. Another reviewer stated that more research on proper spacing between dredges is needed before changing the distance provided in the Gold and Fish pamphlet, as the recommendation lacks scientific support.

Recommendation 9. Limit the number of permits HPAs per length of unit area of stream. Impacts become noticeable when 10% of the stream is influenced.

One reviewer stated that there is no scientific basis for the 10% figures and that this is an example of unprofessional judgment.

Recommendation 10. Request operators monitor the stream for 300 ft downstream after the first half hour of dredging and cease or reduce dredging if turbidity is noticeable.

This recommendation might be problematic for WDFW as they can only condition an activity to protect fish life.

Recommendation 11. Require that operators not disturb any stable woody debris or rocks that extend from the bank.

One reviewer thought it was acceptable to move these items if they were replaced.

Recommendation 12. Preclude disturbance of stable instream woody debris larger than 4 in or boulders larger than 12 in diameter.

One reviewer felt that it was acceptable to move these items if they were replaced. Another noted that removal and replacement would create considerable disturbance.

Management Recommendation 2. Require an annual operational plan from small-scale miners and post-mining summaries of operations.

Throughout their comments, all but one reviewer voiced the need for information on the extent of small-scale mineral prospecting for proper management, noting that it is difficult to manage resources without knowledge of the activities affecting those resources. One, however, wondered how much confidence could be put in pre-season reports. One reviewer suggested that miners should be asked to volunteer their location; there should be no requirement for annual reports or permits, as science has not shown these to be necessary.

Here and elsewhere in their comments, reviewers suggested some additional measures that should be implemented.

- The Gold and Fish pamphlet should be rewritten to a high school level of reading.
- Areas above Grand Coulee Dam on the mainstream Columbia River and near the Hanford reach should be closed to mineral prospecting because of high background levels of heavy metals and other contaminants that can be re-suspended.
- One reviewer suggested that US Environmental Protection Agency provisions for refueling should be used as standards. This may be covered in the author's Recommendation 13. This reviewer also suggested that equipment be certified. Another contended that present Gold and Fish pamphlet requirements are sufficient.

With respect to Table 16, it was noted that Harvey (1986) also provides relevant turbidity information. One reviewer noted that the table needs more science, provides only one reference per recommendation, provides no quotes, and uses inferences.

One reviewer thought Figure 3 was acceptable, but that it needs the streams identified and the exact location of endangered species.

2.12 References

One reviewer made several comments:

- Bayley, P. (2003) and Nakamoto and Kisanuki (1995) are incomplete citations.
- There is inconsistent use of first names and initials (e.g., see Bolton and Shellberg (2001).
- See Everest, F.H. 1969. Habitat selection and spatial interaction of juvenile Chinook salmon and steelhead trout in two Idaho streams. Doctoral Dissertation, Forest Sciences. University of Idaho. 77pp. Cited in NMFS 2006o; or Use Everest and Chapman instead, for ease of access to this information: Everest, F. H. and Chapman, D. W. 1972. Habitat selection and spatial interaction by juvenile chinook salmon and steelhead trout in two Idaho streams. J. Fish. Res. Bd. Canada 29: 91-100.
- Add middle initial to Harvey (B.C.) and Lisle (T.E).
- Naiman is misspelled as Naimen.

2.13 General Questions

The reviewers were asked to respond to four general questions about the white papers:

1. List any additional sources of information you have not already identified that should have been reviewed and incorporated into the analysis. Are there any sources that were used that you feel should not have been? Why?

One reviewer noted that there are tribal databases with considerable stream data that should be utilized; WDFW in updating the Gold and Fish pamphlet could consider this data.

Nelson et al. 1991 in Meehan, AFS Spec. Publ 19 should have been reviewed. The authors do cite Nelson et al. 1991 in the text in Section 8 and in Table 9. This may be the same as Nelson et al. 1991 in Meehan, but their References section does not list either one so it is not possible to know.

One reviewer noted that only studies directly related to small-scale mineral prospecting should have been used in the white paper and inferences using other studies are inappropriate. The reviewer reiterated that additional scientific study is needed prior to any changes to the Gold and Fish pamphlet.

2. In general, what aspect of the paper do you feel are particularly flawed? Why? How could they be improved?

The white paper could be strengthened by more broadly addressing the issue of cumulative effects and by more strongly emphasizing the notion of site-specific analyses and regulations. The site-specific approach could also acknowledge other human activities affecting potentially covered species and the level of mineral prospecting acceptable and regulation of mineral prospecting taking this into account.

One reviewer commented that abbreviation of points in a couple of the tables slowed down understanding of the document. Given that many readers will focus on the tables, it would have been appropriate to include a little more detail.

There should have been explicit acknowledgment of the fact that the potential for take may not be fully estimated because of the lack of knowledge of the scope and extent of mineral prospecting activity.

There should have been recognition that some areas, the Columbia River particularly, have been heavily impacted by historic activities and disturbance of these areas by mineral prospecting would carry a significantly higher risk to aquatic organism.

The focus was on salmonids to the virtual exclusion of other potentially covered fish species, with some information on invertebrates. This was due to the fact that the available literature on the impact of mineral prospecting on fish focuses on salmonids. There could, however, have been more use of professional judgment to extrapolate information to other potentially covered fish species.

Whereas the authors did a generally good job of reviewing the available studies related to small-scale mineral prospecting, they often did not carry this through to discussion of the possible effects on potentially covered species. One reviewer stated that the paper should have used quotes from scientific papers, rather than inferences. The reviewer felt the recommendations were political in nature and inappropriate.

3. In general, what aspects of the paper are particularly well done and successfully convey the information?

The section describing the available information on the effects of multiple dredges was particularly well done.

One reviewer felt the call for information on statewide distribution of mineral prospecting was particularly valuable. This reviewer also noted that the suggestion for site-specific analysis is important and that the overlap of mineral prospecting activities with likely ecological hotspots could receive grater emphasis.

One reviewer noted that use of information such as Harvey (1986), Harvey et al. (1982), and Bayley (2002) in the cumulative impacts discussion is appropriate, but that direct quotes from those papers would have been better than summaries of the findings.

One reviewer thought the paper was well done and concurred with the recommendations. The reviewer also found the figures useful.

4. Please provide any additional comments.

One reviewer noted that available information on the effects of small-scale mineral prospecting falls far short of providing a firm basis for regulations that might be appropriate for the protection of highly valued animal populations. The reviewer concluded that the document incorporates available information and uses it to as the basis for a reasonable set of recommendations.

One reviewer felt that overall, the white paper compiles and interprets the existing literature on in-stream mineral prospecting well. However, it could utilize more recent literature on the effects of stream disturbance on primary production and biological processing of nutrients and organic matter as indirect effects. The paper uses some older research on the potential effects on stream biota from other disturbances such as turbidity and sediment, but neglects to acknowledge the potential effects on these other components.

This reviewer was also glad to see that a statewide database of mineral prospecting activity is recommended. While it may be more effort for the miners, a database will certainly help track the effects of mineral prospecting activity, especially in popular areas.

Still another reviewer commented that the paper is biased and that the recommendations to change the Gold and Fish pamphlet should be put on hold until sufficient sound science is completed. The authors of any white paper should have actual small mineral prospecting field experience.

3 Peer Review of Overwater Structures and Non-Structural Pilings White Paper

Six people reviewed the Overwater Structures and Non-Structural Pilings white paper. Their individual qualifications can be found in Appendix A. The written comments and those made at the post-review meeting are summarized below, following a brief statement of the key issues that reviewers raised. Reviewers written comments are reprinted in their entirety in Appendix D. Note that since this report includes written and verbal comments by the reviewers, all comments summarized below will not be found in Appendix D.

Reviewers' comments on the white paper follow the listing of key issues raised by reviewers, beginning with the EXECUTIVE SUMMARY. Comments on tables and figures are reported at the appropriate place in the text.

Key Issues Raised by Reviewers

The major issues as identified by peer reviewers in their written comments and in discussions at the post-review meeting are listed below:

1. It is obvious that a number of people wrote portions of the white paper. Lack of effective editing left a number of problems that greatly detract from the value of the report.
   - Even within the various sections, the sub-sections do not have a consistent format. For example, some sub-sections have effective lead-ins—others do not. Some effectively discuss the issue and reach appropriate conclusions. Others simply discuss the relevant literature. Some discussions are organized around the impact itself, others around how the impact is triggered. Lack of a standard format resulted in many topics being treated incompletely.
   - Many terms are undefined, used erroneously, and/or used inconsistently throughout the report. For example, what are originally termed "impact mechanisms" become "impact pathways" and the two terms are variously used throughout the rest of the report. "Littoral" actually refers to the shallow water zone of both freshwater and saltwater. In the paper, however, it is treated as if it applies only to marine waters. The terms "habitat protection, "habitat conservation," and "habitat mitigation" are used but never defined. The distinction between them is not clear. The term BMP (Best Management Practice) is used but not defined and it does not become clear from usage what the authors mean by it. "Minimize" is often used when "reduce" would be more appropriate.
   - Many of the sub-sections in section 8 and 9 were primarily discussions of direct and indirect effects that should have been in section 7.

2. Most sub-sections make no attempt to link the information from the cited literature to the potentially covered species. This is especially evident in section 7. The discussions of the various mechanism or pathways never make a complete link from how overwater structures trigger the mechanism to the effects on potentially covered species.
3. The reasons for selection of the twelve impact mechanisms or impact pathways are unclear; there is no explanation or discussion of what an impact pathway is. They are actually a mixture. Some are impacts mechanisms (e.g., shading, noise, substrate modification, artificial light, and vessel interactions). Others are effects of the mechanisms on elements of the environment (e.g., aquatic vegetation) or ecological processes (e.g., littoral drift). Because of this mixture, the discussion of some issues is awkward and fragmented. For example, freshwater aquatic vegetation is actually impacted by shading, direct disturbance, and vessel interactions (three of the other mechanisms or pathways) and one must look in several places for a full discussion of effects of overwater structures on freshwater aquatic vegetation.
4. There are numerous problems relating to the literature reviewed for the white paper:

   - Too many papers are cited as "found in." The authors apparently did not go to the original documents to evaluate the information but instead relied on someone else's interpretation, which in some cases led to misinterpretation.
   - The material from the white papers previously prepared on this subject for WDFW (Nightingale and Simenstad 2001b and Carrassquero 2001) is erratically used. In some cases a synopsis or conclusion from one of the reports is presented. In other cases, whole paragraphs are copied and used without attribution. Often it is not clear why a particular paragraph used from one of the previous white papers is important. In some cases, the original white paper is relied upon almost exclusively and more recent literature is ignored.
   - There appears to be no attempt to evaluate any of the cited literature as to quality. An obscure "gray" literature document seems to have the same value as one published in a peer-reviewed journal.
   - A number of references are cited that reviewers were unable to locate.
   - The format for citation is inconsistent and in many cases incomplete.
   - Pertinent literature that should have been included is not cited.

5. The white paper deals almost exclusively with construction impacts. Operational impacts are occasionally considered or mentioned. Repair, maintenance, and removal are not considered.
6. Freshwater and saltwater aspects of the various impacts that apply to both mediums are inconsistently treated. For example, in some cases, one is discussed extensively and the other in a very cursory manner or not at all, in some cases it is unclear which medium is being referenced, and in some cases where the discussion is in terms of one it could also include the other. The unique aspects of estuarine waters are seldom brought out.

7. A definition of mitigation is never provided. Mitigation is usually considered to involve sequentially 1) avoiding impacts, 2) minimizing impacts, and 3) providing compensation for unavoidable impacts. The authors, however, seem to use it in the limited context of compensation most of the time. Other times they use it in the broader context of all three steps; still other times for the first two stages in the sequence. Sometimes it is not clear which meaning is used.
8. The cumulative impacts section is not very useful. The authors never define what they mean by “cumulative impacts” and the term seems to have various meanings. For example, it is sometimes refers to the full array of impacts of overwater structures at one site over time or the cumulative impacts of multiple structures in a limited area. However, most of the time the term seems to refer to the cumulative impacts of each of the impact mechanisms individually. There is an inference that, at least with respect to accidents, cumulative effects are considered as those effects that likely would not have occurred but for the issuance of an HPA. This is not considered cumulative impacts. In two other instances the authors appear to consider cumulative effects in the broader sense of the landscape, but this is never fully developed.
9. The assessment of potential risk of take from the various impacts (section 9) was deemed of little value. Again, this is largely a result of having no uniform format or approach. For many of the impact mechanisms, there is no evaluation of the level of risk--simply a list of the ways potentially covered species might be impacted. Much of this discussion should have been in section 7. Referenced provisions of the Hydraulic Code WACs are often misstated. Table 10 Summary of Potential for Incidental Take of Potentially Covered Species with only a “yes,” “no,” or “unknown” rating for the various impacts on the various potentially covered species is inadequate because no qualification of level of risk is provided or explanation of how the ratings were derived. Many conclusions do not seem to follow from the material presented.
10. Data gaps for the various impacts are not treated in a systematic or consistent manner in the respective sub-sections. Some are comprehensively discussed, others are not. For example, disruption of littoral drift may be the most extensive impact from overwater structures along the Puget Sound shoreline. There are extensive data gaps relative to littoral drift, but the subject is dismissed with two sentences. No data gaps are even listed. There is only the suggestion to periodically update existing data.
11. In Section 11 Habitat Protection, Conservation, Mitigation, and Management. The authors make no recommendations; they simply present a “laundry list” of ideas from various literature sources. Some are obviously good and some are of questionable value. There is no discernible attempt to edit, organize, or rate them as to their efficacy, practicality, importance, or other aspects. Some are not mitigation measures at all, but recommendations for research that, if important, should have been considered in the data gaps section. Many are presented for one of the impact mechanisms when they should have applied to all.
12. Channel hydraulics is presented as strictly a freshwater impact. This ignores the fact that this is a factor in marine and estuarine locations as well.

13. Some reviewers felt that the document should not be released in its present form because of its many deficiencies. At a minimum, it should not be released without including the peer review comments as a caveat.

EXECUTIVE SUMMARY

Reviewers generally agreed that the executive summary does not accomplish the objective of an executive summary, i.e., to essentially be a standalone document summarizing the salient points of the white paper. It does not clearly present the conceptual framework; it should have made the point that impacts of an overwater project or non-structural piling depend importantly on site-specific considerations and species present; there is no statement as to what the major issues are; there is no discussion of major data gaps or cumulative effects; potential risk of take is discussed in only a cursory manner; and only a subset of the mitigation measures for each impact mechanism is presented.

Overview

It should have been explained that marinas, even though usually overwater structures, are the subject of a separate white paper; this leaves the impression that the Hydraulic Project Approval (HPA) doesn't apply. It would also be helpful here or in the body of the report to define "marinas" and distinguish a marina from an overwater structure as discussed in this white paper.

Each of the impact mechanisms is discussed, but there is no consistent format. For most, there is not a clear path described from the impact mechanism to the impact to how the impact manifests itself as "take" of potentially covered species. For example, shading is discussed without any description of the actual physical or ecological processes whereby juvenile salmon or other potentially covered species or their habitat is threatened with take (harassment, predation, pursuit, etc.).

It is stated that the impacts to be discussed are those associated with constructing and operating overwater structures and placement and removal of non-structural piling. However, there is little discussion of operational impacts in this section (and a scarcity elsewhere in the paper) and removal of pilings is only mentioned once in the body of the report. Neither in the section nor elsewhere are the important related subjects of maintenance, repair, and removal discussed and operational impacts are considered. Construction of overwater structures often involves removal of derelict structures, which often have dense fields of piles, and this can have significant negative effects.

Some terms are treated cavalierly and seemingly without scientific basis. For example, "potentially covered species also have demonstrated dependence on riparian and shoreline vegetation," which indicates there is data showing reduced survival of fish as a function of impacted riparian and shoreline vegetation. But there is no offering of any proof of such. As another example, "littoral" includes lacustrine and marine shorelines. However, in this white paper it is used exclusively for marine areas.

Freshwater and saltwater aspects of the various impact mechanisms are inconsistently treated in this section, as they are throughout the white paper. For example, in some cases, one is discussed extensively and the other in a very cursory manner or not at all, in some cases it is unclear which medium is being referenced, and in some cases the where the discussion is in terms of one it could also be extrapolated to the other, but is not.

Species and Habitat Use

The authors should briefly describe how the species were selected.

Risk of Take and Potential Mitigation Measures

Only a portion of the section 11 measures is included here. For some impact mechanisms, none are mentioned. Either they should all be included or it should be noted that the ones listed in the executive summary are only a sample. This portion of the executive summary would have been improved by a common format and consistency of discussion of the mechanisms.

Littoral Vegetation

Some measures that are offered as mitigation will not actually avoid or minimize take. For example, for Riparian and Shoreline Vegetation, there are four methods for minimizing take; three of them do not do so: preparation of vegetation management plans, submitting monitoring reports, and saving large trees and root wads displaced by the project. They can be ways to facilitate minimization of impacts, but do not do so of themselves. The fourth item, avoiding disturbance of riparian vegetation in areas with high erosion hazard is suspect. Much of the ecological function of riparian vegetation is independent of erosion hazard; and this suggests that it is acceptable to remove it in areas of low erosion hazard. Protection of riparian vegetation in all areas should be a priority measure for minimization of impacts.

"Littoral vegetation" is not an impact mechanism. Decrease in littoral vegetation as a result of shading, for example, is an effect that has secondary effects.

Freshwater Aquatic vegetation

Freshwater aquatic vegetation is not an impact mechanism. A decrease in freshwater vegetation is an effect that has secondary effects.

"Current best management practices" (BMPs) are referenced. But BMP is not defined and it is not clear how they are distinguished from mitigation measures. If the reference is to the Hydraulic Code WACs, which are legal requirements not BMPs, they should say so.

Riparian and Shoreline Vegetation

Riparian and shoreline vegetation is not an impact mechanism. Decreases in riparian and shoreline vegetation is effect that as secondary effects.

Noise

The description of noise as an impact mechanism should include reference to operational impacts as well.

Water Quality

Neither under the mechanism of water quality nor vessel activity is there mention of potential release of fuel, oil, gray or black water, or other contaminants during construction and operation.

The section on water quality should at least mention that this includes impacts on sediment quality as well.

The statement that the risk of take as a result of stormwater treated in accordance with Washington's water quality standards is misleading and likely unproven. The Department of Ecology only requires NPDES stormwater permits for industrial-, municipal-, and construction-related discharges. While construction of overwater structures may require a permit, there are no requirements addressing the on-going discharges that result from operation, resulting in potentially significant acute and chronic water and sediment quality impacts. Since the current practices for non-permitted discharges are generally suggestions (e.g., best management practices), with no monitoring required, the statement that "current practice effectively addresses most potential impacts" is also misleading and unproven. Runoff during the operation of an overwater structure is potentially significant in both the acute and chronic senses.

Channel Hydraulics

Channel hydraulics is not an impact mechanism. A change to channel hydraulics is an impact or effect, with several potential secondary impacts. Channel hydraulics is not strictly a freshwater issue. It also pertains to marine and estuarine systems, but is ignored in these areas in the white paper

Littoral Drift

The discussion on littoral drift here and elsewhere throughout the paper does not consider beach wrack and backshore productivity.

Littoral drift is not an impact mechanism. It is a component of ecosystem function. Changes to littoral drift are effects or impacts, with several potential secondary impacts.

The authors state that impacts can be avoided, in part, by designing pile-supported structures with open space between the pilings. There are always open spaces between pilings; maximizing that open space would reduce impact on littoral drift.

Substrate Modification

Substrate modification is not an impact mechanism. It is an effect most usually associated, in the case of overwater structures, with alterations of sediment transport processes.

Under Substrate Modification, it is unclear what is meant by “shellfish deposition.” If this is a reference to settling of larvae it should so state. This section suggests that placement of piling is the only way the substrate is modified. Substrate modification can result from several other aspects of overwater structures, however.

Channel Dewatering

Though left unstated here, in the report channel dewatering is discussed only with respect to freshwater overwater structures and non-structural pilings. Channel dewatering (or other dewatering of work area) can be an aspect of projects in marine systems as well.

Vessel Activities

Neither under the mechanism of water quality nor vessel activity is there mention of potential release of fuel, oil, gray or black water, or other contaminants during construction and operation.

3.1 Introduction

In the first paragraph it should be noted that the presence of endangered species does not of itself trigger the need for approval of an action from National Oceanic and Atmospheric Administration (NOAA-Fisheries) or U. S. Fish and Wildlife Service (USFWS) (collectively, the two agencies are referred to as the Services) The action must have a federal nexus (e.g., has federal funding or also requires a Corps of Engineers permit).

The appropriate RCW reference to the need for a HPA is 77.55.021(1); 77.55.011 is simply the definition of hydraulic project.

“Marina” should be defined to show how a marina, which includes overwater structures, is distinguished from an overwater structure, the subject of this white paper.

Footnote 1 is a definition of “bed.” The source of the definition should be given. This is somewhat different from the definition found in WAC 220-110-020(7), the Hydraulic Code WACs. This definition excludes “ irrigation ditches, canals, the outflow from stormwater runoff devices." It should read to exclude "irrigation ditches, canals, stormwater runoff devices" The "bed" would obviously exclude any outflow.

3.2 Objectives

The first and second objectives should also include maintenance, and repair. These are important aspects of overwater structures and non-structural pilings and many impacts of these, which can be very significant in terms of fish and shellfish and their habitat, are different from those discussed for construction. Construction of overwater structures often involves the removal of derelict structures, which often have very dense fields of piles. It would be reasonable to discuss this aspect as well. Operation is included here in the objectives, but given little attention in the body of the white paper.

The third objectives here is: "To identify appropriate and practicable measures, including policy directives, conservation measures, and best management practices (BMPs), for avoiding, minimizing, or mitigating the risk of incidental take." In section 11, however, these become habitat protection strategies, conservation strategies, mitigation strategies, and management strategies. BMP is never defined nor is it clear what BMPs are as contrasted to mitigation measures in the context of this paper. Similarly, it is not clear what policy directives are. The term is not used again in the white paper.

This states that measures will be found for or "avoiding, minimizing, or mitigating" the risk of incidental take. The authors never define "mitigation." Mitigation is commonly defined in terms of sequentially avoiding, minimizing, and compensating. Throughout the paper, the authors use "mitigation" in different ways, but usually--as here--in the context of the compensation aspect. In other places, however, it refers to avoiding and minimizing. In still other places it refers to all three aspects. They should define the term and use it in a consistent manner.

3.3 Methodology

Under item 1, it should be stated what WDFW rules and guidance were reviewed. Under item 2, HPAs and Biological Opinions are not appropriately considered "literature."

Under item 3, inclusion of the referenced matrix of literature would have been helpful. It is unclear how "documents" located during the literature review were in turn used in Internet searches. Was it the literature cited in these references that were in turn used in Internet searches? Were any scientific literature databases consulted? Internet searches are not going to be complete.

3.4 Activity Description

The statement in the third paragraph that "The complete legal description of these activities is contained in the Washington Administrative Code (WAC)" is unclear since no "activities" have been described. The assumption is that this means construction of overwater structures and placement of non-structural piling. However, neither the WACs referenced, which are not the only WACs that apply to overwater structures and pilings, nor the totality of the Hydraulic Code WACs contain a complete legal description of the activities. They describe the need for an HPA, the process to acquire one, and the technical provisions that the HPA will typically contain.

Given that "the impact analyses presented below were prepared with the assumption that all applicable provisions of WAC 220-110, and any other applicable laws and regulations of the United States and the State of Washington, are observed in the construction and operation of overwater structures and non-structural piling authorized by WDFW," it would seem incumbent that somewhere in the document the need for effective compliance monitoring and enforcement would be mentioned.

It should be noted that there are no universal definitions of docks, piers, and other facilities addressed in the white paper. This should be kept in mind when considering studies from other areas.

3.5 Species and Habitat Use

The basis for selecting the 52 species potentially covered by the HCP should be explained. It should also explain why only fish and shellfish are potentially covered even though other animals are potentially impacted.

Table 2 is a useful table, but a few minor errors were noted. For example, Pacific herring should be noted as also found in at least Tidal Reference Areas 3, 6, and 7, especially as larvae and juveniles; white sturgeon are found in all marine waters.

Reviewers generally found Table 3 not useful. It is too brief to be of value and, particularly for the marine species, there are too many inaccuracies and inadequacies. Apparently much data that is available on nearshore habitat associations and linkages is not utilized. It suggests that the authors are not very familiar with the greater body of literature for at least the life history and ecology of estuarine/marine fishes.

3.6 Conceptual Framework for Assessing Impacts

The reasons for selection of what are variously termed impact mechanisms and impact pathways are unclear; there is no clear explanation or discussion of what an impact mechanism or pathway is. It is unclear if these terms mean the same thing, though they seem to be used interchangeably. Some are impacts mechanisms (e.g., shading, noise, substrate modification, artificial light, and vessel interactions). Others are effects of the mechanisms on elements of the environment (e.g., aquatic vegetation) or ecological processes (e.g., littoral drift). Because of this mixture, the discussion of some issues is awkward and fragmented. For example, freshwater aquatic vegetation is actually impacted by shading, direct disturbance, and vessel interactions (three of the other mechanisms or pathways) and one must look in several places for a full discussion of effects of overwater structures on freshwater aquatic vegetation.

The authors should decide which to focus upon—the actual impact or the aspect being impacted--and do so throughout the white paper. This aspect of the report causes much confusion throughout and greatly detracts from its value. To compound matters, within the impact mechanism of vessel activities there are three more impact mechanisms introduced.

It is unclear why the physical features of the environment, e.g., littoral vegetation, freshwater aquatic vegetation, and shoreline and riparian vegetation, are included as pathways. For example, the impacts on littoral vegetation and freshwater aquatic vegetation come from shading, direct disturbance, and vessel interactions and the impacts could have been discussed there. The impacts on shoreline and riparian vegetation come from direct impacts and could be discussed there.

The sketchy explanation of the conceptual framework for assessment does very little to lead to understanding. For example, there is not even an explanation of what an impact mechanism is or an impact pathway. A times the two terms seem to mean the same thing; other times they seem to have slightly different meanings.

> Although this is a popular figure, it poses some confusion because of its linear organization. Habitat structure, for instance, can just as easily provide ecological function as habitat processes, and habitat processes and ecological function may have feedback to habitat structure. Instead of just adopting information outright, it would have been helpful had the authors explained how they see the scientific knowledge expressed. For example, it could be as a non-linear organization with considerable feedback.

3.7 Direct and Indirect Impacts

In addition to the confusion between mechanisms and effects, the authors now change their terminology. The previously-described 12 impact mechanisms are listed here as 12 pathways, and additional mechanisms are introduced in some of the sub-sections (e.g. 7.12 Vessel Activities). It is not clear why this is so. The consistent definition and use of terms is critical to understanding this document and to the success of HCP planning.

The section would have benefited greatly from use of a standard format, even though it might have been somewhat difficult due to the mixed nature of the impact mechanisms. At a minimum there should be a standard format at least within the sub-sections for each of the three impact pathway types. One example of lack of consistent format within the sub-sections is for the impact pathways that are aspects of the environment. For some (e.g., 7.2 Littoral Vegetation), the discussion is organized in terms of the impact mechanisms that affect littoral vegetation and how they do so, what the secondary impacts are, and how the secondary impacts affect fish and shellfish. In 7.4 Shoreline and Riparian Vegetation, the discussion is organized around the secondary impacts of modified riparian and shoreline vegetation and includes very little about the impact mechanisms that affect shoreline vegetation and how they do so. It becomes even more confusing in 7.2, however, because on the face of it, two new impact mechanisms are introduced and discussed—ambient light and introduction of noxious weeds. (Ambient light, however, is simply another name for the impact mechanism of shading and introduction of noxious weeds is one aspect of vessel interactions.)

Another result of lack of standard format and appropriate editing is that freshwater as contrasted to marine impacts are treated inconsistently. It would have clarified the report greatly had their been distinct discussion for each of the two mediums for each impact pathway (except those that were clearly only a factor in one medium—e.g., freshwater aquatic vegetation), or clearly stating which medium the discussion applied to and noting when the discussion applied to both. There are some impacts that are unique in estuarine waters as opposed to marine and freshwater, but such distinctions are not made in the white paper.

The material from the original WDFW white papers (Nightingale and Simenstad 2001b and Carrassquero 2001) is erratically used. In some cases a synopsis or conclusion from that report is presented. In other cases, whole paragraphs are copied and used without attribution. Often it is not clear why a particular paragraph is important.

Discussion of the impacts is awkward and fragmented. For example, freshwater aquatic vegetation (a feature of the environment, but named as one of the mechanisms or pathways) is actually impacted by shading, direct disturbance, and vessel interactions (three of the other mechanisms or pathways) and one must look in several places for a full discussion of effects of overwater structures on freshwater aquatic vegetation.

There appeared to be no attempt to evaluate any of the cited literature as to quality. It seemed to be treated the same whether it was "gray" literature or published in a peer-reviewed journal, regardless of how comprehensive it was, and whether it was a local study as compared to one from the east coast. There are published guidelines for "best available science" that could have been used.

This section would have been more comprehensive if effects had been presented for each impact pathway in the categories of construction of the structure, the structure as built, and operations. Doing so would have focused and clarified the discussion.

Each of these involves different impacts, have different data gaps, and require different mitigation measures.

Reviewers felt that the major issue with respect to overwater structures is shading and that this should have been clearly stated and highlighted. Nowhere in the white paper does one get a sense of which of the impact mechanism the authors feel are most important in terms of impact on potentially covered species.

It would be helpful in evaluating the potential for the described impacts to know the extent to which overwater structures cause them. For example, how many or what percentage of overwater structures include channel dewatering?

Some species are attracted to overwater structures and pilings with positive outcomes. This should have been considered and discussed.

In general, several aspects of overwater structures, such as size, height above the bottom, height above the water surface, orientation (east-west or north-south), use of grating and prisms, and others that are important in determining effects are given very little acknowledgment.

3.7.1 Shading

There is a general lack of data on population and diversity with respect to shading. Therefore, the statement that "populations and diversity of aquatic species in the Pacific Northwest can be severely limited in environments shaded by overwater structures" should be qualified accordingly. It might be more appropriate to say that shading affects the distribution and behavior, and in some circumstances, performance (e.g., feeding) of some species.

One reviewer noted that some of the referenced citations are stated to be from the northwest, but are not.

3.7.1.1 Fish Vision

It is not clearly stated in the discussion how fish vision is related to interruption of normal migration and reducing available refuge.

This section implies that light sensitivity is fixed, which is not the case. All fish are capable of some range of light adaptation. This is important in the following discussion relating lighting conditions to observed fish behavior.

3.7.1.2 Prey Abundance, Feeding, and Growth

The last sentence ("For young out migrant salmon such as juvenile chum, pink, and ocean-type Chinook, prey availability is an important component to migration behavior") needs a literature citation.

This section is a good example of the many places throughout the paper where study results are presented in terms of "fish." It would be far more meaningful to name the fish involved.

3.7.1.3 Migration and Distribution

3.7.1.3.1 Ambient Light

The last sentence belongs in the cumulative effects section, not direct and indirect effects on migration and distribution. Williams and Thom (2001) attribute the presumed decline in abundance of some Puget Sound salmon to cumulative effects of "shoreline modifications." There is no indication of the extent to which overwater structures are included in the statement.

3.7.1.3.2 Direct Disturbance and Replacement

What species of adult salmon are referenced as holding under bridges? The authors do not make clear the implications of holding underneath bridges or how holding under bridges relates to overwater structures—the subject of this white paper.

3.7.1.4 Predation

The first sentence states that ambush predators are often found distributed in natural or man-made shaded and covered environments, but doesn't state the species and if they are found there differentially to other areas, which is the real question.

Reviewers disagreed with the conclusion from Carrasquerro (2001) that fish attraction is linked to shade; there is not general agreement in the literature. There is much literature to suggest that it is the structure itself. More likely it depends on a number of site-specific factors. One reviewer commented that he disagreed with some other conclusions from Carrasquerro (2001) in this section as well.

One reviewer commented that smallmouth bass are not especially opportunistic as stated in the white paper—they feed primarily on sculpins, certain other fish, and crayfish. They are major predators of juvenile salmon only in certain circumstances, related to such things as species, hatchery or wild, and other factors. Most studies show that smallmouth bass are associated with structure of some kind and largemouth bass with vegetation.

Increased predation in marine waters due to overwater structures is generally assumed, but has never been documented. The paragraph dealing with potential predators of juvenile salmon in saltwater neglected much of the recent literature. The previous white paper on overwater structures in freshwater (Carrasquero 2001) had more information than this one.

"Non-indigenous" or "introduced" should be used instead of "exotic" in describing smallmouth and largemouth bass.

3.7.2 Littoral Vegetation

One reviewer commented that "Littoral Vegetation" is probably not the best heading for a section dealing with eelgrass and kelp. Both grow well outside the littoral zone—particularly kelp. The reviewer also noted recent WDFW findings of *Zostera marina* growing below –10 m. Littoral vegetation also includes backshore and salt marsh vegetation, which are ignored throughout the white paper.

The discussion of eelgrass should include discussion of epiphytes and associated invertebrates that are important prey for potentially covered species.

Somewhere it should at least be noted that boundaries of eelgrass beds are not static. Thus, an overwater structure might not affect an eelgrass bed in its present configuration, but could preclude future opportunity for eelgrass establishment. Another overlooked item is the fact that Thom has evidence that not only are burrowing crabs attracted to shell hash around pilings, but large number of adult crabs are attracted to attached organisms and they play a possible role in the loss of eelgrass.

WAC 220-110-250 merely specifies the saltwater habitats of special concern. It does not specify that there can be no net loss as stated in the first paragraph.

The statement in the first paragraph that "Furthermore, the hydraulic code rules require that overwater structures be designed or located to avoid shading or other impacts that could result in the loss of eelgrass and kelp habitat [WAC 220-110-300(3) and (4)]" is not correct. WAC 220-110-300(3) precludes shading of eelgrass but does mention "other impacts." WAC 220-110-300(4) requires replacement, using proved methods, of any impacted kelp. It does not require designing or locating structures to avoid shading or other impacts.

One reviewer commented on the following sentence in the fourth paragraph: "Studies of eelgrass communities in Padilla Bay show that a specific group of copepods (*Harpacticus uniremis* and other copepods of the genera *Zaus* and *Tisbe*) is unique to the eelgrass epiphyte assemblage and the principal prey of juvenile chum salmon, Pacific herring, Pacific sand lance, and surf smelt (Nightingale and Simenstad 2001b), with *Harpacticus* spp. less likely to be found in low-light conditions and *Tisbe* spp. found in areas high in detritus, irrespective of light levels." The reviewer questioned that *Harpacticus* spp. are less likely to be found in low-light conditions and *Tisbe* spp. found in areas high in detritus, irrespective of light levels. The reviewer also considered the statement ambiguous.

The statement that juvenile Dungeness crabs are an important salmonid prey species is overly broad and not correct. Larval, not juvenile, Dungeness crabs are important primarily for juvenile coho salmon.

One reviewer noted that HPAs are regularly written for structures that shade eelgrass. They are merely conditioned to minimize or compensate for negative effects and thus result in an increasing loss of this habitat structure and function. Furthermore, another reviewer pointed out, they are often built on state-owned aquatic lands despite the fact that HPAs clearly state that the recipient must gain all other necessary approvals. This reinforces the statement made elsewhere that there should be a discussion in the white paper of the necessity for effective compliance monitoring and enforcement of the HPA program. This white paper discusses the HPA WACs as to their effectiveness as mitigation measures for overwater structures. It would be appropriate to also discuss effectiveness of compliance monitoring and enforcement.

In the next to last paragraph: “Forage fish and juvenile Pacific salmon species preferentially use eelgrass over other habitats.” In what way do juvenile salmon “preferentially use” eelgrass over other areas—feeding, refuge, migration, or other? Reviewers noted that they know of no rigorous scientific evidence of this and that that the statement needs a citation.

3.7.2.1 Ambient Light

In the second paragraph, second sentence, it should be noted that length and width of the structure are also important variables affecting shading.

Also in the second paragraph: “Increased structure height above the bottom was identified as the most important pier characteristic correlating to eelgrass bed quality.” One reviewer commented that others have identified the most important characteristic as increased height above the water surface.

One reviewer noted that this sub-section is a good example of the many instances in the white paper where existing research is not connected to biological effects. Additionally, the authors overlook negative effects related to the shadow. See: Diefenderfer, H.L., C.G.C. Roegner, R.M. Thom, E.M. Dawley, A.H. Whiting, G.E. Johnson, K.L. Sobocinski, M.G. Anderson, and B.D. Ebberts. 2005. Evaluating Cumulative Ecosystem Response to Restoration Projects in the Columbia River Estuary, First Annual Report 2004. Draft submitted to Portland District, U.S. Army Corps of Engineers. Pacific Northwest National Laboratory. PNNL-15102; Thom, R., G. Williams, and H. Diefenderfer. 2005. Balancing the Need to Develop Coastal Areas with the Desire for an Ecologically Functioning Coastal Environment: is Net

Ecosystem Improvement Possible? Restoration Ecology 13:193-203; and Washington DNR 2005. Habitat Classification Verification and Activities Effects Report, Aquatic Resources Program. Other relevant information from Shafer and Fresh is likewise overlooked.

This sub-section is also a good example of one that fails to reach conclusions as to the effect on potentially covered species, even though impact on eelgrass is one of the top two important issues regarding overwater structures. The original white papers dealing with overwater structures did reach conclusions. It would have been reasonable to use these as a basis and build on them.

This section and 7.12.2 in the white paper both have some discussion of vessel interactions on littoral vegetation. It is unclear why this is not consolidated.

3.7.3 Freshwater Aquatic Vegetation

Lentic and lotic freshwater environments should be distinguished because of different characteristics, processes, functions, and impacts.

3.7.3.1 Ambient Light

One reviewer commented there should be guidance on required light levels for vegetation growth and development and the depth where that typically occurs under natural conditions in this region.

3.7.4 Riparian and Shoreline Vegetation

In the parallel littoral vegetation and freshwater aquatic vegetation sections, the impact mechanisms presented are the impacts that overwater structures have upon the vegetation and the discussion is centered around these impacts. In this section, on the other hand, the described impact mechanisms are the effects that the vegetation has upon the aquatic environment. There is virtually no discussion of how overwater structures impact the vegetation. None of the three sections adequately discusses effects on the potentially covered species.

"However, solar radiation has long been recognized as one of the classic limiting factors for upper intertidal organisms and plays an important role in determining distribution, abundance and species composition." This sentence in the last paragraph is a direct quote from Brennan and Culverwell (2004) and should have been so credited.

3.7.4.1 Shading and Water Temperature Regime

In the second paragraph, second sentence, what are the adverse health effects to fish of being subjected to water temperatures outside their optimal range? The authors should be specific about what these effects are (loss of reproductive fitness, increased metabolism, or other) and what the effect is on potentially covered species.

3.7.4.3 Altered Allochthonous Input

Brennan and Culverwell (2004) should also have been cited regarding allochthonous inputs.

3.7.4.4 Groundwater Influence

This alludes to the role of the riparian zone in aiding infiltration of water into the ground, but does not discuss the importance of this groundwater recharge and the effect on stream water temperature or other effects.

3.7.4.5 Habitat Conditions

This section overlooks two important papers with significant details about LWD in estuarine and coastal ecosystems: Maser and Sedell (1994) From the Forest to the Sea. St. Lucie Press, and Simenstad et al. 2003. American Fisheries Society Symposium 37: 265-277.

3.7.5 Noise

The discussion of noise and pile driving overlooks the long-term negative effects to species energy resources as a result of flight induced by noise as well as avoidance and the resultant loss of useable habitat. Other impacts that are not discussed are the potential effect of noise on gametes in female fish before they are spawned, which has recently been identified as a potential problem for salmon. Also, overlooked is the effect of pile driving vibrations on incubating salmonid eggs (see Jensen 2003. New mechanical shock sensitivity units in support of criteria for protection of salmonid eggs from blasting or seismic disturbance. Canadian Tech. Rep. of Fisheries and Aquatic Sciences 2452).

3.7.5.1 Pile Driving

Paragraph 7 states that ". . . it is not sufficient to simply extrapolate information by comparing species that are taxonomically related." It would be better stated that it is difficult to do; the Services currently do so as there is such a dearth of data.

One reviewer commented that the discussion of physical impacts on fish eggs and larvae and on invertebrates (7.5.1.1 and 7.5.1.2) could be augmented by USFWS Biological Opinions on the Hood Canal floating bridge, the State Route 167 extension project, and the CalTrans projects. There are also monitoring reports for CalTrans that have relevant information.

The authors state that not enough is known to establish discrete injury thresholds for different fish species, but then goes on to cite the Services' thresholds. It would have been more appropriate to state that there is a lack of data and then discuss the Services current practices. It is not correct to state that the Services have adopted thresholds. This implies a formal regulatory process—which has not occurred. These are guidelines that the Services use. The citations for the 180 dBrms and 150 dBrms should include recent Biological Opinions from each of the Services as a reference.

The discussion of effects of pile driving is incomplete in that there is no information or data presented on the noise level that can be produced by typical pile driving operations. Such information is available for most of the pile types and sizes typically used in Washington.

A discussion of the results of caged fish studies done by Bud Abbott for CalTrans should be included (Abbott, R. R., E. Bing-Sawyer, and R. Blizard. 2002. Administrative Draft Assessment of Pile Driving Impacts on the Sacramento Blackfish (Orthodon micrcrolepidotus). Caltrans, Oakland, California). Though Abbott acknowledged that his studies were flawed, there is still information to be gained from them. Importantly, they demonstrate that energy accumulates over multiple pile driving strikes. This is demonstrated by the fact that fish that received exposure to multiple strikes had extreme internal injuries (in some cases their internal organs were homogenized). Abbott's work also demonstrated that fish with serious internal injuries might not appear harmed to observers (Abbott et al. 2002). Popper and Hastings (2005) excludes Abbott's work on the premise that it was not peer reviewed. However, they rely heavily on Yelverton's work, which was also not peer reviewed (Yelverton, J. T., and D. R. Richmond. editors. 1981. Underwater explosion damage risk criteria for fish, birds, and mammals. Proceedings of the 102nd Meeting of the Acoustical Society of America, 102nd Meeting of the Acoustical Society of America, Miami Beach, Florida; Yelverton, J. T., D. R. Richmond, R. E. Fletcher, and R. K. Jones. 1973. Safe Distance from Underwater Explosions for Mammals and Birds. Lovelace Foundation for Medical Education and Research, Albuquerque, NM; and Yelverton, J. T., D. R. Richmond, W. Hicks, K. Saunders, and R. E. Fletcher. 1975. The Relationship Between Fish Size and Their Response to Underwater Blast. Defense Nuclear Agency, Albuquerque, NM)

Though such operations might or might not require an HPA, it would also be worthwhile to note potential impacts of pile installations adjacent to water bodies. It is often assumed that installation of piles "in the dry" will result in minimal, or undetectable, sound production levels (SPL) in the water. Monitoring data from impact installation indicates that SPLs in the adjacent waterbody can be significantly elevated (Battelle Marine Sciences Laboratory. 2004. Hydroacoustic Monitoring During Beach Pile Driving at Hood Canal Bridge on June 14th, 2004. Battelle Marine Sciences Laboratory, Sequim, Washington; and Reyff, J. A. 2006b. Russian River Replacement Bridge at Geyserville: Underwater Sound Measurement Data for Driving Permanent 48-inch CISS Piles. Illingworth and Rodkin, Inc., Petaluma, CA.). Hydroacoustic monitoring during impact installation of 48-inch steel piles that were 5 m from a river in California detected SPLs as high as 201 dB_{peak} and 188 dB_{rms} at 10 meters from the pile (Reyff 2006). As sound pressure travels through the substrate, its waveform might be altered, resulting in longer (and therefore less damaging) rise times, but this has not been adequately investigated. Also, during monitoring of vibratory installation of piles adjacent to a river, Reyff (2006) noted that there was clearly noticeable vibration in the river.

3.7.6 Water Quality

In addition to the effects listed, construction and operation of overwater structures may also degrade water quality as a result of fuel spills, discharge of gray water, black water, heavy metals in paints, and stormwater that should be considered.

In this section there is extensive discussion of water quality impacts--mostly a literature review with little analysis, interpretation, integration, or attempt to link water quality effects to the potentially covered species. It is not clear from the discussion what the authors consider to be major issues. Also, bioaccumulation poses some risk and should be considered.

3.7.6.1 Suspended Solids

Storage of excavated material within the floodplain is commonly prohibited under HPA authority, as stated in the first paragraph; one reviewer pointed out, however, that it still occurs.

3.7.6.2 Suspended Solids Impacts on Fish

Effects on salmon should be qualified by life history stage, as the effects on juveniles are very different than on adults, for example.

3.7.6.3 Suspended Solids Impacts on Invertebrates

One reviewer commented that most of the discussion is in terms of freshwater impacts. While suspended solids are a major issue in freshwater, it is probably not appropriate to extrapolate to marine waters. The waters of Puget Sound, especially near major deltas and mudflats can be very turbid naturally, especially during high flows, and winds. Fish in Puget Sound have adapted to such conditions. There is literature that suggests that one of the benefits of estuaries to juvenile salmon is higher levels of turbidity, which can provide refuge from predators. See Gregory, R. S. 1993. The effect of turbidity on the predator avoidance behavior of juvenile Chinook salmon (Oncorhynchus tshawytscha). Canadian Journal of Fisheries and Aquatic Sciences 50:241-246; and Gregory, R. S. and C. Levings. 1998. Turbidity reduces predation on migrating juvenile Pacific salmon. Transactions of the American Fisheries Society 127:275-285.

3.7.6.4 Contaminated Sediment Impacts

The discussion of sediment contamination should include negative effects associated with stormwater runoff from the structures and associated upland facilities (e.g., support buildings, parking lots, and other impervious surfaces).

The authors state "Sediment contamination and the potential for resuspension must be determined prior to construction on a site-by-site basis as part of a project-specific assessment." Determination of potential sediment contamination prior to a project is not a common requirement unless there is known history of contaminated sediments.

3.7.6.5 Dissolved Oxygen Impacts

This discussion overlooks effects associated with stormwater nutrient inputs and accompanying decreases in dissolved oxygen (DO).

3.7.6.7 Treated Wood-Related Impacts

As piles, decking, and other supporting structures degrade or are abraded over time with operation of overwater structures, contaminants are released into the water. There have been recent and expensive efforts to remove them from beaches. This should be discussed as an effect.

The citation of Brooks (2004) and Brooks (1997) is a good example of the comment made elsewhere that there has been no attempt to evaluate the quality of literature cited and that it all seems to be treated as equal. These two industry reports are apparently not refereed, but are presented and considered the same as a paper included in a refereed journal.

3.7.6.7.1 Creosote Treated Wood

It would be more accurate to say that long-term accumulation of metals at the base of pilings has not been evaluated than to say it has not been reported. As stated, it can be interpreted to mean that researchers have looked, with negative results. This is not the case.

The statement in the last bullet that "The risk of potential impacts to salmonids from direct exposure to PAHs or metals leached from treated wood is low" ignores recent findings of higher levels of PAHs in resident salmonids, which have longer residence times.

3.7.6.8 Stormwater and Nonpoint Source Water Quality Impacts

There should be a citation to the referenced Department of Ecology (Ecology) regulations. While Ecology regulates water and sediment quality, the reviewers know of no Ecology regulations for nonpoint source discharges. Stormwater impacts are often not evaluated or even addressed.

The discussion should name the actual contaminants involved with stormwater runoff and the levels of fish and invertebrate sensitivity to each. It should also be noted that EPA considers nonpoint source pollution to be the major contributor to degraded water quality.

3.7.7 Channel Hydraulics

One reviewer felt that this section should either include a discussion of adverse biological effects from shoreline structures associated with overwater structures (fill, armoring, breakwaters, etc.) or note that they are considered in another white paper and give a citation.

Most of this discussion is nearly verbatim to the comparable section in the Water Crossings white paper with little attempt to relate it to overwater structures. One reviewer felt that the impact of overwater structures on channel hydraulics simply does not warrant such an extensive discussion. The continued discussion of channel hydraulics only in freshwater ignores the fact that this can be an impact in marine and estuarine locations as well.

3.7.7.1 Controlling Factors in Channels

In-channel support structures for overwater structures, and non-structural pilings, decrease water velocity, causing sediment deposition on the upstream side and scour on the downstream side and alter the local channel gradient. This should be discussed.

3.7.7.2 Habitat Structure in Channels

This section is a good case in point that overwater structure maintenance needs to be considered and discussed. LWD is often removed from the upstream side of support structures to protect the integrity of the structure, with attendant negative effects.

3.7.8 Littoral Drift

This section should either include a discussion of biological effects from shoreline alterations associated with overwater structures (fill, armoring, breakwaters, etc.) or note that they are included in another white paper and give a citation.

Most of this section is identical to the comparable section in the Water Crossings white paper with no attempt to link it to overwater structures and non-structural pilings, to changes in littoral drift, to impact on potentially covered species.

Washington state has about 2500 miles of beach (not 2000) and most is composed of sand/gravel, not cobble.

3.7.8.2 Littoral Currents

Limiting sediment movement and deposition also limits the establishment and maintenance of backshore vegetation, not just rooted vegetation such as eelgrass in the littoral zone.

3.7.9 Substrate Modification

This section should either include a discussion of biological effects from shoreline alterations associated with overwater structures (fill, armoring, breakwaters, etc.) or note that they are included in another white paper and give a citation. As is, it appears that this is just overlooked.

3.7.10 Channel Dewatering

This is an impact for which it would be particularly helpful to know the extent to which overwater structures are implicated in the described impacts. Specifically, how many or what percentage of overwater structures in freshwater and marine include channel dewatering? This section is also virtually verbatim to the comparable section in the Water Crossings paper with no attempt to relate to overwater structures or non-structural pilings.

3.7.10.5 Loss of Invertebrates

Recolonization rates for benthic invertebrates also depend extensively on season/time of year in addition to those factors listed.

3.7.11 Artificial Light

There is a major recent update of the effects of artificial light that should have been reviewed and discussed: Nightingale, B., T. Longcore, and C. A. Simenstad. 2006. Artificial night lighting and fishes. Pages 257–276 in C. Rich and T. Longcore (eds.). *Ecological consequences of artificial night lighting*. Island Press, Washington, D.C.

This section is identical to the parallel section in the Water Crossings white paper with no attempt to relate it to artificial light associated with overwater structures.

3.7.12 Vessel Activities

Wakes from large commercial vessels have profound effect on shallow water habitats. Wave energy striking the beach/bank causes redistribution/suspension of sediments, bank erosion, displacement of shoreline vegetation and wood debris, and disruption to flora and associated fauna. While this has not been studied extensively, there is information available from the studies of ferry wakes in Rich Passage.

3.8 Cumulative Impacts of Overwater Structures and Non-Structural Pilings

This section is not very useful. The authors never specifically define what they mean by "cumulative impacts" and the term seems to have multiple meanings.

- In some places it is used to refer to the effects of all 12 impact mechanisms at one site over time or of multiple structures in a limited area. In other places, it refers to the cumulative impacts of each of the impact mechanisms individually.
- With respect to accidents, cumulative effects are stated to be those effects that likely would not have occurred but for the issuance of a HPA. These would not be considered cumulative effects.
- In two places the authors appear to consider cumulative effects in the broad sense of the landscape, including perturbations other than those of overwater structures, but this is never fully developed.
- In one place they consider cumulative impacts to be different types of effects manifested from a pathway than those that are simply direct or indirect effects. For example, in the first sentence under shading: "The studies reviewed do not identify cumulative impacts of shading that differ from the direct and indirect impacts of single-structure shading, i.e., decreased primary productivity, loss of eelgrass beds with impacts to the associated food chain processes, and changes in the migration patterns of salmonids."

In some places, indirect effects are confused with cumulative effects.

It would be helpful where possible to describe the pathway of impact. For example, in the case of shading one of the pathways is the fragmentation of naturally contiguous intertidal/shallow subtidal eelgrass.

As in Section 7 Direct and Indirect Effects, several sections here are virtually identical with the parallel section in the Water Crossings white paper. No significant attempt was made to account for the difference between overwater structures and water crossings.

Much of the discussion in the various sub-sections deals with the importance of an element of the habitat to fish and shellfish and other matters that should be in Section 7 Direct and Indirect Effects. Additionally, much of the discussion for some of the pathways is about direct and indirect effects that should have been included in section 7. This section should simply be about how the effects, which should have been identified and discussed in section 7 might be cumulative.

3.8.1 Shading

The third paragraph needs a reference. Also, Williams and Thom attribute the decline of Puget Sound salmon species to "shoreline modifications", not overwater structures.

3.8.2 Littoral Vegetation

Much of the discussion here is on the importance of littoral vegetation. That discussion should have been included in section 7.2—Direct and Indirect Impacts—Littoral Vegetation. This section should simply be dealing with the extent to which effects of overwater structures may be cumulative.

It should be noted that the methodology of Dowty (2005) might not be at the appropriate resolution to detect cumulative impacts unless the impact is very large.

The statement that foraging habitat may not be a limiting factor for juvenile salmon in Puget Sound is overly broad given the plethora of species and life history stages. Whereas this may be true for some, the authors should note contrary information found in Wissmar and Simenstad (1988. Energetic constraints of juvenile chum salmon (*Oncorhynchus keta*) migrating in estuaries. Can. J. Fish. Aquat. Sci. 45(9):1555-1560; and 1998. Variability of estuarine and riverine ecosystem productivity for supporting Pacific salmon. Chapter 6. Pages 253-301 *in* G.R. McMurray and R.J. Bailey (eds.), Change in Pacific Northwest Coastal Ecosystems. Proceedings of the Pacific Northwest Coastal Ecosystems Regional Study Workshop, August 13-14, 1996, Troutdale, Oregon. NOAA Coastal Ocean Program, Decision Analysis Series No. 11. NOAA Coastal Ocean Office, Silver Springs, MD. 342 p.)

3.8.4 Riparian and Shoreline Vegetation

Since shoreline armoring is often associated with overwater structures, the authors should have noted that shoreline armoring is the subject of a separate white paper.

For a general overview and assessment of larger scale historic impacts on marine shoreline vegetations, see: Brennan, J. S. 2007. Marine riparian vegetation communities of Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-02. Published by Washington Sea Grant, Seattle, Washington.

The statement that "The threshold at which a group of activities will have an adverse impact on aquatic species and habitat at the watershed scale cannot be quantified" may not be entirely true. One reviewer noted that, though difficult, there are examples of where this has been done (e.g., Bainbridge Island) via modeling techniques.

3.8.5 Noise

Reviewers did not agree with the statement that a single source of noise is irrelevant. One pile driver in the right place could have a significant impact on individual fish or a group.

It seems overly simplistic to dismiss the cumulative effects of noise as unknown. As in section 8.9 Substrate Modification, it would be appropriate to use professional judgment to state that certain effects can be expected.

3.8.6 Water Quality

The section is too narrowly focused on turbidly and pilings (treated wood). Other pollutant inputs associated with overwater structures need to be considered, including cumulative impacts of stormwater from overwater structures and associated shoreline or upland facilities.

3.8.7 Channel Hydraulics

The authors note "The HPA program itself offers the best means of measuring these impacts, because WDFW has authority to require monitoring of the impacts of authorized projects." Given this statement, there should be a recommendation in this regard in section 11. Also it seems that there would have been a recommendation relative to the need for effectiveness monitoring and adaptive management to utilize the results.

One reviewer commented that, while Washington Fish and Wildlife does have the authority to require monitoring for impacts, it seems that this authority is only applied over a short time span. Therefore, without explicit direction to expand monitoring/sampling efforts to explore longer term impacts, it is unlikely that the HPA process will result in addressing this data gap. Another reviewer commented similarly that the HPA program is a poor measure of impacts because monitoring and adaptive management are limited, at best.

3.8.8 Littoral Drift

In other sub-sections, the authors use best judgments to at least offer some observations and speculation. This should have been done here rather than simply dismiss the subject.

3.8.9 Substrate Modification

It seems that some professional judgment could have been used to offer some reasonable speculation with respect to marine systems along with that for freshwater.

3.8.10 Channel Dewatering

The final sentence, which also occurs in the preceding paragraph, "it seems unlikely that HPA-authorized activities would result in measurable cumulative effects except in the case of rare species where a single project might affect habitat critical to a large fraction of the watershed's population," is curious. It seems to equate cumulative impacts to the effects of a single, large project. One reviewer disagreed with the statement. Based on the reviewer's experience, it seems highly likely that HPA activities result in significant cumulative effects.

3.8.11 Artificial Light

The last sentence indicates that the authors are considering cumulative impacts on a larger scale than it seemed in other sections. There needs to be a clear definition of cumulative impacts and the scale the authors are considering and that needs to be consistently used for all pathways. One reviewer disagreed with the conclusion in the last sentence. The reviewer believed it could easily be assumed that cumulative effects at a larger scale could result in a loss of listed and potentially listed spp.).

3.8.12 Vessel Activities

As in other sections, this seems to downplay cumulative impacts because no studies or assessments have been performed. At the very least it seems legitimate to assume that as the number of sources and degree of impacts increase the likelihood of adverse impacts increases.

3.9 Potential Risk of Take

The impact pathways have now once again become impact mechanisms. Also, as with other sections, a consistent format would have been helpful.

Much of the discussion for some of the mechanisms is about direct and indirect effects that should have been included in section 7. This section should simply be about the extent to which the direct and indirect effects and the cumulative effects might result in take. For example, the discussion of scour and deposition in section 9.7 should have been in section 7.7. Additionally, the impacts from operation of overwater structures continue to be largely ignored.

Since there is insufficient explanation of how the Table 10 values were assigned, reviewers deemed it to be of little value. It is insufficient to assign only a “yes” value to those table cells where impact is expected. A qualitative expression of the level of risk would be a great improvement and increase the value of the table. Better yet would be some integrative measure that provides some idea whether the impact presents a significant risk to a species, population, Evolutionarily Significant Unit, or something similar. It was not clear if this table considers only direct effects or if food web and other ecological linkages were considered. Additionally, there are too many questionable assignments. For example, reviewers questioned the Y assignment for eelgrass/macroalgae and Pacific Hake, lingcod, and all the rockfish. Chum and pink salmon migrate to saltwater upon emergence, so the Y assignment for freshwater aquatic vegetation is not readily apparent. The rationale for some species showing a Y for noise, but not others was questioned.

3.9.1 Shading

One reviewer commented that while the Hydraulic Code may lack specificity as to the light requirements of individual vegetative species, relevant data is available. Recent work by Washington DNR HCP staff scientists found that freshwater species (e.g, *Ceratophyllum demersum, Chara* spp., *Egeria densa, Hydrilla verticillata)* requirements for light range from 2 to 30% of surface light; kelp and eelgrass requirements range from 0.1 to 29% of surface light. (References: Barko, J.W., and R.M. Smart. 1981. Comparative influences of light and temperature on the growth and metabolism of selected submersed freshwater macrophytes. *Ecological Monographs* 51: 219-235; Duarte, C.M. 1991. Seagrass depth limits. *Aquatic Botany* 40: 363-378; Harley, M.T., and S. Findlay. 1994. Photosynthesis-irradiance relationships for three species of submersed macrophytes in the tidal freshwater of Hudson River. *Estuaries* 17: 200-205; Luening, K. 1980. Photobiology of seaweeds: Ecophysiological aspects. International Seaweed Symposium, Goeteborg, Sweden, 11 Aug 1980; Meyer, B.S., and A.C. Heritage. 1941. Effect of turbidity and immersion depth of apparent photosynthesis in *Ceratophyllum demersum*. *Ecology* 22: 17-22; Sand-Jensen, K., and T.V. Madsen. 1991. Minimum light requirements of submerged freshwater macrophytes in laboratory growth experiments. *Journal of Ecology* 79: 749-764; Schwarz, A-M., A. de Winton, and I. Hawes. 2002. Species-specific depth zonation in New Zealand charophytes as a function of light availability. *Aquatic Botany* 72: 209-217; Sheldon, R.B., and C.W. Boylen. 1977. Maximum depth inhabited by aquatic vascular plants. *American Midland Naturalist* 97: 248-254)

This section contains conclusions that should have been in section 7.1; they are out of place here. Moreover, it is unclear how the conclusions are reached. They do not seem to follow from the information presented here, in section 7.1, or in section 8.1.

The authors conclude that shading impacts on salmon could be extrapolated to other small fishes based on available data. Some authority for this should be cited. As is, it is not possible to evaluate the conclusion.

One reviewer commented that it seems to be implicit in the discussion that impacts from shade are unavoidable. It does not seem consistent then to rate the risk for take as moderate.

It does not follow that because a structure is difficult for an applicant to design and locate (second paragraph), that this constitutes a moderate risk of take. One reviewer commented that if the impacts are difficult to avoid, one should conclude that there is high risk of take. On the other hand, certainly the WACs could offer more guidance on how to avoid shading, but site-specific considerations preclude WACs that offer prescriptions to meet every situation.

The next to last paragraph contains the statement that any juvenile Chinook rearing within less than one acre of a dock in Swinomish Slough was deemed taken. This is confusing because an acre is a measure of area, not distance. An acre can be any dimensions that equal 43,560 square feet.

One reviewer acknowledged that the Hydraulic Project Approval WACs require that overwater structures and associated moorings be designed and located to avoid adverse impacts to juvenile salmonid migration routes and rearing habitats, but stated that this is nearly impossible to do. These structures are almost always constructed over intertidal or shallow sub tidal areas. Due to the ubiquitous nature and migratory dependence of some species of juvenile salmon on these same areas, the standard is probably rarely achieved.

3.9.2 Eelgrass and Macroalgae

The comparable subsections in section 7, 8, 10, and 11 of the white paper are titled Littoral Vegetation. That should be the sub-section title here as well.

The statement that "compensatory mitigation has been required for unavoidable effects to eelgrass and macroalgae" is suspect. The context implies that such mitigation is always required. One reviewer's experience is that full compensatory mitigation is rarely achieved and where required is poorly monitored to determine success. Given the dependence of such a requirement on effectiveness and compliance monitoring and enforcement, it is surprising that no recommendations regarding such are found in the white paper.

It is not entirely true that macroalgae critical to potentially covered species occur in deep water and will not be permanently impacted by overwater structures. Macroalgae also occurs in shallow water and is impacted by overwater structures.

In the second and last paragraphs it is stated that WAC 220-110-100(7) deals with compensatory mitigation for impacts to eelgrass. WAC 220-110-100(7) deals with conduit crossings and the approach trench in freshwater.

3.9.3 Freshwater Aquatic Vegetation

In the first paragraph is found: "WAC 220-110-060(8) requires that "removal of aquatic vegetation shall be limited to that necessary to gain access to construct the project. This requirement provides some assurance that impacts are minimized, but makes no provision for recovery or restoration of the impacted vegetation." This is correct for .060(8), but is not accurate for the total requirements in 220-110-060. WAC 220-110-060 also specifies "All pier, dock, float, and piling construction projects shall incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat." Thus, the WACs require that any impact on vegetation must be mitigated.

3.9.4 Riparian and Shoreline Vegetation

In the first paragraph is found: "However, the ambiguous language and the lack of binding provisions regarding replacement of ecological function render the WAC provisions inadequate in that they do not provide assurance that loss of riparian and shoreline vegetation is effectively minimized, let alone compensated. Thus, there is a moderate to high risk that take of fish could occur." On the contrary, WAC 220-110-060 Construction of freshwater docks, piers, and floats, and the removal of piling, provides that "All pier, dock, float, and piling construction project's must incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat." Thus, if WDFW effectively enforces the WACs, there is no risk of loss.

Another reviewer commented in regard to this statement noted it is the most straightforward, honest, and accurate statement in the white paper. There are numerous inadequacies and risks associated with the WACs, in terms of interpretation and implementation, and these need to be honestly and openly stated throughout the document, and should be highlighted in the executive summary, conclusions, and recommendations.

3.9.5 Noise

The science is not clear on the susceptibility to noise of fishes with swim bladders as compared to those without. It may be true in terms of certain types of barotraumas that fishes that lack internal gas-filled voids (such as swim bladders) are less vulnerable to impacts than are fish that have gas-filled voids, such as salmonids, but there are a host of other potential impacts to consider. Risk of injury appears related to the effect of rapid pressure changes on gas-filled spaces in the bodies of exposed organisms (Turnpenny et al. 1994). Biologically, key variables that factor into the degree to which an animal is affected include size, anatomical variation, and location in the water column (Gisiner et al. 1998). Any gas-filled structure within an animal is particularly susceptible to the effects of underwater sound (Gisiner et al. 1998). Those gas-filled voids could include the bowel, nasal passages, lungs, etc.

In regard to observing fish kills and fish in distress, the majority of fish killed as a result of barotrauma sink to the bottom and are not detected (Teleki and Chamberlain 1978) . Additionally, injured fish may appear perfectly normal for hours, and even days after exposure (Abbott et al. 2002) and suffer delayed mortality.

3.9.6 Water Quality

Consumption of contaminated prey should be added to the bulleted list of factors increasing the risk of take. Bioaccumulation also poses some risk of take and should be discussed.

Water quality impacts from normal operations of overwater structures should be considered, as well as accidental spills.

3.9.7 Channel Hydraulics

As in the channel hydraulics sub-sections in other sections, there is not a consistent application to estuarine and marine systems.

3.9.7.2 Habitat Destruction

One reviewer noted that use of the term “habitat destruction” is a departure from the more commonly used “habitat disturbance” or “loss of habitat.” Also the reference is somewhat confusing with temporary destruction and permanent destruction. It seems that destruction would be a permanent loss.

3.9.7.4 Scour

The last sentence, “The generally vague language presented in the WACs will minimize the potential risk for take of potentially covered species, but will not eliminate it,” is very confusing. Are the authors trying to say, “Even though vague, the WACs should at least minimize the risk of take?” A problem with WACs that are vague is that they can lead to inconsistency in use and application between WDFW regions as well as between individual habitat biologists with a region.

3.9.8 Littoral Drift

As noted previously, littoral refers to lacustrine as well as marine shorelines. It is misused throughout this paper to refer to marine waters only.

The citations WDNR 2006a and 2006b are incorrect. Washington DNR created a single document addressing six groups of species (herptofauna, birds, fish, invertebrates, marine mammals, and plants) and 86 individual species in 2005. The correct reference is: Washington Department of Natural Resources. 2005. Covered Species Technical Paper. Aquatic Resources Program. Olympia, WA.

In most sub-sections, there is an assessment of level of risk. There should be in this section as well. This section is almost entirely a discussion of direct and indirect effects that should have been in section 7.

3.9.9 Substrate Modifications

The sub-section deals only with marine waters. Freshwater areas should be included as well.

The authors should have specified which citations in section 7.9 (as referenced in the first sentence) are the basis for the conclusion that the primary direct impact of placing structures is to create hard substrates in settings where such substrates did not previously occur, increasing habitat diversity. Reviewers were unable to find support for this in section 7.9. While this may in certain circumstances benefit rockfish, it would be at the expense of soft-bottom communities and other organisms, such as forage fish spawning habitat. This section appears to be narrowly construed, incomplete, and does not consider the full suite of potential impacts associated with substrate modifications--such as disruption of ecological processes, structure, and functions.

One reviewer did not accept the statement that the language in the WACs will avoid impacts to forage fish and rock sole spawning beds. In the reviewer's experience, this is seldom achieved and the statement does not consider multiple, temporal, and cumulative effects.

3.9.10 Channel Dewatering

This sub-section does not seem to account for temporal loss off habitat and productivity. One reviewer, referring to the discussion of the inadequacies of the WACs in regard to protecting fish during de-watering, stated that this is the kind of candor that is needed to understand risk.

3.9.12 Vessel Activities

As with some other sub-sections, there is no evaluation of the level of risk, simply a list of the ways vessels may impact potentially covered species. This should have been in section 7. In addition to those effects listed, vessels may also impact potentially covered species by degrading water quality and by shading.

3.9.13 Risk Evaluation

Since this and other aspects of the white paper are based on the professional experience of the analysis team, some reviewers thought it would be valuable to know who they are and what their experience is.

The last sentence that "impacts may be avoided by performing the activities when or where covered species are absent" does not account for the adverse effects from the presence or operation of a structure.

Though deemed helpful, Table 12 would be more useful if it was further developed and a better explanation given for how it was derived. The text simply stated that it was based on a brief summary of the incidental take risk analysis presented above (in section 9), but some of the factors included in the table had not been discussed in section 9. For example, there is no discussion of "in-water operation of mechanized equipment," which is referenced in some of the cells. It is not possible to determine how the different items presented in each impact category are derived. For example, it is not apparent why removal of riparian vegetation caused only moderate risk. There is no explanation of the term "non-conforming substrate," and the meaning is unknown. Moreover, as in the rest of the analysis, the table overlooks risk in lacustrine environments. Finally, it is not correct to refer to pile-driving sound levels as being between 180 dBpeak and dBrms as these are different metrics. More correctly, the reference should be to sound levels above 180 dBpeak and/or 150 dBrms.

3.10 Data Gaps

As with others, this section lacks a consistent, systematic, and rigorous approach to the subject.

One reviewer noted, and others agreed, that at any step in the authors' conceptual model there can be data gaps. A holistic discussion that makes this clear and tries to identify the major issues should be developed. This would include:

- Cumulative impacts,
- Ecology and biology of organisms,
- Particular types of impacts on organisms,
- Cumulative impacts, and
- Mitigating factors.

It was not clear to this reviewer that trying to develop an exhaustive list for each impact pathway is productive. It is too easy to fall into the trap that we do not know enough about anything. How does one decide that effects of noise on green sturgeon is as important to study as the response of bull trout to an overwater structure? That would require a short book. However, it might be useful for the authors to ask what information would benefit the Services most and use that as the foundation for developing the discussion of data gaps. For example, listed species are probably the biggest driver in developing an HCP and so might warrant the most attention as far as identifying important data gaps.

3.10.1 Shading

It is important to note that at many commercial docks, vessels are moored a large percentage of the time. Simply stating that the may be moored at various times of year does not capture that.

3.10.2 Littoral Vegetation

One reviewer suggested that sensitivity analysis of eelgrass assessment methodology also needs to be conducted. The scale of many assessment methods is not adequate to answer the questions posed. The importance of backshore and salt marsh vegetation should be added to the bulleted list of data gaps.

3.10.3 Freshwater Aquatic Vegetation

One reviewer noted that, while data gaps exist for the species addressed here, submerged/emergent vegetation in riverine, lacustrine and marine systems provides similar function both as a component of structural habitat and as refuge and foraging habitat for species. The text reinforces the artificial distinction made by the authors in separating littoral and freshwater vegetation and in overlooking lacustrine systems.

3.10.4 Riparian and Shoreline Vegetation

The statement in the first sentence that most of the understanding of the role of riparian and streamside vegetation has grown out of a concern for salmonids is not entirely true. There are a number of important ecological functions provided by riparian systems that have been important drivers in studying the role of riparian vegetation. Some of these are listed in the second sentence.

Except by implication, no data gaps are listed.

3.10.5 Noise

Table 13 was generally considered to be helpful; it would have been better had there been an explanation of how it was developed. It does not seem to have been developed from the previous discussion in the white paper. An obvious question is why this was developed for this particular impact and not any of the others? This is indicative of the uneven treatment of impacts throughout the white paper..

There is an on-going 3-year study on the effects of pile driving on fish (National Academy of Science, National Cooperative Highway Research Program) that could have been reviewed relative to its goals of addressing data gaps. Results are available at: http://rip.trb.org.

3.10.6 Water Quality

Ignored in this section are pH, DO, contaminated sediments, stormwater, other nonpoint source contaminants, and releases from vessels and associated activities.

3.10.7 Channel Hydraulics

The discussion does not address data gaps except perhaps by inference. It is a general discussion of the fact that most studies of the effects of overwater structures are directed at salmonids and how this white paper relies on studies that address water crossing effects on habitat features.

3.10.8 Littoral Drift

Disruption of littoral drift may be the most extensive impact along the Puget Sound shoreline. There are extensive data gaps relative to littoral drift, but they are dealt with in two sentences. No specific data gaps are listed. There is only the suggestion to periodically update existing data.

This section should either include a discussion of data gaps related to shoreline structures associated with overwater structures (fill, armoring, breakwaters), or refer to the appropriate white paper.

3.10.9 Substrate Modifications

This section should also either include a discussion of data gaps related to shoreline structures associated with overwater structures (fill, armoring, breakwaters), or refer to the appropriate white paper.

3.10.11 Artificial Light

The need for information on specific guidelines (e.g., light frequency, intensity, timing etc.) that reduce impacts should be stated.

3.11 Habitat Protection, Conservation, Mitigation, and Management Strategies

As previously noted, there seemed to be no attempt to evaluate or assess the quality of information. An internal agency document seems to be considered equivalent to a paper in a refereed journal. Assessment of the quality of information seems particularly important when mitigation measures suggested in the referenced literature are being presented here. Though unstated, the authors of this white paper apparently are recommending the measures suggested by the various sources as those WDFW should consider adopting. As such, the authors' professional assessment of the information and the mitigation measures should have been provided. Suggested measures could have been rated as to their efficacy, practicality, and other aspects.

There is no discernible attempt at organization of the material and recommendations—which are basically a "laundry list" of ideas, some good and some of questionable value. The following suggestions would have organized the section, helped put the suggestions into context, and improved the value immensely:

- The authors never provide a definition of "mitigation," which is usually considered as the sequence of avoiding, minimizing, and compensating. In most cases in this white paper, however, they seem to be using "mitigation" primarily in the sense of "compensating." In some places, however, they use it in the broader sense (e.g., 11.6 in the white paper). This section would have been more valuable had they defined mitigation in the context of the usual sequencing, and used the term consistently.
- It also would have been helpful had they defined "protection strategies," "conservation strategies," "mitigation strategies," and "management strategies" and designated the recommendations accordingly. As written, they apparently are all lumped together.
- Organizing around the 12 impact mechanism is awkward in this section. One way of organizing the recommendations that would have been valuable would be to present the recommendations as avoidance and minimization measures dealing with the planning phase (considerations for siting, multiple use community facilities, orientation, dimensions, lighting, flotation), materials (piling materials, treatment considerations, use of grates or light transmitting glass-centered concrete blocks), construction phase (considerations for equipment, sequencing, dewatering), the structure as it exists after construction (primarily addressing continuing impacts such as shading, substrate changes, interruption of migration), and operation (sewage handling, stormwater runoff, vessel impacts). Compensatory measures to mitigate for the impacts remaining after all practical avoidance and minimization measures were implemented for the previous stages would be the final category (compensatory habitat creation or rehabilitation, monetary compensation), including monitoring requirements and adaptive management to achieve compensation goals.

This section should also consider and discuss strategies based on disallowing additional structures for certain areas, under certain conditions, for certain types, etc.

There is no discussion of the uncertainty associated with any of the measures.

As was common throughout the paper, but pronounced in this section, freshwater aspects were particularly poorly done.

A common aspect of new overwater structures is removal of an existing structure in order to use the location or as compensatory mitigation. It would have been appropriate to discuss the effects of such removal and suggest mitigation measures.

One reviewer suggested as an additional mitigation measure that the HPA should require that any overwater structure be removed at the end of its useful life.

3.11.1 Shading

The next to the last item in the second set of bullets is not a mitigation or conservation strategyl. It is a recommendation for research to address data gaps. The final recommendation is a combination of recommendation for a study to address a data gap and a mitigation measure. These should all have been in the data gaps section.

3.11.2 Littoral Vegetation

An additional mitigation measure suggested by one of the reviewers is that WDFW should conduct a siting analysis to determine whether structures should be permitted at all and that they should deny permits in areas that other entities have defined as important and/or critical habitat.

The sub-section is incomplete without consideration of mitigation for impacts on backshore vegetation.

Here and in 11.3, the authors seem to be suggesting that compensatory mitigation is an acceptable substitute for avoiding and minimizing impacts to vegetation. Also, they give no consideration to the long-term negative effects associated with the presence of the structure. Long-term monitoring and maintenance requirements will be necessary for any such mitigation, especially for eelgrass given that eelgrass restoration is "possible, with difficulty."

3.11.4 Riparian and Shoreline Vegetation

Much of the second set of bullets is applicable to all vegetation and should be incorporated in the applicable sections.

Here and in 11.2 and 113, mitigation for temporal loss of vegetations should be considered.

3.11.5 Noise

It is not accurate to state that the Services assume a certain reduction of noise with bubble curtains. It is, rather, a case-by-case assessment. In some cases, project proponents commit to achieving a specific reduction. Other times, specific levels are required. It would be better here to discuss the range of sound level reduction that has been achieved and recommend specific allowable levels.

One reviewer noted that here have been recent experiments with the use of "temporary noise reduction piles" that are not yet reported in the literature. These are essentially a pile within a pile with the void filled with either air or foam. These show promise of effective noise reduction.

This is the first time rise time has been mentioned. The term should be defined and there should be a discussion in at least section 7 as to the relevancy to effects on potentially covered species.

In the discussion of pile caps, it should be noted that they reduce sound pressure levels and lengthen rise time. This may be a factor in reducing physical injury.

3.11.6 Water Quality

This section neglects to include any strategies that apply to stormwater.

3.11.8 Littoral Drift

Focus on transport mechanism ignores one of the most important aspects of littoral drift cells that needs to be a focus of management and regulation, i.e., sediment delivery processes by feeder bluffs. Focus on transport zones overlooks what may be the most significant impact.

3.11.9 Substrate modifications

This focuses entirely on marine areas and ignores any considerations for lacustrine and riverine systems.

3.11.12 Vessel Activities

This focuses almost entirely on marine areas and ignores any considerations for lacustrine and riverine systems.

3.12 References

Some comments regarding references were noted in the discussions of the various sections. Reviewers were critical of the manner in which the body of available literature is used and cited:

- It is unacceptable to use "cited by" or "in" to the extent that is done. This indicates that the authors of the white paper didn't look at the original references. Use of secondary or tertiary sources often results in an interpretation of the primary data that is less than accurate. They should have reviewed any reference they cite.
- For those that papers that are cited as "in" another report, the citation is not given in a consistent manner. In some cases the citation in the text is to the original report, e.g., "Lagler et al. (1950, cited in Carrasquero 2001)"; in other

cases it is to the secondary report, e.g. "Petr (Cowx and Welcomme 1988, in Petr 2000)."

- It is inappropriate to use a reference that is not available. One reviewer noted that there are a large number of the references that he tried unsuccessfully to obtain. Another reviewer noted that papers of his are cited even though even he could not locate them. he format for citing the references is inconsistent, with incomplete information presented for many. Some are cited erroneously.
- There are many relevant references that should have been included that are not. A number of those are listed in reviewers' comments.
- There is no attempt to evaluate the quality of the references used. An unpublished, un-refereed agency or industry report is given the same weight as a paper in a peer reviewed journal. The latter should have been the primary source for the information presented.
- At least one reference is listed in the Reference section that is not cited in the text (Tyack, P.L. and C.W. Clark. Communication and acoustic behavior of dolphins and whales. In: Au, W.W.L., A.N. Popper, and R.R. Fay (eds.), Hearing by whales and dolphins. New York, Springer, 2000, pp. 156-224).
- The authors' placed too much importance on some documents, such as Corps of Engineers Regional Permit No. 6. Just because someone else is doing something doesn't make it important. The authors should give their evaluation of its importance.

3.13 GENERAL QUESTIONS

1. List any additional sources of information you have not already identified that should have been reviewed and incorporated into the analysis. Are there any sources that were used that you feel should not have been? Why?

Fresh, K. L., T. W.-Echeverria, S. W.-Echeverria, and B. W. Williams. 2006. Using light permeable grating to mitigate impacts of residential floats on eelgrass Zostera marina L. in Puget Sound, Washington. Ecological Engineering 28:354-362.

Dauble, D. D., T. L. Page and R. W. Hanf, Jr. 1989. Spatial distribution of juvenile salmonids in the Handford Reach, Columbia River. U. S. National Marine Fisheries Service Fishery Bulletin 87:775-790.

Garland, R. D., K. F. Tiffan, D. W. Rondorf and L. O. Clark. 2002. Comparison of subyearling fall Chinook salmon's use of riprap revetments and unaltered habitats in Lake Wallula of the Columbia River. North American Journal of Fisheries Management 22:1283-1289.

Koehler, M. E. 2002. Diet and prey resources of juvenile Chinook salmon (Oncorhynchus tshawytscha) rearing in the littoral zone of an urban lake. Master's thesis. University of Washington, Seattle.
Sergeant, C. J. 2004. Effects of bottom slope, substrate, cover, predators and ontogeny on lentic habitat preference by juvenile Chinook salmon (Oncorhynchus

tshawytscha) in experimental arenas. Master's thesis. University of Washington, Seattle.

Sergeant, C. J., and D. A. Beauchamp. 2006. Effects of physical habitat and ontogeny on lentic habitat preferences of juvenile Chinook salmon. Transactions of the American Fisheries Society 135:1191-1204.

Tabor, R. A., G. S. Brown, and V. T. Luiting. 2004. The effect of light intensity on sockeye salmon fry migratory behavior and predation by cottids in the Cedar River, Washington. North American Journal of Fisheries Management 24:128-145.

Fritts, A. L. and T. N. Pearsons. 2004. Smallmouth bass predation on hatchery and wild salmonids in the Yakima River, Washington. Transactions of the American Fisheries Society 133:880-895.

Fritts, A. L. and T. N. Pearsons. 2006. Effects of predation by nonnative smallmouth bass on native salmonid prey: the role of predator and prey size. Transactions of the American Fisheries Society 135:853-860.

Phillip, D. P. and M. S. Ridgway (eds). 2002. Black bass: ecology, conservation, and management. American Fisheries Society Symposium 31.

Koehler, M. E., K. L. Fresh, D. A. Beauchamp, J. R. Cordell, and C. A. Simenstad. 2006. Diet and consumption of juvenile Chinook salmon in littoral habitats of Lake Washington. Transactions of the American Fisheries Society 135:1580-1591.

Naughton, G. P., D. H. Bennett, and K. B. Newman. 2004. Predation on juvenile salmonids by smallmouth bass in the Lower Granite Reservoir system, Snake River. North American Journal of Fisheries Management 24:534-544.

The PSNERP program is in the process of publishing short monographs on a number of the species/issues being considered here such as salmon, herring, smelt, beaches and bluffs, and riparian forests. The website where these documents can be located is: http://pugetsoundnearshore.org/publications.htm#reports

Fresh, K.L. 1997. The role of competition and predation in the decline of Pacific salmon and steelhead, pp. 245-276. In: D.J. Stouder, P. Bisson, and R. Naiman (eds.) Pacific Salmon and their Ecosystems. Status and Future Options. Chapman and Hall.

Fresh, K.L., R.D. Cardwell, and R.R. Koons. 1981. Food habits of Pacific salmon, baitfish, and their potential competitors and predators in the marine waters of Washington, August 1978 to September 1979. Wash. Dept. of Fisheries, Progress Report. No. 145. 58 pp.

Gregory, R. S. 1993. The effect of turbidity on the predator avoidance behavior of juvenile Chinook salmon (*Oncorhynchus tshawytscha*). Canadian Journal of Fisheries and Aquatic Sciences 50:241-246.

Gregory, R. S. and C. Levings. 1998. Turbidity reduces predation on migrating juvenile Pacific salmon. Transactions of the American Fisheries Society 127:275-285.

Simenstad, C.A. 2000. Commencement Bay aquatic ecosystem assessment. Ecosystem-scale restoration for juvenile salmon recovery. University of Washington, School of Fisheries, Sof-UW-2003. 25pp.

Beamer, E., A. McBride, C. Greene, R. Henderson, G. Hood, K. Wolf, K. Larsen, C. Rice, and K. L. Fresh. 2005. Delta and Nearshore Restoration for the Recovery of Wild Skagit River Chinook Salmon: Linking Estuary Restoration to Wild Chinook Salmon Populations. Supplement to Skagit Chinook Recovery Plan, Skagit River System Cooperative, La Conner, Washington.

Toft, J.D., J. R. Cordell, C. A. Simenstad, and L. A. Stamatiou. 2007. Fish distribution, abundance, and behavior along city shoreline types in Puget Sound. North American Journal of Fisheries Management 27:465-480.

Abbott, R. R., J. A. Reyff, and G. Marty. 2005. Monitoring the Effects of Conventional Pile Driving on Three Species of Fish.

Caltrans. 2001. Fisheries Impact Assessment. Caltrans.

Gisiner, R. C., and coauthors. 1998. Workshop on the Effects of Anthropogenic Noise in the Marine Environment. R. C. Gisiner, editor Effects of Anthropogenic Noise in the Marine Environment. Marine Mammal Science Program, Office of Naval Research.

Hastings, M. C., and A. N. Popper. 2005. Effects of Sound on Fish. CalTrans.
Laughlin, J. 2005. Underwater Sound Levels Associated with Restoration of the Friday Harbor Ferry Terminal. WSDOT, Seattle, WA.

Laughlin, J. 2006. Underwater Sound Levels Associated with Pile Driving at the Cape Disappointment Boat Launch Facility, Wave Barrier Project (Revised). Washington State Parks.

Teleki, G. C., and A. J. Chamberlain. 1978. Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie. Journal of the Fisheries Research Board of Canada 35:1191-1198.

Turnpenny, A., and J. Nedwell. 1994. The Effects on Marine Fish, Diving Mammals and Birds of Underwater Sound Generated by Seismic Surveys. Fawley Aquatic

Research Laboratories Limited, Marine and Freshwater Biology Unit, Southampton, Hampshire, UK.

Turnpenny, A., K. P. Thatcher, R. Wood, and J. Nedwell. 1994. The Effects on Fish and other Marine Animals of High-level Underwater Sound.

One reviewer noted that there are many gray literature sources that were missed/ignored, but there are several that are important to Section 7.8:

Finlayson, D.P. , 2006, The Geomorphology of Puget Sound Beaches (9.5 Mb PDF), Dissertation . School of Oceanography, University of Washington, Seattle, WA: 216 p.

Finlayson, D.P., and Shipman, H., 2003, Puget Sound Drift Cells: the importance of waves and wave climate (263 Kb PDF), Puget Sound Notes: Olympia, WA, p. 1-4.
Finlayson, D. 2006. The geomorphology of Puget Sound beaches. Puget Sound Nearshore Partnership Report No. 2006-02. Published by Washington Sea Grant Program, University of Washington, Seattle, Washington. Available at http://pugetsoundnearshore.org

Also, for Section 7.11:

Nightingale, B., T. Longcore, and C. A. Simenstad. 2006. Artificial night lighting and fishes. Pages 257–276 in C. Rich and T. Longcore (eds.).Ecological consequences of artificial night lighting. Island Press, Washington, D.C.

For a synthetic description of juvenile salmon utilization and "dependence" on Puget Sound, see:

Fresh, K.L. 2006. Juvenile Pacific Salmon in the Nearshore Ecosystems of Washington State. Puget Sound Nearshore Partnership Report No. 2006-06. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington. Available at: http://www.pugetsoundnearshore.org

2. In general, what aspects of the paper do you feel are particularly flawed? Why? How could they be improved?

(Coordinator's note: Many of the reviewers' comments submitted in this section were also submitted at the appropriate place in their comments on the body of the white paper. They are noted again here as indicative of what the reviewer's thought were major flaws.)

For most impact mechanisms or pathways, as they are variously called, there was little or no attempt to link the discussion to impacts on potentially covered species. Also, there was not a consistent attempt to show how overwater structures triggered the mechanism or pathway.

The criticisms relative to use of literature (as noted in 3.9.12 of this report) are a major detraction from the quality of the white paper and the confidence with which one can consider it.

One reviewer commented that some of the assumptions of species associations and dependence might be "precautionary," but not really based on adequate knowledge of species life histories and ecology.

Recommendations in section 11 are grossly inadequate. For the most part they are simply a grab bag of ideas taken from various reports with no attempt by the authors to apply their professional judgment to evaluate them. None come as recommendations, they are simply listed, with the appropriate citation, with a statement such as "WDFW might want to consider" them.

Many sections are very confusing in that one cannot distinguish what applies specifically to marine as compared to freshwater environments. In some cases, the discussion was with respect to one medium, but could just as well have applied to both but the extrapolation was not made. In at least one case where there was such extrapolation, reviewers considered it invalid.

One reviewer noted that several sections draw conclusions with either weak or no rationale obvious from the discussion. In many cases, conclusions are oversimplified and do not account for the real effects on the ground or for the variability of site-specific conditions and project impacts.

The cumulative effects section was very weak. The authors don't define cumulative effects. Since there is no universally accepted definition of cumulative effects or agreement on how to analyze them it would have been appropriate for them to provide their working definition. This comment can be found in more detail in 9.8 of this report.

In neither section 7 nor 8 do the authors explicitly consider the project-specific cumulative effects of the suite of individual effects working synergistically. This then understates the actual impact of an individual overwater structure.

Given that the analysis assumes projects comply with applicable WAC provisions, there soul be some analysis of the extent and effectiveness of compliance monitoring and enforcement, and recommendations for any shortcomings.

The 12 impact pathways should consider both construction and operation of overwater structures, including maintenance and associated activities and associated land use/development.

One reviewer recommended there should be a discussion of how uncertainty is addressed and whether or not the "Precautionary Principle" applies.

3. In general, what aspects of the paper are particularly well done and successfully convey the information?

One reviewer thought the paper is generally well done. Another thought water quality, channel hydraulics, and noise are effectively treated.

4. Please provide any additional comments

Although one reviewer thought the authors generally did a good job of assembling the pertinent literature addressing effects of overwater structures, there was general agreement that the authors had not satisfactorily linked the information to impact on potentially covered species in section 7. For most of the 12 impacts, there was little or no attempt to do so. At least one reviewer found the document limited in its utility as a supporting document of the development of an HCP and that it provides only limited understanding and evaluation of the major issues surrounding overwater structures. At the post-review meeting, some reviewers expressed the opinion that the document should not be released in its present form because of its many deficiencies. At a minimum, it should not be released without including the peer review comments as a caveat.

One reviewer commented that, even though the regulatory extent of the HPA is limited to the protection of fish and shellfish during "work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state," the analysis of take in the HCP planning context must include a discussion of the effects that may result from the action regardless of the control the entity may legally exercise over the effect.

The fact that this document does not address impacts associated with shoreline armoring, which is often a feature of overwater structures, stood out greatly. The authors should have noted that this is the subject of a separate white paper and provided a citation. Since this white paper is silent in that regard, it leaves the impression that it was simply overlooked.

Failure to consider impacts of the operation of overwater structures is a critical flaw for the paper and the HCP planning process, and is a failure of the HPA program. While take may be the result of construction of a structure, it is more frequently the result of the long-term presence and operation of the structure and the cumulative biological effects of multiple permitted structures. Addressing these operational and cumulative impacts is critical to the success of the analysis of effects, any future HCP, and WDFW's legal requirement to protect fish and shellfish.

The various sub-sections within sections of the paper do not utilize a consistent format. Thus, important information is often overlooked and summaries and conclusions not uniformly presented. Much of the shortcomings of the paper would probably not have occurred had a consistent format been followed. The text frequently fails to link the strings of declarative sentences describing existing research and impact mechanisms with biological effects. These two shortcomings could have easily been resolved by utilizing a technical writer with expertise in aquatic ecosystems.

The existing body of research primarily addresses salmonids and very little effort was made to extrapolate the information to other potentially covered species and their habitats. Without the extrapolation, it appears that there is generally no benefit accrued to non-salmonids by inclusion in the HCP planning effort.

There is an artificial distinction made between the biological significance of, and impacts to, freshwater and marine submerged/emergent vegetation and sediment transport as a result of overwater structures. While it is true that there are some differences in processes (e.g., wind driven currents, tidal currents, stream flows) and types of vegetation, the analysis would greatly benefit by combining the discussion of vegetative and hydrologic impacts. Specific impacts (e.g., disruption of drift cells) should be addressed within this larger ecological context.

Although "littoral" refers to lacustrine as well as marine shorelines, this paper almost entirely overlooks mechanisms and impacts associated with lakes. This is a critical flaw.

Though not actually a comment on the white paper, one reviewer stated that to a large extent, the HPA permitting process concentrates on negative effects related to the construction of a single structure/facility and overlooks both the on-going and long-term operational impacts associated with the existence of the structure, and the effects of siting multiple structures in a specific embayment/body of water. In essence, this results in a total abdication of the agency's responsibility to protect the continued well being of fish and shellfish. This oversight should be addressed as a part of the HCP planning process and in all future rule revisions and guidance to HPA writers. While this document frequently refers to mitigation, the context indicates that what is actually being addressed is compensation for a negative biological impact. Mitigation is properly the sequence of avoiding, minimizing, and then compensating for any residual impacts. The authors either misuse the term or are willing to de-emphasize the first two steps in the process and go to compensation. A result of the perception that negative effects can be compensated for has led the regulatory community to often replace existing, functioning habitat with a new type of habitat. The result is decreased habitat function as a result of the newness of the created habitat, with little or no commitment to ensuring the long-term success of the replacement.

One reviewer expressed that a major problem with the white paper is that it tries to cover a subject that is too large and diverse and over 50 species. This greatly diminishes the quality and usefulness of the document. This is a result of the fact that freshwater and marine overwater structures, non-structural piling, and treated wood are all addressed in the same paper. For the original WDFW white papers, marine and freshwater overwater structures and treated wood issues were treated in 3 white papers. This seemed to work well and the division should have been maintained.

One reviewer felt that the impacts of overwater structures on growth and survival of organisms should have been directly highlighted where appropriate. While changes in behavior or distribution of a listed species are regarded as a take, a more severe issue is changes in growth and survival.

4 Peer Review of Bank Protection/Stabilization White Paper

Seven people reviewed the Bank Protection/Stabilization white paper. Their individual qualifications can be found in Appendix A. Their written comments and those made at the post-review meeting are summarized below, following a brief statement of the key issues that reviewers raised. Reviewers written comments are reprinted in their entirety in Appendix E. Note that since this report includes written and verbal comments by the reviewers, all comments summarized below will not be found in Appendix E.

Reviewers' comments on the white paper follow the listing of key issues raised by reviewers, beginning with the EXECUTIVE SUMMARY. Comments on tables and figures are reported at the appropriate place in the text.

Key Issues Raised by Reviewers

The major issues as identified by peer reviewers in their written comments and in discussions at the post-review meeting are listed below. They generally follow the order that the issues appear in the white paper.

14. The white paper was apparently written by a number of authors. Lack of effective editing left a number of problems that greatly detract from the value of the report. Many of the other issues on this list would have been addressed with effective editing.
15. Even within the various sections, the sub-sections do not have a consistent format. For example, some sub-sections may have effective lead-ins—others do not. Some effectively discuss the issue and reached appropriate conclusions. Others simply address the relevant literature. Most sub-sections make no attempt to link the information to potentially covered species other than the one(s) in the cited literature. This is especially evident in section 7.
16. Terms were often not defined and/or were used inconsistently throughout the report:

    - What are termed the seven" impact mechanisms" through section 6 become the seven "impact pathways" in section 7.
    - A major factor in confusion in the paper is that "mitigation" is not defined and is used variously. Mitigation normally is defined as sequentially avoiding impacts, minimizing impacts, and compensating for any avoidable impacts. The authors sometimes use the term in this broad context, but more often strictly for compensation—sometimes within the same paragraph. Sometimes "mitigate" is used in reference to the first two steps in the sequence.
    - The use of the terms "habitat protection strategies," "habitat conservation strategies," "habitat mitigation strategies," "habitat management strategies" and "BMPs" is confusing. Conservation strategies are defined as design elements to avoid or minimize impacts. The term often indicates a method for restoring or preserving a population, and would not be

something to reduce the impact of an action during the design phase. Normal use of the term would apply to measures utilized during all phases of a project. BMPs are defined as measures used during the construction phase to avoid and minimize. BMPs are usually considered recommendations and might apply to the operation and maintenance as well. There is also the question of where operational aspects fit. Bank protection projects require maintenance and repair. They are neither design elements nor measures used during construction. It is unclear what constitutes a "habitat protection strategy." This term is used in the title of section 11, but nowhere in the text of the paper.

- The objectives of the white paper refer to "policy directives," conservation measures, and BMPs to address potential impacts. The term policy directives is never used again.
- "Minimize" was used when more often "reduce" would have been more appropriate. Minimize connotes taking to a very low level.

17. Information on habitat requirements and distribution of the potentially covered species was considered inaccurate.
18. The conceptual framework for assessing impacts was deemed inappropriate, overly simplistic, unclear, and confusing.
19. The objectives state that maintenance and operation of bank protection structures will be considered. The emphasis is on construction, however, with very little on maintenance or operation and even less on repair and removal. These other aspects have significant ramifications for adverse impact.
20. Throughout the various sub-sections there is much discussion of how the impact mechanism affects the particular fish or habitat referenced in the study. There is, however, little or no discussion of just how it is that bank protection structures trigger the mechanism. For example, just how is it that bank protection increases scour of substrate? The narrative simply says that bank protection projects have the potential to do so.
21. Most of the available literature focuses on salmon or salmonids. The authors should have used their professional expertise to make some observations of the effect of the various impacts on other potentially covered fishes. There is very little of this, however.
22. The effects of the various impact mechanisms or pathways are discussed individually. Doing so ignores the synergistic effects of all the impacts working together and underestimates total impact of bank protection. Much of the discussion was a worst-case scenario. The white paper describes effects that would not occur under present regulations.
23. Saltwater as compared to freshwater impacts are inconsistently discussed. In some cases, one medium is discussed and the other virtually ignored. On some cases the discussion of one cold be extrapolated to the other, but is not. In some cases, it is unclear which is being discussed.
24. The authors' stated definition of cumulative impacts and what they actually address do not coincide. The stated definition is "the incremental impacts of individual projects considered in the context of other past, present, and reasonably

foreseeable future actions." However, each of the impact mechanisms is discussed individually with no mention of the interaction of impact mechanisms. The reference to past, present, and future "actions" suggest that bank protection effects will be discussed in the context of other habitat perturbations. There is no such discussion, however.

25. Regarding the analysis of potential risk of take, it was noted that evaluation of risk at the project level is inappropriate. Bank protection interrupts natural processes that have far-reaching consequences. One reviewer noted that the number of flaws in Table 10 is too great to list; that it is difficult to track the rationale for how each category was selected; and much of the information is oversimplified, over generalized, or doesn't recognize variations in location, type of project, temporal loss, or adequacy of proposed mitigation. Other specific deficiencies were also noted.
26. The impact mechanisms (which are in some places referred to as impact pathways), as titled, are a mix of mechanisms (e.g., construction activities), elements of the environment (e.g., aquatic and riparian vegetation), and ecological processes (e.g., channel processes). As discussed, they are actually a combination of impacts (construction activities) and effects—effects on elements of the environment (e.g., aquatic vegetation) and effects on ecological process (e.g., channel processes). The terms are given different definitions, but they are used interchangeably. This is never explained and very confusing.

EXECUTIVE SUMMARY

Overview

One reviewer recommended dropping the word "stabilization" from the title, since banks are part of fluid systems and armoring does not "stabilize" them, but rather is a method used to prevent erosion. Most shoreline bluffs will continue to erode from factors such as wind, water, and gravity. Using the term stabilization creates a misunderstanding of the influences and processes at work. Another commented that WDFW's objective should be simply to avoid take, rather than avoid, minimize, or compensate.

Another reviewer felt that the second objective would be a good place to establish the timeframe for a future cumulative impacts analysis and potential risk of take, suggesting 50 years.

Direct and Indirect Impacts

The statement in the Riparian Vegetation paragraph "Changes to water quality, and particularly temperature, are the most important of these impacts" of riparian vegetation disturbance, is too generalized. Other impacts may be just as important in some situations, e.g., loss of allochthonous food for juvenile salmonids.

The issue of habitat accessibility could be described more clearly. One reviewer suggested a sentence “Habitat Accessibility is influenced by physical variables including geography (e.g. height of a waterfall), flow, and temperature. The reviewer noted it is different for different species and life stages of each subject species, depending on their physiological abilities such as ability to jump falls.

Habitat Protection, Conservation, Mitigation, and Management Strategies

Definition of the terms “BMP,” “habitat protection strategies,” “habitat conservation strategies,” “habitat mitigation strategies,” and “management strategies” would be helpful. As used here and in the body of the report they are not consistent with more common usage. As a result, the statement: “Conservation measures are design elements intended to avoid or minimize impacts to habitats and species, and BMPs are measures used during the construction phase to avoid or minimize impacts,” is confusing. What are habitat protection strategies, habitat mitigation strategies, and management strategies and how are these terms used? BMPs are normally considered to be voluntary measures but in the white paper the term is used also to apply to legal requirements. Commonly, it is incorrect to characterize all conservation measures as design elements. Avoidance and minimization measures are also conservation measures applied as design elements during site selection and they may obviate the need for many of the potential measures that would be applied during construction. “Mitigation” is usually defined as the sequence of avoiding, minimizing, and compensating for unavoidable impacts. In this section it seems to be used strictly as compensation. As used throughout the report, however, “mitigation” sometimes refers to the compensatory aspect, sometimes for avoiding and minimizing, and other times to the broader context of all three steps. Clear definitions and consistent usage would greatly clarify the paper.

Data Gaps

One reviewer felt that a significant data gap that should be addressed in the executive summary is an analysis of the adequacy of the implementation of the current program.

4.1 Introduction

The authors should note the source of the definition of “bed” given in footnote 1. This is not the definition in the Hydraulic Code WACs. In the white paper definition, the “outflow” from stormwater runoff devices, or other artificial watercourses is excluded. What should be excluded are runoff devices and other artificial watercourses, not the outflow from them.

Table 1 refers to potentially covered fish and wildlife species. No wildlife species are listed, nor are they being considered for inclusion in the HCP.

Errors were noted in Table 1in the status of green sturgeon (they are federally threatened) and the Latin binomials for several species. Correct Latin binomials can be found at http://www.fishbase.org/search.php.

4.2 Objectives

One reviewer commented that one of the objectives of the report should be to evaluate effectiveness of the current HPA program since the recommendations appear to make technical modifications, but not structural changes, to the existing program. Many of the tools listed as necessary to minimize risk of take currently exist. An assessment of how they are being utilized is necessary to determine if take is being avoided under current operating procedures, or whether the tools or procedure currently employed need to be modified.

4.3 Methodology

The third objective refers to policy directives, conservation measures, and BMPs to address potential impacts. The term policy directives is never used again. In section 11 the means of addressing impacts are habitat protection, conservation, mitigation and management strategies.

One review rhetorically asked how many habitat biologists were interviewed for this white paper. A literature review misses much of the practical experience and observations that could reveal many of the major weaknesses in the interpretation, implementation, and protective ability of the Hydraulic Project Approval program.

Neither in the second method nor elsewhere in the methodology is there any indication that any literature was searched for mitigation or other measures (e.g., regulatory or policy) to decrease impacts from bank protection activities.

4.4 Activity Description

Some of the discussion in some sections is pertinent only to freshwater, some to marine areas, and some to both. A general observation on this section is that there is often not a clear distinction between these three situations.

4.4.1 Statues and Rules Regulating Bank Protection Structures

The discussion in this section is extremely misleading. Each of the cited WACs pertains to either freshwater or saltwater, not to both. This is not made clear in the discussion. The authors mix freshwater and saltwater WACs in the discussion and make it appear that the provisions pertain to both.

The term "technical provisions" should be defined—e.g., mitigation measures or restrictions that are incorporated in the HPA.

The discussion of WAC 220-110-280 in paragraph 5 should refer to "non-single-family residential bulkheads," not "non-residential bulkheads (i.e., all other than residential)," and to "single-family residential" rather than "residential." The distinction in the WACS is between bulkheads on single-family property and all other bulkheads, whether associated with a residence or not. This paragraph is very misleading. WAC 220-200-180 also prohibits non-single-family residential bulkheads in Pacific herring spawning areas, not just in eelgrass and in rockfish and lingcod settlement and nursery areas as stated.

One reviewer noted that the restriction on bulkheads in eelgrass areas is only a restriction on bulkheads that would impact eelgrass by their footprint. Others that would indirectly impact eelgrass are not prohibited.

There should be a WAC citation for the sentence "Material choice is addressed in the various rules, which ban certain wood preservatives and rock sizes except where approved," or more details provided.

One reviewer noted that the statement "certain types of (bulkhead) projects are nearly always prohibited in certain habitats" needs to be qualified. The reality, the reviewer continued, is that bulkheads (single-family residence or other) are rarely denied. This needs to be explicitly stated. Bulkheads always result in a permanent modification or loss of habitat. Another wondered what constitutes "in eelgrass" areas related to construction of bulkheads and doubted that the department denies HPAs for bulkheads on all beaches with eelgrass for non-single-family upland use. This reviewer also wondered if the prohibition was limited to bulkheads that would impact eelgrass by their footprint, or would include bulkheads that have an indirect effect on offshore eelgrass beds.

4.4.2 Environmental Setting of Bank Protection Structures

One reviewer commented that it would be useful in marine waters in Table 2 to show bank protection HPAs by residential and non-residential. This would allow a clearer calculation of projected potential cumulative impact if WAC 220-110-280 were truly enforced as part of the HCP. The rate of issuance of HPA's categorized this way would also align better with other sources of information such as Shoreline Management Act environment designations that suggest what types of development would be allowed by the local governments.

The text indicates that bulkheads are evenly distributed between freshwater and saltwater areas. This is contrary to Table 2, which shows about 75% more in fresh water.

4.4.3 Bank Protection Techniques

This section is very confusing at times as the authors switch back and forth between discussion of freshwater and marine aspects without identifying which the discussion pertains to.

4.4.3.1 Hard Approaches

4.4.3.1.1 Vertical Retaining Walls

One reviewer noted that the choice of material often has less to do with the project site and habitat that the landowner’s or contractor’s preference.

4.4.3.1.2 Rock Revetments

Most of the items listed as “revetments” are usually vertical or near-vertical rather than sloping, and do little to absorb wave energy as is stated that they do.

4.4.3.1.4 Levees

In addition to flood protection, levees were built and are maintained for development, primarily agricultural.

The statement that “soft approaches are used where shear forces are relatively low” does not account for vegetation that can withstand high shear stress (USDOT, FHA. 1988. Design of Roadside channels with flexible lining. Hydraulic Engineering Circular No. 18. FHWA-IP-90-017). Nor does it not account for the systematic process of selecting the streambank stabilization technique that fits the objectives formalized in Cramer et al. (2003). The selection of a stabilization approach depends on considerations other than shear stress, including acceptable risk.

4.4.3.2 Soft Approaches

4.4.3.2.1 Log/Rootwad Toes

Log/rootwad installations are often more than just for toe protection as stated, extending above the lower limit of vegetation for bank protection. These structures are not discussed. It is not clear if this discussion is related to freshwater or salt water.

4.4.3.2.2 Beach Nourishment

For some reason, maintenance is mentioned here for beach nourishment projects but not for other techniques. Bulkheads and other bank protection structures require repair, maintenance, and replacement. These aspects should be discussed as appropriate for bank projection structures here, in section 7, and elsewhere.

One reviewer commented that this discussion should also reference the work of Zelo at al. (2000) and Shipman (2001).

4.4.3.2.3 Subsurface Drainage Systems

Surface drainage is often an issue as well as subsurface drainage and should be discussed. Drainage systems are usually components of bank protection projects, not bank protection projects per se as this seems to imply.

4.4.3.2.4 Biotechnical Bank Protection

Riparian plantings may be added to bank protection projects, but also may be used as a stand-alone alternative to conventional armoring.

Gerstel and Brown (2006) evaluated several biotechnical and integrated approaches (per 4.3.3 in the white paper) used on Puget Sound shorelines. This information is available at www.psp.wa.gov and should be included.

The definitions of live fascines and live drain poles do not make clear the distinction between the two. The term “tree kickers” should be defined.

4.4.3.3 Integrated Approaches

One reviewer stated that the last sentence in this paragraph is somewhat misleading. It would be more accurate to state that virtually all of these modifications result in some disruption of natural processes, structure, and functions. Some may be used to make improvements to an altered system, but rarely does one bank protection project (even when identified as restoration) restore larger scale processes.

4.5 Potentially Covered Species Habitat Use

Comments on Table 3 Range of Potentially Covered Species Listed in Table 1 include:

- WRIA is an acronym for Watershed (not Water) Resources Inventory Area.
- White sturgeon occur in all marine areas and many streams throughout the state.
- Juvenile salmon, except sockeye and pink, are found in all Tidal Reference Areas (TRA).
- There are better references for juvenile fish distribution than Wydoski and Whitney (2003).

- Longfin smelt and Dolly Varden are probably found in all TRAs.
- There is no information that rockfish are found in all TRAs and this is unlikely. The distribution of some is not well enough known to assign to areas.
- It is unclear what "Columbia and Snake Rivers" means for white sturgeon, mountain suckers, and sockeye salmon. Specifically, are WRIAs that include those rivers included in the range or just the portions of those rivers that occur within the WRIAs listed?

For Table 4, it was commented that there are too many errors to point them out individually, the authors are apparently not very familiar with the greater body of literature for at least the life history and ecology of estuarine/marine species, and if this is to provide important indicators of habitat and other dependencies, someone who is more knowledgeable needs to provide this information.

WDFW and DNR are each involved in development of HCPs likely including the same species, and accurate information is required. It was suggested by reviewers of the Overwater Structures white paper that tables 3 and 4, which are used in all four white papers developed in 2006, contain numerous errors that the two agencies need to mutually resolve so they are using consistent data.

4.6 Conceptual Framework for Assessing Impacts

The explanation of impact, impact mechanisms and impact pathways is unclear and confusing. This is a major factor diminishing the value of the report. Impacts are defined as activities authorized under an HPA for bank protection. Impact mechanisms are defined as alterations to any of the framework components. Seven impact mechanisms are listed, two of which are actual mechanisms and the other, as named, are elements of the environment or ecological processes. As presented, however, these five are actually alterations to elements of the environment and alterations to ecological processes. Proper labeling of these might have reduced the confusion somewhat (e.g., alterations to riparian vegetation, modifications of channel processes).

This framework was developed to understand natural processes. It is not one that is used by the Services to determine effects to species listed under ESA. That method evaluates effects after avoidance and minimization measures have been applied. An appropriate model, or an amended version of the present model, should be used.

One reviewer commented with respect to Figure 1, that although the figure is popular and not incorrect per se, it poses some confusion because of its linear organization. Riverine and estuarine/marine nearshore ecosystems, like most ecosystems, do not function in simple linear fashion. Habitat structure, for instance, can just as easily provide ecological function as habitat processes, and habitat processes and ecological function may have feedback to habitat structure. Instead of just adopting information outright, the authors should think about how they see the scientific knowledge expressed, perhaps in a non-linear organization with considerably more feedback.

There are some impacts of bank protection projects that don't seem to be covered by the seven mechanisms. For example, there are instances where estuarine/marine beach profiles are changed by modified wave-induced sediment erosion. Also seemingly not included are altered sediment input, beach composition, and sediment transport in marine waters. There are also secondary impacts that don't seem to be included. For example, marine or estuarine bank armoring often allows upland development in closer proximity to the water with attendant secondary impacts (loss of backshore vegetation, creation of a barrier between aquatic and terrestrial systems).

One reviewer noted that the Puget Sound Nearshore Partnership has documents with ideas for better capturing the temporal component of disrupted process over time from the existence of a process-constraining structure.

The discussion of channel processes and morphology throughout the paper is strictly in terms of freshwater (river) channels. This ignores the fact that there are comparable channel processes in marine and estuarine waters, which are different from littoral drift, which is considered under 7.3 Substrate Modification.

4.7 Direct and Indirect Effects

"Impact mechanisms," and "impact pathways" are previously defined as meaning two different things, but seem to be used interchangeably. The confusion due to the fact that impact mechanisms are a mix of mechanisms and effects is further exacerbated by the fact that what were previously seven impact mechanisms now become seven impact pathways, and new impact mechanisms are introduced in some of the sub-sections.

Throughout the various sub-sections there is much discussion of how the impact mechanisms (or pathways as they are now called) affect habitat and to a lesser extent the fish and invertebrates involved in the cited studies. There is, however, less discussion of just how it is that bank protection structures trigger the mechanism. The narrative in come cases simply says that bank protection projects have the potential to do so. For example, just how is it that bank protection increases scour of substrate? One must know this in order to consider and evaluate potential mitigation measures.

For the most part, there is missing a clear linkage from bank protection structures (construction, repair, and maintenance) to the impact mechanism, to how the impact mechanism affects habitat or directly affects fish and shellfish, to how the impacts on the habitat actually affects the fish and shellfish species actually studied, to impacts on potentially covered fish and shellfish species. A standardized format, or appropriate editing, would have addressed this problem.

The effects of the various impact mechanisms or pathways are discussed individually. Doing so ignores the synergistic effects of all the impacts working together and underestimates total effect of bank protection.

The literature on effect on fish by the various impact mechanisms focuses on salmon or salmonids. However, the authors should use their professional expertise to draw some conclusions with respect to other potentially covered fishes.
Bank protection routinely requires maintenance and repair, and structures must often be removed at the end of their useful life. All these activities impact potentially covered fish and shellfish species, but are not discussed. Maintenance is mentioned in the objectives, but there is no follow-up.

Freshwater areas and saltwater areas are often covered inconsistently in the sub-sections. In general, freshwater areas receive more discussion; the discussion for marine areas at times is inadequate. At times the authors often do not make clear which environment the discussion is relevant to and the reader must try to deduce this. It would have been better to clearly separate discussion of freshwater impacts from marine or clearly state which the discussion references.

In this section and in the Executive Summary, the term "essential life-history traits" is used in the context of being affected by bank protection projects. The term is never defined. Life history "traits" would not be subject to modification, except perhaps on the evolutionary scale. Apparently the authors mean sensitive life history stages. They should define the term and/or use the more appropriate one. Also, the section and paper would be clearer if the terms "direct impacts" and "indirect impacts" were defined and the distinction clearly drawn.

One reviewer noted that, in at least some cases, the discussion mixes temporary (construction period-only) impacts with permanent impacts. It would be easier to evaluate impacts if they were clearly separated into these two categories. The impacts described seem to be a worst-case scenario in some cases. They describe impacts that do not take into account existing regulations.

4.7.1 Construction Activities

The discussion seems to ignore several common effects of construction activities: compaction of substrate by equipment, burial of substrate by stockpiling of materials, disturbance of beds and beaches (holes, ruts, etc.) by equipment or barges, and removal or destruction of aquatic or riparian vegetation.

4.7.1.1.3

The authors should consult Partridge (1979) for general descriptions of effects of noise on fish schooling behavior and habituation to noise. Schooling behavior may be critical to survival in some species, especially forage fish. There are also other reports on effects on fish behavior from seismic literature to expand on this section.

4.7.1.2 Suspended Solids

4.7.1.2.1 Impacts to Fish

In several places the authors refer to factors that might influence impact of suspended sediment on fish. An additional factor that is not included would be the history of exposure or adaptation to a natural high-suspended sediment regime.

4.7.1.2.1.2

This should discuss sub-lethal effects of suspended solid concentrations. This would include, for example, the reduction of feeding rates and inhibition of certain physiological responses and the effect this has on potentially covered species.

4.7.1.2.1.4

Determining an impact threshold for salmonids is important. Unfortunately, the authors picked a Biological Opinion for which they did not have access to a key supporting document (USFWS. 2005. Sediment Biological Review). Thus, the train of logic in the white paper, is hard to follow and incomplete. A central piece of information is missing: the level of impact the Services determined to constitute an adverse effect. This information is available in NMFS 2004/01878 Appendix C and NMFS 2004/01876. For a more complete discussion of the ramifications of this, see Appendix E under 7.1 Construction Activities. One reviewer pointed out that it was inappropriate to use this Biological Opinion as reviewers were unable to acquire and evaluate it. This reviewer also stated that these standards are currently under review and that the reviewer considered the current standards excessive for monitoring requirements.

This refers to the Services anticipation that turbidity levels that result in adverse effects to bull trout and Chinook salmon were reasonably certain to occur as far downstream as 3.3 miles. One reviewer noted that more recent BOs did not use this distance, assuming that turbidity would be kept within the mixing zone.

The context of the example where high turbidity levels were detected 4300 ft downstream should be given. One reviewer commented that this is an extreme situation and may have had contributing factors.

4.7.1.2.2 Impacts to Invertebrates

It should also be noted that sedimentation effects on benthic invertebrates depends on the rate of sediment deposition. Benthic invertebrates are adapted to moderate sediment movement and deposition, but not to extremely high rates.

4.7.1.3 Channel Dewatering

4.7.1.3.1 Impacts to Fish

In regard to the statement "operation of a flow bypass system generally will not result in disturbance to the streambed or cause an elevation in turbidity levels, unless the discharge at the outlet results in scouring of substrate material or erosion of streambanks," it should be noted that energy dissipaters are generally required to preclude scouring from occurring.

4.7.3.1.2 Impacts to Invertebrates

Another potential impact is related to displacement of fish, either naturally to avoid high turbidity or as a result of fish removal. This will increase the density of fish in the area being utilized, and increase competition for food and space.

4.7.2 Channel Processes and Morphology

This discussion is solely related to rivers. This ignores the fact that most of the channel processes and the manifestations of the alteration of the processes similarly occur in saltwater and estuarine areas. Reduced habitat complexity, substrate coarsening, decreased channel migration, reduced LWD, reduced gravel (and sand) recruitment, and disrupted flow through the hyporheic zone (beach seeps) also occur on marine and estuarine shorelines. Also, either in this section or 7.3 Substrate Modifications, the geomorphologic changes in estuarine/marine shorelines, as a function of bank protection needs to be discussed.

4.7.2.1 Impacts to Fish

This section describes several negative effects from bank stabilization that, with proper planning, are mostly avoidable. One reviewer felt that the analysis process described in Cramer et al. (2003) should be used for every bank protection project to reveal these reach and other problems. Recognizing failure mechanism and analyzing reach and site conditions will then allow for selecting solutions that avoid and/or minimize upstream and downstream negative effects.

Levees have the potential for adverse effect on potentially covered species. It is not clear, however, how levees shorten and straighten a channel as stated.

4.7.3 Substrate Modifications

Though complicated by the fact that HPAs are only effective for up to five years, there needs to be a way to require removal of armoring material at the end of its useful life.

4.7.3.1 Addition of Non-Erodible Substrate

4.7.3.1.1 Impacts to Fish

The first paragraph includes the statement that rockfishes typically do not occur along the immediate shoreline where bank protection structures would be placed. It should be noted that some rockfishes do occur along the shoreline and associate with bank protection. Also note that important prey items other than fish can be impacted by addition of non-erodible substrate. For example, insect and amphipods are lost as a result of lost backshore and riparian vegetation and beach wrack. These structures also often eliminate refugia and likely subject fishes, including juvenile salmonids, to increased predation.

4.7.3.1.2 Impacts to Invertebrates

This paragraph demonstrates the need to be clear whether the discussion refers to freshwater or marine areas. It should be stated here that the discussion primarily refers to saltwater. One has to deduce that the first sentence refers to freshwater and the second to saltwater. One has to question the applicability to Puget Sound of a study in Korea. Also, Sobocinski (2003) and Sobocinski et al. (2004) would be better references for effects on invertebrates in Puget Sound, but these studies were not included.

4.7.3.2 Increased Scour of Substrate

This section again ignores impacts in saltwater. Scour is typically increased at the end of marine structures and along the base. There are also impacts to forage fishes that should be considered.

One reviewer noted that, whereas the authors state that scour occurs horizontally and laterally ("The term "scour" is usually used to refer to flow-driven horizontal excavation of the streambed, but it can also occur laterally along stream margins and result in bank erosion."), "scour" usually refers to flow driven vertical excavation. This sentence also infers that horizontal and lateral are different—but lateral is also on the horizontal plane and the meaning of this is not clear.

4.7.3.2.1 Impacts to Fish

One reviewer rhetorically asked: what about impacts to forage fishes in the marine environment and prey production? The reviewer commented further that this section again shows a freshwater bias. This is very confusing and poorly organized and presented.

4.7.3.3 Increased Deposition of Substrate

There is considerable discussion about "fine" and "coarse" sediment. The discussion would have been more meaningful had there been values attached.

4.7.3.3.1 Impacts to Fish

This section is a good example of the emphasis on salmon or salmonids throughout this report. The title is Impacts to Fish, but the discussion is solely about salmon, with no attempt to draw conclusions for other potentially covered species. The literature focuses on salmonids, but the authors should be able to use their professional judgment to make some observations relative to other potentially covered fishes.

4.7.3.4 Altered Littoral Drift

Most Puget Sound beaches are mixed sand and gravel, not cobble. In most of Puget Sound, rivers provide a minor amount of the material that forms and maintains the beaches. The bulk of the material comes from marine shoreline banks and bluffs.

This seems to fit better in 7.2 Channel Processes and Morphology. Alterations to littoral drift can affect substrate, but also influence a wide range of other processes and habitat characteristics. Also, various publications by Finlayson provide excellent new information for Puget Sound beaches that should have been included.

4.7.3.4.2 Sediment Transport

While it is true that revetments, which are usually sloping, may dissipate wave energy better than vertical structures, they are usually constructed of riprap (with attendant substrate modification problems) and occupy a much larger footprint on the beach/shoreline than vertical structures.

One reviewer commented that Lincoln Park in Seattle is probably a better example of sediment loss due to a bulkhead and should at lease be mentioned.

4.7.3.4.4 Impacts to Invertebrates

Important information on backshore/riparian vegetation and prey linkages to salmonids in Sobocinski (2003), Sobocinski et al. (2004), Brennan et al. (2004), Brennan and Culverwell (2004), and Brennan 2007 should have been reviewed and included.

4.7.4 Habitat Accessibility

4.7.4.4 Impacts to Fish

The discussion of impacts to fish should include temporary impacts from dewatering and diversions on migrating or traveling fish.

4.7.5 Aquatic Vegetation

It is important to note that the determination of the Ordinary High Water line (OHWL) is not an exact science. OHWL is often at a considerably higher elevation than it appears from casual observation.

4.7.5.1 Alteration of Marine Aquatic Vegetation

The relationship between bank protection measures on marine shorelines and aquatic vegetation is important, but poorly documented. The emphasis in this section is on the value of aquatic vegetation to fish, which is important. But there needs to be more emphasis on the effect of bank protection structures on aquatic vegetation, which is more to the point of this sub-section. There should be more reference to Thom et al. (1994), and especially to beach work at Lincoln Park in Seattle.

4.7.5.1.1 Impacts to Fish

The reference to Chinook salmon feeding on polychaete worms is somewhat misleading. This feeding is probably seasonal when the worms have emerged into the water column for spawning. The referenced study by Brennan et al. (2004) found that terrestrial insects comprised 50% numerically of Chinook diet in both years of the study. This suggests a strong link to terrestrial and backshore vegetation.

The authors state that Blackmon et al. (2006) noted that juvenile salmon preferentially use eelgrass over other habitats. The preferential use is not confirmed in the peer-reviewed literature.

The last paragraph in the section refers to juvenile rockfish being associated with vertical structures. Some adult rockfish show such association as well.

Sediment pulses will often result from construction of bank protection projects. Missing here is a discussion of the impacts of sediment pulses on marine vegetation and direct and indirect effects on associated fishes that could be expected downdrift.

4.7.6 Riparian Vegetation

4.7.6.4 Altered Groundwater Influence

It should be mentioned that armoring of marine shorelines and associated activities alters groundwater patterns that play an important role in habitat quality, especially for species that are sensitive to shifts in temperature and moisture.

4.7.6.6 Impacts to Fish

To the bulleted list in the first paragraph should be added "reduced ability to reduce contaminated runoff from nearby surfaces."

4.7.6.7 Impacts to Invertebrates

Sobocinski (2003) and Sobocinski et al. (2004) are important works dealing with the effects of alteration or removal of marine riparian vegetation and should be included. See also Brennan et al. (2004) and Brennan and Culverwell (2004).

4.7.7 Water Quality

There is very little in the section about water quality in marine waters and its effects. This is a major omission.

4.7.7.1 Water Temperature in Freshwater Environments

This section and 7.6.1 are really dealing with the same subject—water temperature and its effects. It is unclear why 7.6.1 discusses both freshwater and marine water and 7.7.1 deals only with freshwater. This discussion is awkward as presented and should have been combined.

It should also be noted that activities often associated with bank protection, in addition to the installation and existence of the structures, can contribute to reduced water quality.

4.7.7.3 pH Impacts

One reviewer noted that the discussion of adverse impacts of uncured concrete coming in contact with water is irrelevant. WDFW and Ecology require concrete to be cured seven day prior to contacting the water.

4.7.7.4 Salinity

This section discusses the potential for bank protection and associated dredging to affect salinity, but there is nothing mentioned in the white paper in 7.7.5 Impacts to Fish and Shellfish about the impacts of this on potentially covered fish and shellfish.

Characteristic of many Puget Sound beaches is a continuous corridor of reduced salinity. The Puget Sound Nearshore Ecosystem Recovery Program (PSNERP) conceptual model and the regional nearshore Chinook recovery chapter (extension from the referenced Fresh and Averill, 2005, report) suggest that bulkheading along marine shorelines can also disrupt the natural flow of freshwater from bluffs into beach seeps thereby fragmenting this corridor.

4.7.7.5 Impacts to Fish and Invertebrates

This section is supposed to discuss effects of alterations of each of the water quality parameters on fish and shellfish, but it does not effectively do so. It doesn't do much more than state that each of the discussed water quality parameters can have an effect.

4.8 Cumulative Impacts

The authors' stated definition of cumulative impacts and what they actually address do not coincide. The stated definition of what is to be addressed is the cumulative impacts of "future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (50 Code of Federal Regulations 402.02), as per ESA consultations. The reference to "projects" seems to refer to the effects of the seven impact mechanisms as they work together synergistically. However, each of the impact mechanisms is discussed individually with no mention of the interaction of impact mechanisms. One reviewer noted that the Services consider cumulative impacts in the context of the interactive and synergistic effects of the individual actions making up the entire action, not in terms of future state or private activities.

The reference to future "activities"--not "bank protection projects"--suggests that bank protection effects will be discussed in the context of other habitat perturbations, perhaps a discussion of how the impacts of bank protection might be different in a relatively pristine environment as compared to one that has been heavily impacted by waterfront development. There is no such discussion, however.

The first reason given for the importance of cumulative effects of bank protection structures is that they are often constructed to counteract natural habitat-forming processes. But even those that are not constructed for this purpose also always have the effect to at least some degree. It could also be noted that projected sea level rise due to global warming will likely increase the requests for HPAs for marine bank protection. The three reasons given why bank protection activities might have significant cumulative impacts would be strengthened by linking them to the categories and examples of impacts in Table 7. Table 7 would be more helpful if the cumulative impact type was designated for each of the mechanisms.

One reviewer noted that, while an emerging science, there are potential methods to at least semi-quantify likely impacts from shoreline armoring in the future. County growth projections, build-out scenarios, and likely shoreline development patterns may be reasonably forecast using Washington Department of Community, Trade, and Economic Development and county data, HPA database documentation, etc. This may require that the HPA database be upgraded to record shoreline length and parcel number for geographically explicit assessment of impacts. While this functionality may not currently exist, it will be necessary to adaptively manage HCP implementation.

This same reviewer commented that, in addition to Table 7, three additional considerations should be included in a cumulative effects analysis:

- Differential effects of bank protection on marine or lake shores where armoring is placed at or below the ordinary high water mark. Doug George from United States Geological Survey in Menlo Park has conceptual and empirical evidence from higher energy shorelines on how standing waves can form and accelerate the sediment transport disruption processes.
- Projected sea level rise scenarios for Washington's marine shorelines and tidal river segments are likely to place more bank protection structures within and below the ordinary high water mark within the likely 50-year HCP analysis timeframe, regardless of the elevation at which they were built.
- Responses of humans to perceived risk from sea level rise, associated erosion and bank stability on streams affected by projected increased winter rainfall from global climate change will need to be considered.

Another reviewer suggested that there are additional studies on the cumulative effects of bank protection that were not considered. For example, the University of Washington has issued numerous reports on stream urbanization, and there are studies from 2001 on cumulative impacts of projects on the Missouri River.

A third reviewer felt the authors had presented a good synthesis for cumulative effects, but that it might be strengthened if the cumulative impact type was designated for each of the seven impact mechanisms. Also helpful would be a description of how the authors characterize cumulative impacts, particularly how cumulative impacts are not simply additive, but usually very non-linear with inherent thresholds and saturation levels.

4.8.1 Construction Activities

It is true, as stated, "The threshold for watershed and population size and the number of activities that must occur within a particular watershed to have a measurable cumulative impact are not established in the literature." However, literature laying the groundwork for establishing specific take thresholds for watersheds is available. McElhany et al. (2000) introduces the viable salmonid population (VSP) concept (an independent population of any Pacific salmonid that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time frame) and identifies VSP attributes, and provides guidance for determining the conservation status of populations and larger-scale groupings of Pacific salmonids. He outlines concepts intended to serve as the basis for a general approach to performing salmonid conservation assessments.

For the HCP it would be useful to estimate the construction impacts on at least abundance and spatial diversity by watershed and set upper limits for take/impacts. In previous Biological Opinions, NMFS (e.g., 2004-01878) established construction impacts on abundance that were below a not-explicitly-calculated jeopardy threshold. In that Biological Opinion NMFS estimated construction impacts and put them in relation to the abundance of the watershed and Evolutionarily Significant Unit (ESU).

4.8.2 Channel Processes and Morphology

One reviewer stated that this may be the most significant category of cumulative impact as a result of the complex geomorphic linkages between bank stabilization and downstream and downdrift channel and shoreline processes, yet it is limited to a single, very general, paragraph. In the riverine environment, work by Montgomery, Buffington, and others, addresses sources of cumulative impacts in geomorphic systems. Macdonald et al (1994) provides some additional insight into the cumulative impacts of bank protection on marine shorelines.

4.8.6 Riparian Vegetation

One reviewer commented that removal or other impact on riparian vegetation also has a strong potential for significant short- and long-term secondary effects on water quality, loss of LWD and organic debris recruitment, loss of salmon terrestrial food items, change in temperature regime, potential for increased sedimentation, and other. The time required to return to a fully functioning mature canopy and understory needs to be considered.

4.9 Potential Risk of Take

One reviewer commented that the statement (first paragraph after Table 8) that “the federal agencies tend to quantify the extent of anticipated take by measure of the amount of impacted habitat” is somewhat misleading. Federal agencies become involved only if there is a federal nexus. Also, this reviewer commented that characterizing a take based on project size ignores cumulative impacts. It also ignores the fact that some habitats are relatively more abundant, more sensitive and/or more important to any given species

For evaluating the risk of take (second paragraph after Table 8), potential impacts were divided into two categories: those associated with the installation of the bank protection structures and those associated with the existence of the structure once it is in place. It would have been helpful had the discussion in section 7 been so divided. Note, though, that this again seems to ignore repair and maintenance activities, which can have significant impacts.

Much of this is discussion of direct, indirect, and cumulative impacts that would have been more appropriate in sections 7 and 8.

Not all impacts associated with construction of bank protection projects are short term as stated. For example, impacted riparian vegetation may never be allowed to recover, compacted soils may remain so, and materials may be left on the beach and become permanent features.

The statement (paragraph 5) that “A project’s size and location certainly dictate the potential for and magnitude of take” is not a good generalization. Some habitats are more sensitive than others and a small project in one of these can do more damage than a larger project elsewhere. Similarly, the statement that integrating soft and hard bank protection elements would result in intermediate risk is an oversimplification as it ignores area specific sensitivities. It needs to be made clear that by their very nature, all bank protection projects interfere with the natural process to which fish and shellfish have become adapted; thus each one entails some take.

The white paper in the second paragraph of this section states “No explicit take thresholds (such as shoreline length) were identified during a review of bank protection-related biological opinions prepared by NOAA Fisheries and USFWS in recent years.” One reviewer commented that he 2006 USFWS Restoration Programmatic Opinion (1-3-05-FWF-0167) does not consult strictly on streambank stabilization work. However, regardless of the type of work, it establishes upper limits in shoreline length for allowable construction impacts by major river systems. This is a good concept for a programmatic consultation or for any consultation that evaluates construction impacts from multiple projects over several years. It could be adapted for the pending Hydraulic Project Approval HCP.

It should be noted that Cramer et al. (2003) and Saldi-Caromile et al. (2004) are valuable guidelines, as stated. Yet, since they are guidelines, their use is voluntary, and there is no assured outcome.

The statement that "an understanding of the conditions and processes throughout a larger reach of the water body is necessary" should be emphasized. This could be the focus for a discussion of the role and importance of considering bank protection projects in the landscape setting (e.g., littoral drift cell in estuarine/marine settings, river reach in freshwater).

It is noted for some of the impact mechanisms that additional special provisions may be incorporated into a bank protection HPA in freshwater based on site-specific conditions. This is true for all freshwater impact mechanisms per WAC 220-110-032. Additionally, per WAC 220-110-230, additional special provisions may be added to an HPA for any project in marine waters. Furthermore, one should not assume that because there is no specific provision in the WACs relative to a particular issue, that the issue will not be addressed in the HPA. If the HPA writer believes there is an issue that general WAC provisions do not address, a special, site-specific WAC provision can be attached. The no-net-loss standard applies to any potential impact of any bank protection project, not just for certain impact mechanisms as indicated in the table.

One reviewer noted that marine bulkheads are seldom located above OHWL and stated that even marine single-family residence bulkheads should be required to use the least impacting type of structure.

One reviewer commented that with each project having different site-specific conditions—physical and biological, everything cannot be solved with more specific WACs. There should be enough habitat biologists so they have sufficient time to address the site-specific aspects of each projects. Currently, administration of the HPA program suffers from habitat biologists having to deal with too many projects, as well as outdated WACs.

In acknowledgment of the "no-net-loss" provision, one reviewer noted that this does not translate into reality.

With respect to Table 8, reviewers commented that:

- The freshwater bias that occurs throughout the paper occurs again here. For example, channel processes in freshwater are included but there is nothing on beach/littoral processes.
- Riparian vegetation is just as important for green sturgeon as it is for white sturgeon.
- The "N" rating for surf smelt for aquatic vegetation does not take into account its importance for prey production and refuge.

- One reviewer disagreed that riparian vegetation has no risk of take for the rockfishes, considering food web linkages.

4.9.1 Evaluation of Risk of Take Under Existing Statutes

One reviewer suggested that WDFW policy guidelines for the HPA program should also be evaluated, in addition to the WACs. Questions such as at what level in the organizational hierarchy can project denials occur, what is the guidance relative to whether or not HPAs are written for federal agency projects, is there a requirement for compensatory mitigation for unavoidable impacts if the Integrated Streambank Protection Guidelines (ISPG—Cramer et al. 2003) are followed, and others should be addressed.

Another reviewer suggested that all bank stabilization projects should have to go through an impact analysis process and select the least impacting treatment, as outlined in ISPG. There is too much rock and concrete being used when a less impacting alternative would suffice. This reviewer also noted that the no-net-loss provision should be considered only an objective and does not translate into reality. Innovative approaches, perhaps conservation banking, are necessary to improve this problem.

Reviewers had several comments on Table 9 Evaluation of Existing WAC and RCW Provisions and Risk of Take:

- Some evaluations point out there is too little specificity in the WAC, e.g., channel processes. However, with each project having different site-specific conditions, WACs cannot address every conceivable situation. A better or at least companion way should be to allow the HPA biologists sufficient time to address each project. Currently, the administration of the HPA program suffers from outdated WACs, but also from too high of a caseload for most HPA biologists.
- It may be unreasonable to identify timing restrictions that will protect all potentially covered species because of the number that may occur in a particular area and variations in the period they are particularly vulnerable. Using this approach in many places might not leave a work window.
- For Substrate Modifications, Addition of Non-Erodible Substrate, it is noted that placement of appropriate size gravel on the beach is required on surf smelt spawning areas. One reviewer commented that such gravel typically is driven off due to the increased wave energy where bulkheads occur. Also, note that requirements for replanting vegetation do not account for temporal effects.
- One reviewer agreed with the noted deficiencies in the current WACs as pointed out and felt that addressing these would help minimize take and impacts to critical areas. In addition, this reviewer felt that all bank stabilization projects should go through an analysis process and selection of least impacting treatment as per Cramer et al. (2003).

4.9.2 Evaluation of Relative Risk of Take

Table 10, which summarizes the evaluation of risk of take, is based on best professional judgment of the analysis team. In order to know the confidence that can be placed on the evaluation, some reviewers thought it was necessary to know who the members of the analysis team were and their qualifications.

One reviewer noted that the number of flaws in the table is too great to list and that it is difficult to track the rationale for how each category was selected. Much of the information is oversimplified, too general, and/or doesn't recognize variations in location, type of project, temporal loss, or adequacy of proposed mitigation. One reviewer, however, thought the table was very good.

Another reviewer noted that it is completely inappropriate to describe risk solely at the project scale. As the white paper already acknowledges that these activities disrupt natural processes, the spatial and temporal effects of those processes that are interrupted are beyond project scale. It may be important to discuss certain concepts as thresholds qualitatively. It is generally understood, for example, that armoring across an entire littoral drift cell could irreparably damage sediment transport processes leading to beach steepening and coarsening and loss of depositional features downdrift, such as sand spits, barrier lagoons and barrier estuaries. These features support many of the potentially covered species.

The statement that activities in the low risk category may be suitable for programmatic approval ignores cumulative impacts.

The statement that "The risk evaluation summarized in Table 10 assumes that potentially covered species are present when the described impact occurs; thus, impacts may be avoided by performing the activities when or where potentially covered species are absent" is not totally true. Even though a species may not be present at the time of the impact, the effects could persist and may impact later use of the area by the species.

One reviewer noted, relative to beach nourishment, that the table addresses turbidity and aquatic vegetation concerns, but not aspects related to forage fish spawning beaches. It also fails to address short-term as compared to long-term impacts. Beach nourishment may adversely impact certain habitats in the short term in some settings, yet provide net benefits in the long term.

Under beach nourishment, the authors seem to imply that the ordinary high water mark (OHWM) and Mean Higher High Water Mark (MHHW) are interchangeable. This is not true. MHHW often lies 10 to 20 ft waterward and 1 to 3 ft lower in elevation than OHHW.

4.10 Data Gaps

One reviewer thought the recommendations generally lacked the specific rationale for further studies. Another suggested that there be cooperation between WDFW and academia to address basic science gaps through direct collaboration, contracts or grants, or provision for matching of federal funds.

4.10.1 Direct Impacts of the Covered Activities to Potentially Covered Species

One reviewer thought that it might be more important to look at the synergistic effects of the full suite of impact mechanisms or pathways of bank protection projects than to conduct additional studies on the impact of individual mechanisms. Since much of the shoreline and rivers have already been modified by human perturbations, it would be helpful to find large areas of undisturbed shoreline to use as reference points for studies in areas that have been modified.

Also needed, another reviewer noted, is information on the effect of downstream displacement of juvenile salmonids during high water events. This is a result of decrease in low velocity areas resulting from simplification of stream banks or from increase in depth and velocity resulting from bank armoring.

Another data gap is an evaluation of the loss of recruitment of large wood as a result of bank protection and the resultant net export of wood out of the system.

One reviewer believed that information is needed on the frequency and consequences of issuance of emergency HPAs. By statute, certain types of HPAs—including bank protection--must be issued immediately upon request during an official emergency.

One reviewer commented that bank protection projects disrupt natural processes and the effects are larger than project level. They need to be looked at on a larger scale, e.g., the drift cell in marine waters.

4.10.2 Indirect Impacts of the Covered Activities to Potentially Covered Species

As noted in 4.7.7.7.4, there are conceptual models suggesting that bulkheads along marine shorelines can disrupt the natural flow of freshwater from bluffs into beach seeps. This fragments the continuous corridor of reduced salinity characteristic of many Puget Sound shorelines. Lack of empirical studies on this phenomenon is a significant data gap.

4.10.3 Cumulative Effects of the Covered Activities to Potentially Covered Species

In regard to littoral drift, there is a need for improved understanding of the relationship in marine systems between reduced sediment availability and downdrift response of beach elevation and substrate composition.

4.10.4 Conservation Measures, Best Management Practices, and Mitigation

As noted by one reviewer, a significant data gap is information to determine the effectiveness of the current implementation of the HPA program as it relates to bank stabilization projects. For example, how well the program works under emergency conditions, effectiveness of enforcement, adequacy and effectiveness of mitigation, the extent to which ISPG is used, information on denials of HPA applications, effectiveness of current WACs and program implementation in achieving the no-net-loss standard, and other aspects. Absent an analysis of the effectiveness of the current program, it is not possible to determine the need for additional measures and assess the likelihood of the program to meet ESA requirements.

4.11 Habitat Protection, Conservation, Mitigation, and Management Strategies

In this section, as throughout the paper, “mitigation” is sometimes used in the broad sense of avoiding, minimizing, and compensating. At other times it is used in the limited context of the compensatory aspect. At other times, it seems to refer to avoiding and minimizing. A clear definition and consistent use is necessary.

As noted earlier, WDFW is statutorily required to immediately issue HPAs upon request for certain types of projects, including bank protection, during duly proclaimed emergencies. One reviewer noted that consideration should be given to means of mitigating for the effects of these projects.

4.11.1 Avoidance and Minimization Measures

The problem with definitions of terms is manifested in this section as well. “Conservation measures” are defined as design elements with the purpose of avoiding or minimizing impacts, and BMPs are measures used during the construction phase to avoid and minimize. The distinction is not made clear. Some of the BMPs are called mitigation measures in the Table 11 (in the broader context of mitigation). The use of “conservation measures” as strictly applying to the design stage is also troublesome to reviewers and is contrary to more normal usage of the term. The term “conservation measures” usually indicates a method for restoring or preserving a population, rather than one designed to reduce the impact of an action during the design phase. It is unclear what constitutes a “habitat protection strategy.” This term is used in the section title, but not in the text.

Presenting mitigation measures in the categories of avoiding, minimizing, and compensating would have made the presentation more comprehensive and valuable, and would have eliminated the problem of variable meanings of “mitigate.” Measures would simply be called avoidance measures, minimization measures, and compensation measures.

One reviewer noted that use of the term “mitigation” is inappropriate when discussing ESA requirements.

In some cases, “minimize” is used when “reduce” would be more appropriate. For example, there are BMPs to minimize noise of construction activities. Minimize connotes reducing to the smallest possible amount. There is no showing that the measures will do that. One of the measures listed to minimize noise is to require a spill prevention plan. The connection between a spill prevention plan and noise minimization is not clear.

One reviewer noted that effectiveness of site-based mitigation strategies has been called into question in recent years, specifically regarding regulation of wetlands (see Mockler/King County and Ecology reports). Generally, these functional failures are due to lack of mitigation actions appropriate to the scale of interruption of the ecological processes. It is not reasonable to mitigate for cumulative effects solely through site-specific mitigation conditions, especially the ongoing effects of an ever-expanding base of process-disrupting structures. WDFW should consider an acknowledgement of cumulative and unavoidable impacts of each HPA and require a Resource Impact Fee to capitalize a programmatic restoration fund. This fund could then be used to mitigate cumulative impacts at the appropriate scale of the disrupted processes through strategic land acquisitions and process-based restoration projects.

One reviewer (in comments on 7.2.1.1 of the white paper) suggested that the analysis process described in Cramer et al. (2003) should be used for every freshwater bank protection project (freshwater) to reveal reach and other problems that led to bank failure. Identifying the failure mechanism and analyzing reach and site conditions will allow selecting solutions that avoid and/or minimize upstream and downstream negative effects.

Another suggested that there needs to be way to require removal of armoring material at the end of its useful life. This is complicated by the fact that HPAs are only effective for up to five years.

In regards to Table 11:

Use of the term “as possible” is problematic, for example, requirements such as leaving as many existing trees in place “as possible.” A number of these are in the Table 11 (and current WACs) and are subject to interpretation. It is “possible” to leave all the trees. Who decides what is possible in the context of a specific proposal? Perhaps a better way is to require a vegetation management plan as part of an HPA application where this is an issue. Then WDFW would evaluate the plan and determine if it calls for leaving as many existing trees in place as possible. Compliance with the accepted vegetation plan would become a provision of the HPA.

Under Construction Activities, relative to qualifications for those that will handle fish in removal projects, one qualified person should be directing the project. Assistants should not have to have specialized training. It was noted that the Services have established qualification for those who will be conducting electrofishing activities.

Under construction activities, avoiding use of pile driving hammer is recommended. However, impact hammers may still be necessary to “proof” pilings set by vibration. For construction activities and/or riparian vegetation there should be something about maintaining riparian buffers.

For Channel Processes BMPs it is recommended that “For activities requiring dewatering, plan for at least a one-year flow event to occur during construction and design dewatering systems accordingly.” One reviewer thought the flow design level should be specific to the site and the construction period and expected flow. Also, in some cases, the dewatering process may have greater impact on fish than performing the work in the wet, so dewatering should not be required.

One reviewer noted that requiring monitoring of revegetated areas for ten years is excessive and asked for the rationale of requiring monitoring beyond the three years usually required. This reviewer also believed that exclusion of non-native plants for revegetation is unrealistic. There are many indigenous plants that provide the same functions as native plants. Also, for the purpose of erosion control, native grasses are not desirable due to the long duration most of them take to germinate and establish a substantial mass to stabilize soils. Requiring the removal of non-native plants may require an excessive use of chemical applications in order to meet this requirement. Other reviewers disagreed, noting that there are enough indigenous species available.

This same reviewer also noted that saving vegetation and LWD material removed from a site for future use (as recommended as a conservation measure for riparian areas) is problematic. If WDFW requires this, WDFW must accept ownership and responsibility for the material upon removal. Another reviewer noted that there are organizations that will help in this regard and coordinate with potential users.

A conservation measure recommended for Construction Activities is "Manage all surface water to contain and direct it appropriately to the base of the bluff (high-bank sites)." The issue of upland drainage has not been previously discussed and should have been under 7.1 if it is an aspect of construction of bank protection structures with potential effects on potentially covered fish and shellfish.

4.11.2 Mitigation Strategies

Some of the measures listed in Table 12 are not compensatory mitigation measures at all, but are avoidance and minimization (or, more properly, reduction) measures, for example, "use energy dissipation structures" for Channel Processes and Morphology and "stormwater treatment or flow buffering" for Water Quality. These are reduction measures, not compensation measures. (Use of energy dissipaters is listed in Table 11 as a conservation measure. In the "Function" column in Table 12 it is also described as a reduction measure.)

Replacing eliminated vegetation of itself cannot be considered full compensatory mitigation. There is still a temporal loss even if full replacement if achieved.

Use of ISPG may legitimately be considered self-mitigating in terms of avoiding and reducing or minimizing impact, but it is doubtful that it often is fully self-mitigating, including compensatory mitigation. One reviewer questioned where it is shown that following these guidelines results in no net less of habitat functions and values in the long term. Using the guidelines can lead to a number of alternatives, any of which can be chosen. They cannot all be equally benign. And any of them still offer some level of interference with the natural processes to which the fish species assemblage of an area has adapted.

Though there is mention of ISPG, there is no recommendation for requiring its use or for reach-scale analysis or evaluation of site context prior to project design or for appropriate mitigation. Qualified persons must conduct the analysis.

One reviewer suggested the following regulatory measures that should be considered, some of which would require changes to the Hydraulic Pproject Approval statute:

- Extend HPA authority beyond OHWL for bank protection projects. (Coordinator's note: HPA authority presently is not limited by OHWL. The limitation is to work that will use or change the bed or flow of waters of the state.)
- Change the emergency procedures element of the HPA program so that entities do not take advantage of emergencies to undertake work that should have been done via the normal permit process.

- Establish a requirement that mitigation for emergency work must be determined and implemented within a specific time frame following an emergency or that work done during the emergency will be removed.
- Require coordination with Tribal and other interested governmental entities in the issuance of bank protection HPA's.
- Incorporate standards within the HPA program for mitigation associated with bank protection projects. For example, tree replacement ratios for replanting on or off-site to mitigate for removal of mature vegetation.
- The HPA program has as its sole criteria the protection of fish life, yet biologists are frequently put in the position of choosing between protecting fish life or private or public property. Standards should be established that provide for less subjectivity in determining to what extent fish will be affected in order to protect private interests. The ISPG recommends that new riprap installations should be built "only where bank failure would have intolerable consequences or where site conditions are extreme." How is the biologist to determine what is intolerable or extreme, and how is this valued against the statutory requirement of the act to protect fish life? Clearly the proliferation of riprap projects indicates that intolerable consequences occur quite frequently.
- With respect to enforcement of regulations, the reviewer assumed a more robust discussion was inadvertently left out of the document. Clearly a discussion regarding the adequacy and efficacy of current HPA enforcement measures associated with bank protection projects is warranted, as well as a discussion of additional financial needs and regulations necessary to insure effective enforcement.

4.11.3 Management Strategies

4.11.3.1 Regulatory Recommendations

One reviewer suggested that since many small projects do not meet the no-net-loss standard and often do not offer much opportunity for compensatory mitigation, development of conservation banks or other innovative ideas should be considered for such projects.

Another reviewer cautioned that establishing too many across-the-board requirements eliminates the flexibility that is needed to deal with differences in scope, size, location, and other site-specific factors. Unreasonable and unrealistic requirements may be put on some projects.

The statutory limitation on WDFW's ability to regulate single-family residential bulkheads in saltwater is a significant problem. A recommendation to address this would be appropriate.

The first recommendation is good (require pre- and post-construction project monitoring) but does not go far enough. There also needs to be a recommendation of what to do with the collected information.

The second recommendation includes that structural design is a project element that would benefit from inspection during construction. Structural design has long been determined at this point. Is this intended to mean to assure compliance with the design? It is not well stated if that is the point.

One reviewer commented that the recommendation to hire private firms or individuals to inspect projects needs some justification as to why this would be better than doing so with agency staff. It seems that the person that interacted with the applicant and wrote the HPA would the best person to conduct compliance inspections. WDFW should be given the wherewithal to retain a level of staffing commensurate with the task. The reviewer also noted that delays to project progress from waiting for an inspection could result in the project extending beyond the in-water work window.

The recommendation to allow beach nourishment as a mitigation technique presumes that it is not currently allowed. Reviewers are not aware that is the case. Also, there is a level of doubt about the efficacy of this practice as a general compensatory mitigation measure. There needs to be proper evaluation of impacts and acknowledgment of inherent problems with and limitations of the technique. Throughout the white paper, the authors seem to consider it a proven, reliable technique. Reviewers do not agree that is necessarily the case.

Regarding the last item, a 500-ft bank protection project should not be considered for programmatic approval. Programmatic HPA coverage for any bank protection project is problematic. Programmatic approval needs to be reserved for projects that can be rendered benign by standard conditions. Otherwise the programmatic approval only makes it easier for a project proponent to conduct a project and for WDFW to administer the HPA program. It does not meet WDFW's legal mandate to preserve, protect, and manage the fish and shellfish resources of the state.

4.11.3.3 Information Gathering Recommendations

In addition to recommending gathering more information, one reviewer recommended evaluating existing data and/or establishing a moratorium until the level of allowable impact/thresholds can be determined. As it stands, the reviewer believes, this will only "monitor the decline/degradation" and puts off much needed actions to protect what is left and prevent additional damage.

4.11.3.4 Education Recommendations

One reviewer suggested that education within WDFW should include mid and upper level management and policy makers.

4.12 General Questions

1. List any additional sources of information you have not already identified that should have been reviewed and incorporated into the analysis. Are there any sources that were used that you feel should not have been? Why?

(Note: citations are as provided by the reviewers. They have not been converted to a standard format.)

A Critique of the State’s Hydraulic Code by Hollowed, J. and Larry Wasserman, Center for Natural Resource Policy, 1999.

One reviewer noted there are many gray literature sources that were missed/ignored, but there are several that are important to Section 7.8:

- Finlayson, D.P., 2006, The Geomorphology of Puget Sound Beaches (9.5 Mb PDF), Dissertation . School of Oceanography, University of Washington, Seattle, WA: 216 p.
- Finlayson, D.P., and Shipman, H., 2003, Puget Sound Drift Cells: the importance of waves and wave climate (263 Kb PDF), Puget Sound Notes: Olympia, WA, p. 1-4.
- Finlayson, D. 2006. The geomorphology of Puget Sound beaches. Puget Sound Nearshore Partnership Report No. 2006-02. Published by Washington Sea Grant Program, University of Washington, Seattle, Washington. Available at http://pugetsoundnearshore.org
- See for synthetic description of juvenile salmon utilization and “dependence” on Puget Sound shorelines: Fresh, K.L. 2006. Juvenile Pacific Salmon in the Nearshore Ecosystems of Washington State. Puget Sound Nearshore Partnership Report No. 2006-06. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington. Available at: http://www.pugetsoundnearshore.org

A major work on bank protection is the MS thesis by Sobocinski: Sobocinski, K. L. 2003. The impact of shoreline armoring on supratidal beach fauna of central Puget Sound. MS thesis, School Aquat. Fish. Sci., Univ. Washington, Seattle, WA. 83 pp.

2 In general, what aspects of the paper do you feel are particularly flawed? Why? How could they be improved?

One reviewer felt that the discussion of channel changes and morphology would have benefited from more discussion of geomorphology, with appropriate references.

Though this is a biological document, this connection is important in evaluating indirect and cumulative impacts.

Another commented that instead of evaluating take under recommended strategies, it assumes that low risks of take, as compared to intermediate and high risk, are an appropriate approach. This, of course, ignores cumulative effects. How will a proliferation of low risk projects result in the protection and recovery of listed species? Further, the white paper relies too heavily on the ISPG process as the mechanism to minimize take without an analysis of its implementation and effectiveness. Also, there is no analysis to determine if the program as described will be effective. The reviewer further suggested there should be a basin-by-basin, or region-by-region analysis of the current effectiveness of the program, along with a survey of WDFW habitat biologists to consider their evaluation of the current effectiveness of the program and recommendations for improvement. The white paper should also recommend outright prohibitions of certain activities that have significant fisheries consequences. The process as described ultimately results in a continuation of incremental losses of salmon habitat.

Another commented that there is a significant lack of context to the way that Puget Sound basin rivers and shorelines function in the absence of bank protection and the ecosystem processes and functions/goods/services that benefit human society. An important contribution to understanding the impact of bank protection would be an explanation of what is at risk in terms of natural processes that are inhibited by bank protection in various ways. For instance, there are few explanations or references to feeder bluff supply of sediments that sustain beaches within littoral drift cells.

This reviewer also commented that the dominant use of other synthetic white papers, i.e., gray literature, instead of the primary literature is somewhat disturbing, being one more step further into potential misinterpretation. The problem is that the reader doesn't really know what validity and level of peer-review supports a particular interpretation without knowing and being able to reference the primary literature source. The general lack of citation of much peer-reviewed literature should be discouraging from a number of points, only one of which is the poor referencing to the original sources of these interpretations.

3. In general, what aspects of the paper are particularly well done and successfully convey the information?

One reviewer commented that the analysis of impacts of bank protection activities on habitat and biota is well done, with adequate citations.
Another felt that one of the better aspects is the consistent synthesis of threshold effects, which may provide some of the more important information to HCP planning.
A third reviewer noted that "stabilization" in the title gives a false impression. In most cases, banks are protected but not stabilized—especially shoreline bluffs. They will continue to erode from other natural factors such as wind, water, and gravity.

5 Peer Review of Water Crossings White Paper

Six people reviewed the Water Crossings white paper. Their individual qualifications can be found in Appendix A. The written comments submitted by each reviewer and those made at the post-review meeting are summarized below, following a brief statement of the key issues that reviewers raised. Their written comments are reprinted in their entirety in Appendix F. Note that since this report includes written and verbal comments by the reviewers, all comments will not be found in Appendix F.

Reviewers' comments on the white paper follow the listing of key issues raised by reviewers, beginning with the EXECUTIVE SUMMARY. Comments on tables and figures are reported at the appropriate place in the text.

Key Issues Raised by Reviewers

Throughout the white paper, it was obvious the numerous authors were involved in writing the various sections and sub-sections. Many of the specific issues listed below would have been addressed had there been effective editing to bring the various parts together into a cohesive whole.

1. Partly due to lack of a standard format, the treatment of the individual impact mechanisms varied in completeness within the sections dealing with direct and indirect effects, cumulative effects, potential risk of take, data gaps, and mitigation measures. In none of the sub-sections in Section 7 Direct and Indirect Impacts, for example, is there demonstrated a clear path from water crossing structures to how they trigger the impact mechanisms, to their effect on potentially-covered species.
2. Some sub-sections in section 9 Potential Risk of Take reach conclusions about species studied in the various papers the authors reviewed, but none get to broader conclusions about the risk of take of potentially covered species. There is no qualification of which risks are more or less important, i.e., how likely they are to occur and the seriousness of consequences if they do.
3. Water crossing structures impact fish and shellfish and/or their habitat in various ways during construction, by virtue of their existence (e.g., shading, stormwater runoff), as a result of their operation (e.g., vessel interactions), from maintenance and repair activities (e.g., removal of debris from pilings), and from removal at the end of their effective life. To be complete, each of these would have been treated in the sections on effects, data gaps, and mitigation. Operation and maintenance received scant attention--repair and removal none.
4. The authors do not define "cumulative impacts," and it is considered in various contexts throughout the section. Much of the discussion simply relates to the direct and indirect effects and should have been in section 7 Direct and Indirect Effects.

5. Several critical terms were not defined and were used throughout the report with various meanings such that the report is often confusing. For example:

    - What began as twelve impact mechanisms became twelve impact pathways in section and different impact mechanisms were introduced. At times the two terms seem to mean the same thing. At other time they seem to have different meanings.
    - "Mitigation" was variously used in places to refer to the usual meaning of sequentially avoiding, minimizing, and compensating. In other places, it referred to the avoiding and minimizing aspects and in others strictly to compensating. At times it was unclear which meaning was intended. "Minimize" is often misused for "reduce."
    - The terms "habitat protection strategies", "conservation strategies", "mitigation strategies", and "management strategies" are not defined. "Conservation strategies" is used in the title of section l1, but not used elsewhere.
    - "BMPs" (Best Management Practices) is not defined. In common usage, BMPs are voluntary measures; here they seem to be both voluntarily and legally required.

6. The terms "impact mechanism" and "impact pathway" are not defined. The 12 impact mechanisms or pathways, as they are variously called, are a mixture of actual mechanisms of impact of overwater structures that can affect fish, shellfish, and their habitats (e.g., channel dewatering, noise). Others are the effects of those mechanisms on habitat elements (e.g., substrate modifications) impacts of water crossings (e.g., channel dewatering) or ecological processes (e.g., channel processes. This mixture makes it difficult for the reader. One must go to as many as three sub-sections to find, for example, the effect of water crossings on freshwater aquatic vegetation. The rationale for choice of the 12 is never explained or discussed.
7. In Section 11 Habitat Protection, Conservation, Mitigation, and Management Strategies, the authors never recommend any measures. They simply reprint lists from various reports with a comment that WDFW "might want to consider" them, or something similar. There is no attempt to evaluate their efficacy, how practical they are, or other aspects. There was no obvious attempt to systematically examine the various effects of water crossing structures and consider means of avoiding or minimizing those effects. Measures presented were simply a "grab bag" of ideas from others.

    Presentation of the measures in the context of the 12 impact mechanisms, or pathways, is awkward. Many measures presented for one pathway would similarly apply to others. A systematic approach presenting measures to avoid and reduce or minimize the various effects as plan and design, construction, existence of the structure, operation, and maintenance would have resulted in a much more meaningful presentation.

Summary of Reviewers' Comments on the White Paper

The remainder of this section is a summary of the reviewers' comments on the Water Crossings white paper. Comments on tables and figures are reported at the appropriate place in the text.

EXECUTIVE SUMMARY

Overview

One reviewer noted that in the context of ESA, it is not appropriate to discuss compensatory mitigation; one can only avoid or minimize incidental take. Another commented that the paper is void of any mention of "critical habitat," which is a major component of most ESA analysis.

Risk of Take and Potential Mitigation Measures

Throughout this report, "minimize" is often used when "reduce" would be more appropriate. "Minimize" means to reduce to the lowest possible level, whereas "reduce" carries no connotation of degree of reduction.

Channel Hydraulics

Here and throughout the white paper, the authors work on the basis that channel hydraulics is strictly a freshwater feature. This ignores the comparable situation in many estuarine and marine locations. They should explicitly identify the very different impacts of hydrological alterations of streams as contrasted to impacts on estuarine lagoons (where the mouth is often constricted by dikes, bridges, and other structures). This should include discussion of upstream (or back lagoon) versus downstream (or estuarine mouth, marine convergent zone) impacts.

Regarding Table ES-1, one reviewer noted that it is not always clear whether the impacts are direct, indirect, cumulative, or short- or long-term. It seems to be a mix of most of these and it would have been helpful had they been characterized.

Also regarding Table ES-1, one reviewer commented that the authors attribute embedding to reduced sediment transport. This is not the cause of embedding, nor is embedding a direct result of bank erosion. Deposition is a result of reduced sediment transport, but deposition is not the same as embedding. Scour is not due to increased local transport capacity as stated. Local scour results from increased turbulence due to flow obstruction. New bridges and culverts are required to be designed to pass the 100-year flow event plus debris, thus are less likely to block flow and/or result in scour than older structures. This reviewer also commented that deposition downstream of scour areas is a temporary impact of short duration and small in significance. Loss of riparian vegetation due to bank erosion would be a secondary impact not directly caused by a water crossing, but by some other force acting upon a water-crossing site. This comment was submitted relative to bridges that span the channel and would only be true for those.

Water Quality

The authors make the statement "In contrast, incidental take risk associated with dissolved oxygen impacts is probably quite low." It was not clear to what "in contrast" referenced as no expression of degree of incidental take risk has yet been made. No justification was given in support of this statement and one reviewer disagreed.

One reviewer noted that in the context of the Endangered Species Act it is not relevant to consider compensatory mitigation, which is allowed under the Hydraulic Code. Reviewers discussed this issue and concluded that resolving the difference between federal and state law is a significant issue that will have to be dealt with in the HCP development process. Authors of this white paper were only charged to deal with the science of water crossings and their impact on potentially covered fish and shellfish species.

5.1 Introduction

One reviewer noted here and in section 5 Species and Habitat Use, that some sharks, marine mammals, and birds are not included in the white paper, but may be affected by water crossings structures. (Coordinator's note: HPA authority includes only fish and shellfish. Only those listed in Table 1 are currently under consideration for inclusion in the HCP. It would have been helpful had the basis for the selection of the 52 potentially covered species been described. It was noted in the comments on one of the other white papers that the Services will consider all impacts of an action on ESA species regardless of WDFW's statutory authority.)

Footnote 1 and Table 1 refer to potentially covered fish "and wildlife" species. No wildlife species are included in the table. None are being considered for inclusion in the HCP. Also in Table 1, green sturgeon should be listed as federally threatened.

5.2 Objectives

In this section and in the objectives, it is stated that construction and operation of water crossing structures will be considered. However, there is little discussion or treatment of operational aspects and virtually none of maintenance, repair, and replacement. These all have significant potential for affecting potentially covered species.

5.3 Methodology

5.4 Activity Description

5.5 Species and Habitat Use

Table 2 Range of Potentially Covered Species Listed in Table 1 was presented in all four white papers. Reviewers had several comments:

- WRIA is an acronym for Watershed (not Water) Resources Inventory Area.
- White sturgeon occur in all marine areas and many streams throughout the state.
- Dolly Varden, longfin smelt, and juvenile salmon, except sockeye and pink, are found in all Tidal Reference Areas (TRA).
- There are better references for juvenile fish distribution than Wydoski and Whitney (2003).
- There is no information that the rockfishes are found in all TRAs and this is unlikely. The distribution of some is not well enough known to assign to areas.
- It is unclear what "Columbia and Snake Rivers" means for white sturgeon and sockeye salmon. In the column for Water Resource Inventory Area a number of areas are listed followed by (Columbia, Snake rivers). Does the range include the entire WRIAs that are listed, the entire Columbia and Snake rivers, or just the portions of those rivers that occur within the listed WRIAs?
- Pacific herring should be noted as also found in at least Tidal Reference Areas 3, 6, and 7, especially as larvae and juveniles.

Table 3 Habitat Requirements of Potentially Covered Species was presented in all four white papers. Reviewers generally found the table not useful. It is too brief to be of value and, particularly for the marine species, there are too many inaccuracies and inadequacies to point out individually. Apparently much data that is available on nearshore habitat associations and linkages was not utilized. It suggests that the authors are not very familiar with the greater body of literature for at least the life history and ecology of estuarine/marine fishes. If this is to provide important indicators of habitat and other dependencies, someone who is more knowledgeable needs to provide this information.

WDFW and DNR are each involved in development of HCPs likely covering the same species, and accurate information is required. It was suggested by reviewers of the Overwater Structures and Non-Structural Pilings white paper that because of the numerous errors in tables 1 and 2, that the two agencies need to mutually resolve them so they are using consistent data.

5.6 Conceptual Framework for Assessing Impacts

Figure 1 Conceptual Framework for Assessment was presented in all four white papers prepared in 2006 and reviewers' comments are noted here.

Another reviewer noted that the framework is not the same as is applied under an ESA section 7 consultation. Under a consultation, effects to the species are not considered until after the avoidance and minimization measures are applied. What is missing from this framework is a step where impacts to the species are minimized or reduced.

The terms “impact mechanism” and “impact pathway” are not defined. The 12 impact mechanisms or pathways, as they are variously called, are a mixture of actual mechanisms of impact of overwater structures that can affect fish, shellfish, and their habitats (e.g., channel dewatering, noise). Others are the effects of those mechanisms on habitat elements (e.g., substrate modifications) impacts of water crossings (e.g., channel dewatering) or ecological processes (e.g., channel processes). Had these all been appropriately labeled (e.g., reduced eelgrass and macroalgae, altered littoral drift), it might not have been quite so confusing. One must go to as many as three sub-sections to find, for example, the effect of water crossings on freshwater aquatic vegetation. The rationale for choice of the 12 is never explained or discussed.

5.7 Direct and Indirect Impacts

With the 12 impact mechanisms, or as they are called here, impact pathways, being a mixture of mechanisms and effects, the discussion of effects on fish and shellfish or their habitat becomes very disjointed. For example, modifications of substrate are discussed in Section 7.2, Section 7.3, and 7.4

Probably because different authors wrote the various sections, there is not a standard format. For most of the impact pathways, there is a good presentation of the results of the cited literature, but few conclusions about the impact on the studied fish species, much less any attempt to extrapolate to other potentially covered species. There is not a clear link from water crossings to the impact pathways to effects on potentially covered species. For most of the impact pathways there is little discussion of how water crossings trigger the impact pathway. For example, throughout the section on water quality, it is just stated that water crossing can increase suspended sediments, can adversely impact pH, etc.

Throughout this section are conclusions about risk of take. These would more properly be in section 9.

In this section, and throughout the paper, the authors do not distinguish between impacts that occur during construction and those that occur due to operation. Sediment impacts, for example, are greatest during construction.

5.7.1 Channel Dewatering

The authors ignore the fact that construction of water crossings in estuarine and marine waters often entails dewatering so work can be conducted in the dry. This needs to be considered here and in the following sections of the white paper.

5.7.1.1 Fish Removal and Exclusion

One reviewer felt that there should be a discussion of substrate and cover type that impact effectiveness of dewatering, an acknowledgment that LWD and snags may reduce the efficiency of seining, and discussion of how to hold and transport fish to a safe release point.

The last paragraph has the statement "Electrofishing can kill both juvenile and adult fish if improperly conducted." Electrofishing can kill either immediately or as a delayed response even if conducted properly. It should also be noted that fish injured as a result of electrofishing might display reduced fitness and survival.

5.7.1.5 Loss of Invertebrates

The aspect of rates of invertebrate recolonization of dewatered areas following reintroduction of water should at least be mentioned here. If there is any pertinent literature, it should be discussed and cited.

5.7.2 Channel Hydraulics

Reviewers agreed that this section, as limited to discussion of alterations to freshwater streams, missed the widespread documented impacts of bridges and other water crossings structures on channel hydraulics in estuarine and marine areas, especially estuarine areas that drain at low tide. One reviewer discussed this issue in detail. Those comments are summarized and presented here even though some of them go beyond the subject of channel hydraulics:

The mouths of these estuarine systems are often narrowed (with riprap fill) to create a smaller span for bridges. In some cases they are completely filled and a tide gate or culvert is installed to allow some exchange of marine and fresh water. These physical alterations of flow significantly impact estuarine systems, often resulting in scour at the constricted opening and sediment accumulation in the estuary, reduction in estuarine depth, loss of tidal tributaries, warming of estuarine water, and changes to DO and pH of estuarine water. In some cases, pooling occurs behind the constriction and this has collateral effects that vary by season (depending on rainfall, air temperature, and mixing within the estuarine area).

Artificial pooling, in addition to changing flow rates and constricting channel openings, can also impact predation rates (through artificial aggregative effects). Some discussion of the impacts of water flow alterations and channel morphology (of freshwater and tidal channels) on predator-prey interactions should be discussed.

Largely absent from the current discussion of the impacts on freshwater streams and rivers is a review of impacts of structures on saltwater intrusion into estuarine areas (e.g., drowned river mouths) during tidal floods into lower river and stream reaches.

The authors state, referring to streams: “Water crossing structures have primarily temporary effects on regime channel hydraulics, and the channel equilibrates to local scour or deposition without significant substrate composition changes.” This reviewer strongly disagreed for estuarine and marine areas. The reviewer noted from personal observations that in-channel structures associated with bridges can restrict the movement of fine sediment seaward thus increasing downstream (nearshore) scour. Tide flats downstream of such structures are thus composed primarily of sand and coarser sorted sediments (rather than fine silt sediments). This shift in sediment is extremely important for benthic organisms and there is often a shift in benthic invertebrate species resulting from changes to sediment composition. In some cases corollary changes to channel width that are associated with bridge and other water-passage structures increase tidal velocity in the channels and can cause permanent alterations to channel morphology.

5.7.2.1 Controlling Factors in Channels

One reviewer noted that increased roughness is achieved with a commensurate increase in water surface elevation. Water surface elevation will often dictate engineering solutions.

The statement “For many rivers and streams, a single representative discharge may be used to determine a stable channel geometry” needs to be clarified. Channel-forming flow does not guarantee a stable channel.

One reviewer noted that the authors cite a Barks and Funkhouser (2002) finding where relocating a bridge increased water velocity, scour, and channel destabilization, which could be mitigated by planting trees and riprapping the area. This seems to suggest that use of riprap has solved a velocity problem. However, there was no problem absent the bridge. The existing roughness conditions throughout the reach should be the baseline from which effects of the structure (and compensatory mitigation) are determined. There are an increasing number of bridge replacement projects proposed where the existing channel-encroaching structure is being replaced with a much longer structure. However, riprap is being proposed for some distance up-and down-stream, often out into the streambed creating a “nick point” for head- and down-cutting. The habitat benefits from removing the channel encroaching structure are negated by adverse effects on bankline/riparian vegetation and channel hydraulics, with secondary habitat effects.

5.7.2.2 Habitat Structure in Channels

The statement that step-pool habitat is the principal spawning habitat for resident salmonids is contrary to the experience of a least some of the reviewers.

5.7.3 Littoral Drift

The authors acknowledge that littoral drift occurs in lakes, but do not discuss this aspect. This is an important factor in many larger lakes.

It is true that bank erosion is a large source of sediment in Puget Sound. But rivers are also an important source, passing along sediments from upstream erosion to estuaries and on to Puget Sound where they become subject to littoral drift. The white paper makes it appear that Puget Sound sediments come solely from eroding shoreline banks.

5.7.4 Substrate Modifications

In the first sentence, the authors refer to marine littoral drift as being analogous to freshwater channel hydraulic processes. This is not an accurate analogy. Littoral drift is caused by wave action striking the shore at an angle. As noted earlier, channel hydraulic process also occur in estuarine and marine environments due to tidal currents. This is analogous to freshwater channel hydraulic processes.

While this is a good discussion of the impact of marine structures on substrate, much of it is specific to pipelines and docks, with little to link it to water crossing structures other than pipelines. The culvert discussion relates to only one type of culvert in the circumstance where it is not embedded as is usually required.

Coordinator's note: One reviewer suggested that the effects of tide gates should be discussed and the effect of elevated culverts on fish passage. Both these topics are treated in other white papers.

5.7.5 Water Quality

Much of the discussion is taken from the Overwater Structures and Non-Structural Piling white paper with little attempt to relate it to water crossing structures.

5.7.5.1 Suspended Solids

Reviewers disagreed that the NMFS conclusion that potential increases in turbidity would have negligible impacts on salmonids and their habitats was valid as a general conclusion. This depends on site- and resource-specific circumstances.

5.7.5.2 Contaminated Sediment Impacts

The second paragraph discusses effects of suspended sediments on salmonid behavior as described by laboratory and field studies and states several important findings. However, except for the last sentence, the discussion is not supported by any citations to specific studies.

Somewhere in the white paper there needs to be a discussion of the impact of suspended sediment on eelgrass growth. It does not occur here or in 7.6 Eelgrass and Macroalgae.

5.7.5.3 Dissolved Oxygen Impacts

One reviewer disagreed with the conclusion that low DO associated with water crossings will pose minimal risk to fish. If pooled water is low in DO, fish trapped during lowtide in pools of water behind water-crossing structures (e.g., riprap dams that commonly occur below bridges that are inundated only at + 2-3 foot tides) could experience protracted periods of stress. The authors also need to consider the impact of increased water temperature (and other water quality parameters such as pH and salinity) that occur in stagnant water trapped behind partial dams, culverts, tide-gates, and other restrictive structures often associated with water crossings.

The comment from one reviewer notes a problem that occurs here and is common throughout the paper. In this sub-section and in 7.5.4 of the white paper, there is no indication of whether the discussion applies to freshwater, saltwater, or both.

5.7.5.6 Stormwater and Nonpoint Source Water Quality Impacts

One reviewer commented that the statement that stormwater impacts are mitigated by Ecology regulations under the Clean Water Act and that compliance with Ecology and Department of Transportation (DOT) stormwater guidance will not result in incidental take of listed species is not accurate. Neither state water quality standards nor the presumptive approach of such compliance predicated upon the use of certain BMPs are protective of listed fish. For example, NMFS has identified incidental take from the effects of stormwater in recent biological opinions (e.g., State Route 167 Extension, soon to be available on the NMFS website). The biological effects thresholds of dissolved copper (Baldwin et al. 2003) and dissolved Zn (Sprague 1968), used in these analyses as the basis for incidental take, are well below state water quality standards.

(Coordinator's note: The authors fail to define "mitigation" anywhere in the paper. It should have been defined and consistently used. They variously use it in the overall sense of avoiding, minimizing and compensating; for avoiding and minimizing; and strictly as compensatory mitigation. At times it is difficult to know which of these they mean. In the above-referenced statement (that stormwater impacts are mitigated by Ecology regulations under the Clean Water Act), they may have meant it in the restricted context of avoiding and minimizing. In which case the reviewer probably would not have disagreed—complying with water quality standards will minimize or at least reduce impacts. The reviewer apparently understood the authors to mean mitigate in the broad context, that complying with the water quality standards eliminates any adverse impacts.)

5.7.6 Eelgrass and Macroalgae

5.7.6.1 Ambient Light

One reviewer stated that the discussion here is taken from the white paper on overwater structures with little attempt to link to water crossings. Bridges in marine water areas must be high enough off the water for navigation and do not have the same shadow effect. During the post-review meeting, this reviewer agreed that bridges exist in marine waters that are low enough to have a shading impact. Most of those built under current requirements, however, will have reduced or no potential for shading due to their height.

5.7.8 Riparian and Shoreline Vegetation

One reviewer noted that this section discusses removal of riparian vegetation during the construction of water crossings, but does not mention the often-greater adverse impact on riparian and shoreline vegetation from the placement of riprap in association with water crossings. Vegetation may be planted in the interstices but there will at least be a temporal loss and probably some degree of permanent loss.

(Coordinator's note: One reviewer commented on the need for discussion of vegetated levees and dikes. Levees and dikes are considered in the Bank Protection white paper.)

5.7.8.1 Shading and Water Temperature Regime

One reviewer commented that the white paper did not show any references relating to a level of vegetation loss that has a measurable impact on water temperature and that impacts that are not quantifiable or measurable are insignificant. Some other reviewers disagreed: (1) some studies have shown measurable impact, (2) even if studies hadn't shown it, that wouldn't mean it didn't occur, and (3) even individually minute impacts can become significant cumulatively or synergistically.

5.7.8.2 Streambank/Shoreline Stability

One reviewer felt that impairment of hyporheic function attributable to water crossings is mostly theoretical.

5.7.8.5 Habitat Conditions

One reviewer stated that LWD positioning and influencing pool formation has no direct correlation to water crossings. Some others disagreed. While most newer bridges will totally span the channel and many culverts will be sized to pass reasonably expected LWD, older bridges with piers or pilings in the water will catch LWD that may be removed from the channel during maintenance. Older culverts will catch much debris and newer, larger culverts will still catch some. This is often removed from the channel and no longer available for downstream recruitment.

5.7.9 Noise

5.7.9.1.1 Pile Driving

Recent Biological Opinions (e.g., State Route 167 Extension, soon to be available on the NMFS website) have indicated that egg masses in adult female salmon may be at particular risk from high sound production levels. These risks include mortality of individual eggs, tearing of the mesenteries securing the eggs in the ovary resulting in the eggs being extruded prior to spawning, or developmental abnormalities that could decrease survival. Limited research indicates that post-fertilized eggs are sensitive to mechanical shock, such as pile driving (Jensen 1997; Jensen 2003).

5.7.10 Artificial Light

This sub-section is taken virtually word for word from the Overwater Structures and Non-Structural Pilings white paper with little attempt to relate it to water crossing structures.

5.7.11 Shading

There is considerable information available from the DOT presenting research on fish movement and predation under docks (e.g., “Impacts of ferry terminals on juvenile salmon migrating along Puget Sound shorelines. Phase II: Field Studies at Port Townsend Ferry Terminal).

This sub-section is also taken from the Overwater Structures and Non-Structural Pilings white paper with little attempt to relate it to water crossing structures.

5.7.12 Vessel Activities

This sub-section is also taken from the Overwater Structures and Non-Structural Piling white paper with little attempt to relate it to water crossing structures. Impacts from vessel activities associated with water crossings are likely to be non-existent or temporary.

5.8 Cumulative Impacts of Water Crossings

The authors never define what they mean by "cumulative impacts," and the term is used with multiple meanings. At times it seems to refer to the full array of impacts of overwater structures at one site over time or at multiple sites in limited areas. The discussion, however, is primarily in terms of the cumulative impacts of each of the impact mechanisms individually. There is another inference that, at least with respect to accidents, cumulative effects are considered those that likely would not have occurred but for the issuance of an HPA. This is not what is normally considered cumulative impacts. Inference elsewhere places suggest that the authors are considering cumulative effects in the broader sense of the landscape, but this is never discussed (e.g., 8 .8 refers to " the threshold at which a group of activities will have an adverse impact to aquatic species and habitat at the watershed scale. . . "). Further confusion about what the authors consider to be cumulative effects is that very little of the discussion in the section is actually about cumulative impacts. It is mostly just further discussion of the direct and indirect effects of the various pathways that should have been in section 7.

Most of this section is simply copied from the Overwater Structures and Non-Structural Pilings white paper with little attempt to link it to water crossings.

The statement that accidents would be considered by the federal agencies in their decision to issue an Incidental Take Permit is not true. All projects have minimization measures that normally include measures for spill control and containment. The Services consult on the expected project, not the unpredictable or unexpected action. Additionally, accidents have direct, indirect, and cumulative effects, not just cumulative as the authors imply. The authors also seem to imply here that they consider cumulative impacts to be those that would not have occurred but for the issuance of the HPA. These are not cumulative impacts.

In this section and elsewhere, it is noted that the authors' professional experience was utilized. Some reviewers thought it would have been helpful in evaluating the white paper if the authors and their relevant experience had been reported.

5.8.1 Channel Dewatering

Almost all of the discussion is of direct and indirect effects and should have been in section 7.1.

One reviewer felt that pertinent information on the impacts of handling fish and other stresses associated with fish bypass and transport systems in the Columbia River might have application to effects of channel dewatering.

5.8.2 Channel Hydraulics

One reviewer stated that catastrophic failure of water crossings during natural disaster is not a cumulative effect as stated in this section.

5.8.5 Water Quality

One reviewer noted that stormwater runoff from bridge surfaces and pollutants from bridge maintenance activities can run directly into the river. Bridge decks should be required to direct run-off into bioswales or catchment areas that provide some measure of treatment and storage.

The statement "It is well known that PAHs and metals are significant components of urban stormwater" needs a citation. The authors don't make it clear how this discussion relates to cumulative impacts.

One reviewer felt that turbidity from water crossings is temporary and not cumulative. Others disagreed that it was temporary; and even temporary effects can be important cumulatively. Another reviewer related personal observations that vibration from some railroad trestles cause turbidity every time a train passes over.

5.8.7 Freshwater Aquatic Algae

This discussion relates to direct, not cumulative, effects and the authors fail to show any correlation to water crossing structures.

5.8.8 Riparian and Shoreline Vegetation

The authors make no attempt to correlate referenced impacts with water crossing structures.

5.8.9 Noise

The authors make no attempt to link the referenced impacts to water crossing structures.

5.8.12 Vessel Activities

The discussion does not relate the discussed impacts of vessel traffic to water crossing structures.

5.9 Potential Risk of Take

5.9.1 Channel Dewatering

It is not true, as stated, that WAC 220-110-120 only applies to game fish and food fish. It applies to "game and food fish and other fish life." The assessment that "there is a relatively high risk of take for dewatering activities in fish streams because the WAC does not focus on 'all fish,' methodologies for removal could result in stranding fish, and fish could be harmed through mishandling" needs to be clarified.

One reviewer noted that channel dewatering is overused. For example, dewatering for in-water work immediately adjacent to the shoreline may be limited by simply sandbagging the immediate vicinity of the in-water portion of the structure. Sometimes a portion of a channel can be dewatered in lieu of the entire channel.

5.9.2 Channel Hydraulics

One reviewer noted that another potential impact that should be considered is the impact of pooling (or slackwater) on estuarine species due to loss of full tidal exchange. Another commented that riprap, which is often associated with bridge projects and causing several negative impacts, including channel simplification.

One reviewer commented that the sentence "However, the use of qualifying language diminishes the effectiveness of such provisions in avoiding incidental take," should read avoiding "impacts" instead of "incidental take," as that is a misuse of the term "incidental take."

Also regarding Table 11 (which is the same as Table ES-1), one reviewer commented that the authors attribute embedding to reduced sediment transport. This is not the cause of embedding, nor is embedding a direct result of bank erosion. Deposition is a result of reduced sediment transport, but deposition is not the same as embedding. Scour is not due to increased local transport capacity as stated. Local scour results from increased turbulence due to flow obstruction. New bridges and culverts are required to be designed to pass the 100-year flow event plus debris, thus are less likely to block flow and/or result in scour than older structures. This reviewer also commented that deposition downstream of scour areas is as temporary impact of short duration and small in significance. Loss of riparian vegetation due to bank erosion would be a secondary impact not directly caused by a water crossing, but by some other force acting upon a water-crossing site. This comment was submitted relative to bridges that span the channel and would only be true for those.

5.9.2.3 Embedding

One reviewer commented that embedding (and deposition of fines) sufficient to cause the impacts discussed requires quantities of fine material unlikely to be generated from a water crossing.

5.9.2.4 Scour

One reviewer felt that scour from portions of water crossings in the wetted perimeter is local, direct, and not likely to be cumulative.

Another noted that riprap designed to reduce scour can in fact promote scour. This is avoided by locating bridge abutments outside the floodplain. If located within the floodplain, using buried groins immediately adjacent to abutments in lieu of riprap can reduce scour.

5.9.4 Substrate Modifications

The authors discuss the positive impact of artificial hard substrates for marine organisms that are frequently found in structured or architecturally complex habitat. They should also discuss the impacts on resident soft-bottom species and migratory species (such as crab and flatfish) that forage in mud and sand flats at high tide. Conversion of soft-bottom habitats to highly structured habitats benefits some species (as mentioned by the authors) at the cost of displacing others. A discussion of the negative impacts should also be included.

The authors statement “There is a moderate to high risk of take of fish associated with substrate modifications in freshwater environments” does not seem consistent with the discussion. The cited WAC requires impacts to be minimized—taken to smallest possible amount. It doesn’t seem consistent that there would then remain moderate to high risk of take.

5.9.5 Water Quality

As noted in 7.5.6, dissolved metals biological effects threshold concentrations are very low, take can be expected from the stormwater runoff from most projects where there is a significant amount of pollution-generating impervious surface (PGIS). Incidental take can only be avoided when there is no net increase in pollutant loading and the effluent concentrations are at or below the thresholds. Minimization measures include retrofitting existing PGIS in addition to treating all new PGIS, significant use of infiltration BMPs to minimize the pollutant load and minimize the discharge such that pollutant concentrations are diluted within a few feet of the outfall, and/or large receiving waterbody volume and/or high flows.

5.9.6 Eelgrass and Macroalgae

One reviewer commented that the discussed impacts are for overwater structures and not water crossings. The discussion of risk of take should consider that most bridges in the marine environment must be high off the water for navigation and do not have the same shadow effect.

5.9.10 Artificial Light

The discussion is in terms of artificial light from overwater structures, with no attempt to equate to light that might be associated with a bridge.

5.9.11 Shading

The discussion of shading impacts is in reference to overwater structures. The authors make no attempt to equate to shading that might be associated with a bridge.

5.9.12 Vessel Activities

This is simply a discussion of effects of vessel activities. There is no attempt to show how these impacts might be a result of vessel activities associated with a water crossing or discussion of risk of take.

5.10 Data Gaps

One reviewer noted that specific distribution of the potentially covered species is a general data gap. Information that is available is often not available at a scale that is usable for site-specific analysis.

5.10.2 Channel Hydraulics

One reviewer suggested eliminating the first sentence (“Most processes associated with channel hydraulics are reasonably well understood.) The reviewer felt that it does not add anything and conflicted with the last sentence.

5.11 Habitat Protection, Conservation, Mitigation, and Management Strategies

One reviewer felt that the discussion was insufficient in scope. Where critical habitat (CH) is present, protection, mitigation, conservation, and management should focus on Primary Constituent Elements (PCEs) of critical habitat. A permanent loss of any PCE could result in Adverse Modification of CH, tantamount to Jeopardy under the ESA.

Another reviewer suggested that consideration of cumulative effects be made part of review of each HPA.

5.11.1 Channel Dewatering

The authors suggest that fish screens on pumped diversions should adhere to performance criteria of WDFW and NMFS. There are other aspects of screening that should also be adhered to, such as mesh material.

The authors suggest that WDFW adopt protocols for fish removal in association with channel dewatering. Some specific recommendations from reviewers regarding protocols are that WDFW should:

- Specify seine mesh size according to species and age class of fish likely to be present.
- Specify seine mesh material.
- Specify sequencing of actions.
- Be flexible to account for site-specific conditions.
- Consider use of a sump hole to draw fish into.

The following were also suggested as considerations for channel dewatering:

- Avoid unnecessary channel dewatering (e.g. when in-water structures to be isolated are located immediately adjacent to the wetted perimeter.)
- Limit dewatered area to that which is necessary to isolate the in-water structures (e.g., dewater only a portion of the channel in lieu of the entire channel.)
- Install work area isolation structures with sufficient height to exceed maximum water level reasonably expected during project.
- Install individual pieces of multi-piece cofferdams in sequence to discourage fish from entering the project area and to allow fish that become trapped to escape through the downstream opening.
- Conduct cofferdam dewatering in two to three stages, pausing between stages to accommodate fish removal.
- Do not remove cofferdam materials until turbidity levels within the work area are the same as the river.

Reviewers agreed that it is necessary to have a qualified person as the lead person in charge of fish removal operation. Assistants under the lead persons direct supervision, however, need not meet the same qualifications.

5.11.2 Channel Hydraulics

It is not clear why the suggestion that “WDFW might consider a requirement to assess take risk for each HPA” occurs only in this sub-section since it is a suggestion for all HPAs. The suggestion of a formal risk take assessment for large projects is well taken, but might be too burdensome for small, low impact projects. For these, some qualitative analysis might be more appropriate.

Similarly, requiring a hydraulic model for placement of a structure below OHWM is appropriate for large projects. Allowance for a conceptual or qualitative model for small, low impact projects would at least ensure that thought had been given to the subject.

One reviewer thought that designing water crossings to the 500-year flow event to deal with catastrophic failure is unreasonable.

Another suggested that bridge abutments should be located outside the channel migration zone; use of in-water piers should be avoided unless site and engineering design constraints necessitate their use; drilled shafts should be utilized for all abutments and piers; shafts should extend to below the depth of scour to avoid need for scour protection; and if scour protection is demonstrated to be necessary, it should be limited to buried groins immediately adjacent to abutments in lieu of riprapping the bank.

5.11.5 Water Quality

The suggestion to phase and stagger the installation of ACZA- and CCA Type C-treated structures by a few weeks or more was deemed impractical from a project management standpoint and cost-prohibitive. Better would be to use the requirements of *Best Management Practices for the Use of Treated Wood in Aquatic Environments* developed by the Western Wood Preservers Institute.

For projects with treated wood it was suggested that a risk assessment should be undertaken for projects involving more than 100 piling, with large areas of treated wood--such as bulkheads, in industrial areas where there may be high background levels of metals or polycyclic aromatic hydrocarbons, or in close proximity (<50 feet) to other projects involving more than 20 pilings that are treated with a similar preservative. Additional criteria should be applied for the use of specific types of treated wood per http://www.wwpinstitute.org/pdffiles/AquaticGuide.pdf. Treated wood should be coated with an impact-resistant, biologically inert substance.

Another suggestion was that, for stormwater runoff from water crossing structures, there should be assurance that dissolved copper and zinc result in no net increase in pollutant loading and that effluent concentrations are at or below appropriate thresholds. Impacts should be minimized by (1) retrofitting existing pollution-generating impervious surfaces in addition to treating all new ones; (2) using infiltration BMPs to minimize the pollutant load and minimize the discharge such that pollutant concentrations are diluted within a few feet of the outfall, and/or by discharging into large receiving water body volume and/or high stream flows; treating all stormwater from water crossings.

5.11.8 Riparian and Shoreline Vegetation

The authors suggest a requirement for revegetation plans and monitoring for projects that temporarily disturb vegetation. Missing, though, is a recommendation for necessary elements of a plan and the specific goal or objective for revegetation requirements, i.e., simulate original species type, abundance, and distribution, or other. The suggested revegetation plan calls for a goal of 100% survival of plantings--one reviewer asked, 100% survival of what?

One reviewer commented that monitoring requirements may be appropriate for large revegetation projects, but not for small riparian area impacts. Also, stem counts at the end of three years may be problematic, depending on the density of the vegetation and the amount of recruitment of volunteer species.

Saving vegetation (specifically large trees and root wads) removed for the project for later use in restoration efforts, as suggested, does nothing mitigate effects of the project, though it may have benefits elsewhere.

One reviewer commented that saving vegetation could create a storage problem. Placement on lands adjacent to the project can be problematic if the applicant does not own the land. Also, the material might be stolen if it is marketable (e.g., cedar trees). The issue of who is responsible for the material once it is placed in an upland area for use by others needs to be addressed. It is likely any material WDFW requires to be removed and saved for future restoration projects will become their property and responsibility. They will be responsible for moving the material from the job site and storing it for future use by restoration groups.

This reviewer also noted that although the use of native vegetation may be preferred, it should be noted that in certain circumstances, non-native plants perform better. This is typically where the area has previously been highly disturbed and no longer provides the conditions normally required by native vegetation. It should also be noted that native herbaceous species are slow to germinate and grow, therefore do not provide soil stabilization necessary to minimize erosion along the disturbed banks. (In response to this same comment in the Bank Protection white paper, the reviewers thought there were sufficient suitable native plants available for use.)

This reviewer commented further that it is not possible to ensure 100 percent survival of plant material for one year. It would be better to require that any plants that die during the first year must be replaced. Also, even though the standard of 80% survival rate after three years is used by several agencies, it is not always realistic, depending on site-specific conditions. Consideration needs to be taken into account for plant loss associated with browsing, girdling, drought, freezing, insect infestation, and diseases. This is especially critical for any monitoring requirement beyond three years.

5.11.9 Noise

It should be noted that use of a wooden pile cap as recommended may reduce noise, but is a safety hazard. The wood can splinter and endanger nearby workers. Also, "proofing" with an impact hammer may be necessary for piles installed with a vibratory hammer.

One reviewer submitted a specific recommendation for bubble curtains. They should encircle the perimeter of the pilings from the substrate to at least 5 ft above the maximum water level expected during pile installation. The bubble curtain may be unconfined if water velocities will remain below 1.15 mph, but must be confined in higher velocities.

5.12 General Comments

1 List any additional sources of information you have not already identified that should have been reviewed and incorporated into the analysis. Are there any sources that were used that you feel should not have been? Why?

Hecht, S.A., D,H, Baldwin, C.A. Mebane, T. Hawkes, S.J. Gross, and N.L. Schola. 2007. An overview of sensory effects on juvenile salmonids exposed to dissolved copper: Applying a benchmark concentration approach to evaluate sublethal neurobehavioral toxicity. NMFS, March 2007.

Jensen, J.O.T. 1997. Mechanical shock sensitivity units in salmonid eggs. Department of Fisheries and Oceans Canada, Pacific Biological Station, Aquaculture update 78, Nanaimo, British Columbia (September 15, 1997). 3p.

Jensen, J.O.T. 2003. New mechanical shock sensitivity units in support of criteria for protection of salmonid eggs from blasting or seismic disturbance. Department of Fisheries and Oceans Canada, Pacific Biological Station, Aquaculture update 90, Nanaimo, British Columbia (April 7, 2003). 18 p.

Sandahl, J.F., D.H. Baldwin, J.J. Jenkins, and N.L. Scholz. 2007. A sensory system at the interface between urban stormwater runoff and salmon survival. Environmental Science and Technology 41(8): 2998-3004.

Sprague, J.B. 1968. Avoidance reactions of rainbow trout to zinc sulphate solutions. Water Research 2: 367-372

2. In general what aspects of the paper do you feel are particularly flawed? Why? How do you feel they could be improved?

One reviewer commented that the authors seem to have overlooked the impact of water-crossing structures on estuarine systems, in particular the impact of changes to tidal flushing and artificial pooling (behind structures). In general, the reviewer felt that the impacts on estuarine and marine species and habitat (except for eelgrass and salmonid species) was weaker than the discussion of impact on freshwater species. There needs to be significantly more discussion of the impacts of water-crossings on marine habitats and species other than salmon.

The paper does not address the effects of operations or maintenance activities associated with overwater structures. Many of these activities require a HPA.

The use of the term mitigation (i.e., compensatory mitigation) throughout the document is not appropriate when addressing ESA take.

3. In general, what aspects of the paper are particularly well done and successfully convey the information?

One reviewer commented that overall the review is well written and most of the freshwater topics are covered in depth. Although, the reviewer feels the authors did a good job reviewing the potential impacts of water crossings on freshwater aquatic systems, the review would be strengthened by a broader discussion of potential impacts on marine and estuarine systems. In particular, bridges along shorelines in Washington often span the openings of large and small pocket estuaries. In many cases riprap has been added to narrow the bridge span and movement of riprap and accumulation of material beneath the bridge can form an intertidal dam, restricting drainage of tidal channels during low-tide and causing artificial pooling of stagnant water upstream of the bridge. The pooled water can accumulate sediments, become anoxic, and/or increase in temperature during the summer or decrease in salinity during rainfall events causing thermal or other physiological stress to migratory species entrapped during ebb tides. The authors should discuss the potential impacts of restricted tidal-hydrology on species and habitats. I am also unclear as to why avian and marine mammal species were not included in these assessments. More discussion of the impact of water-crossings on non-salmonid marine and estuarine species should also be included.

APPENDIX A

Qualifications of Individual Reviewers

Although all reviewers were generally recognized as having the expertise to review the white paper they were chosen for, each was asked to submit a resume, curriculum vitae, or other statement of their qualifications. Some of the submissions were edited for brevity. They are presented here in the following order:

NAME	WHITE PAPER(S) REVIEWED
Scott E. Anderson	Water Crossings
James S. Brennan	Overwater Structures and Non-Structural Pilings Bank Protection/Stabilization
Carol Cloen	Overwater Structures and Non-Structural Pilings
Stephanie Ehinger	Bank Protection/Stabilization
Kurt Leigh Fresh	Overwater Structures and Non-Structural Pilings
Brett C. Harvey	Small-Scale Mineral Prospecting
Kirstin K. Holsman	Water Crossings
Russell C. Ladley	Water Crossings
Doug R. Myers	Bank Protection/Stabilization
Thomas Ostrom	Overwater Structures and Non-Structural Pilings
Aaron M. Prussian	Small-Scale Mineral Prospecting
Michal J. Rechner	Small-Scale Mineral Prospecting
Neil Rickard	Water Crossings
Ken Schlatter	Water Crossings
Thom Seal	Small-Scale Mineral Prospecting
Sheri Sears	Small-Scale Mineral Prospecting
Hugh Shipman	Bank Protection/Stabilization

Charles A. “Si” Simenstad	Overwater Structures and Non-Structural Pilings Bank Protection/Stabilization
Emily J. Teachout	Overwater Structures and Non-Structural Pilings
Larry Wasserman	Bank Protection/Stabilization

Scott E. Anderson Qualifications

- 6 years regulatory experience with projects including various road crossings structures, road widening, retrofitting, scour attenuation, and bank protection.

- Currently a WASDOT Liaison to NMFS, dedicated to all types of road projects, often crossing structures, formal and informal consultations statewide.

- Negotiate and coordinate terms and conditions, minimization measures, and BMP's for projects through the ESA.

- NMFS representative to the Technical Advisory Committee (TAC) of the Lower Columbia Fish Recovery Board. Provide technical review and scoring of enhancement projects for funding through the governors office.

Education:

The Evergreen State College, Olympia, WA.
Master of Environmental Studies degree October, 1999.
Major: Biology and Habitat of Pacific Salmon

Thesis Topic (Literature Review): *Freshwater Rearing of Juvenile Chinook Salmon and other Salmonids: Potential for Restoration In Puget Sound.*

Western Washington University, Huxley College of Environmental Studies, Bellingham, WA. *Bachelor of Science* degree, June 1993.
Major: Environmental Policy and Assessment

Applicable Training*:*

Basic Section 7 Training, Lacey, November, 2003

Advanced Section 7 Training, Lacey, April, 2004

Design of Road Culverts for Fish Passage Training, Olympia, WDFW, 2004
Integrated Streambank Protection Guidelines (ISPG) Training, Olympia, March 2004

Forest Service Analytical Process Biological Assessment Training, Portland, 2005.

Natural Channel Design Workshop, Interfluve Inc., Lacey, June, 2005

JAMES S. BRENNAN
Marine Habitat Specialist

BIOGRAPHY
(http://www.wsg.washington.edu/bios/brennan.html)

Education
M.S. Marine Sciences, Moss Landing Marine Laboratories/San Jose State University, 1986

B.S. Biology, Creighton University

Positions Held
Marine Habitat Specialist. Washington Sea Grant Program, March 2005-present

Senior Marine Ecologist. King County Department of Natural Resources and Parks, 1999-2005

Fish and Wildlife Biologist 3. Washington Department of Fish and Wildlife, 1994-1999

Private Consultant. 1993-1994

Regulatory Affairs Manager. Morning Star Fisheries, 1991-1993

Fish and Wildlife Biologist III, Project Leader. Oregon Department of Fish and Wildlife, 1990-1991

Program Manager/Staff Biologist. ECOS, Inc. Environmental Consultants, 1989-1990

Research Associate. Moss Landing Marine Laboratories, 1986-1989

Research Assistant/Research Technician. Moss Landing Marine Laboratories, 1982-1986

Professional Activities
Science Team member, Puget Sound Nearshore Ecosystem Restoration Program (PSNERP), 2001-2004

Chair, Central Puget Sound Nearshore Technical Committee, 1999-2001

WRIAs 8&9 Technical Advisory Committees, 1999-2005

City of Bainbridge Island, Environmental Technical Advisory Committee, 1998-present

Planning Committee, Poster Session Chair, Estuarine Research Federation 2003 Conference, 2002-2003

Professional Memberships

American Fisheries Society
Estuarine Research Federation
Pacific Estuarine Research Society

CAROL CLOEN

PROFILE

Expertise in project management, scientific research, and administration combined with unique communication skills.

PROFESSIONAL EXPERIENCE

11/2003 TO PRESENT

Lead Scientist, Endangered Species Act Compliance Project
WASHINGTON DEPARTMENT OF NATURAL RESOURCES, AQUATIC RESOURCES DIVISION; OLYMPIA, WA

- Draft and evaluate plans of statewide significance to ensure scientific validity and compliance with the Endangered Species Act (ESA).
- Research and develop data and methods applicable to ESA planning.
- Design and lead inter- and intra-agency multidisciplinary research teams.
- Seeks out "best available science" for habitat conservation planning from a variety of governmental, academic, and private sources.
- Develop monitoring, data management, and adaptive management protocols for developing and implementing the ESA compliance plan.
- Determine biological and ecological goals for covered habitats and species
- Research mechanisms and potential magnitude of benefits to species and habitats resulting from DNR's land management activities.
- Prepare technical articles of peer-review/publication quality in support of habitat protection and endangered species act compliance matters.
- Seek out scientific peer review of appropriate compliance plan components.
- Responsible for expertise in: aquatic ecology, application of scientific methods to habitat conservation planning and landscape-scale planning, pathways of impacts from aquatic land management actions on biological systems.
- Develop and manage research contracts and budgets.

1/01 TO 11/2003

King County Wastewater Project Manager
Washington Department of Natural Resources, Aquatic Resources Division;
Olympia, WA

- Coordinate internal policy discussions with Division/Region managers, Executive Management and staff;
- Represent DNR's policy, guidelines and procedures to King County regarding issues associated with outfall siting, sediment remediation, and construction/performance standards;
- Work to establish reasonable and technically feasible sediment remediation goals for state owned lands;
- Create and edit agency policy papers, as well as project updates for internal and external dissemination;
- Review and provide comment on scientific data related to the effects of wastewater on aquatic ecosystems, and King County's Habitat Conservation Plan;
- Participate in the Aquatic Resources Division Endangered Species Act Response Team;
- Supervise and coordinate the timely and accurate review of scientific/technical material by internal and external staff;

- Participate in interagency and stakeholder meetings related to the siting of King County's wastewater treatment facilities, conveyance systems and marine outfalls;
- Develop methodologies to integrate the work products from this project into future agreements with King County, as well as applying the project's outcomes state-wide;
- Develop and maintain an accurate project schedule for deliverables; and
- Maintain oversight of the project's $600,000 plus budget.

7/99 TO 1/01

AQUATIC RESOURCES PROGRAM MANAGER

WASHINGTON DEPARTMENT OF NATURAL RESOURCES, SOUTH PUGET SOUND REGION; ENUMCLAW, WA

- Managed day-to-day operations of the Aquatic Resources leasing operations;
- Participated in the development of aquatic resource management plans;
- Provided scientific review and written comment on environmental impact statements and ecosystem analysis;
- Researched and presented briefings for senior management;
- Ensured programmatic consistency with departmental policies;
- Principal negotiator for the joint King County/WA DNR Wastewater Memorandum of Agreement;
- Editor of the Phase III Right of Way Manual;
- Provided guidance to field staff in lease administration and ecosystem management;
- Supervised support staff;
- Directed workload analysis;
- Interacted with sister agencies, department staff and proponents to ensure environmental protection; and
- Negotiated with proponents.

1/97 TO 7/99

RIPARIAN RESTORATION MANAGER

DELAWARE RIVERKEEPER NETWORK, SCHUYLKILL OFFICE; ST. PETERS, PA

- Designed and implemented Schuylkill River riparian restoration program;
- Supervised, hired and trained staff, volunteers, and student interns;
- Coordinated a multi-disciplinary scientific research/technical team;
- Developed partnerships with government, citizens and businesses to support restoration efforts;
- Wrote and developed grants and annual reports;
- Participated on review panel for internal and external publications;
- Developed and presented riparian restoration, public education and program outreach seminars;
- Selected, designed and installed bio-engineered restoration projects;
- Created multimedia presentations related to watershed planning for use with government, businesses and citizen groups;
- Edited and revised Citizen water quality monitoring program manual, including Quality Assurance/Quality Control;
- Designed and implemented water quality database.
- Administered $600,000 plus budget; and
- Maintained and updated organizational web page.

8/95 TO 6/96 **Graduate Teaching Assistant**

STATE UNIVERSITY OF NEW YORK COLLEGE AT BROCKPORT; BROCKPORT, NY

- Prepared and delivered biology laboratory lectures to majors and non-majors;
- Critiqued and graded student laboratory reports;
- Created laboratory support material and demonstrations;
- Counseled students and problem solved study issues; and
- Taught study skills to special needs freshman.

5/94 TO 8/95 **LIMNOLOGY RESEARCH ASSISTANT**

STATE UNIVERSITY OF NEW YORK COLLEGE AT BROCKPORT; BROCKPORT, NY

- Assisted in the design and implementation of research projects;
- Coordinated and preformed weekly water quality analysis for stressed stream and watershed monitoring projects in EPA certified water quality laboratory;
- Conducted windshield survey, and designed the accompanying database and map set for Livingston County;
- Participated in 1993 Lake Huron Limnology Practicum on the EPA Research Vessel Lake Guardian;
- Field crew for various SUNY Brockport Limnology research projects; and
- Maintained and updated laboratory documentation and procedures, including Quality Assurance/Quality Control.

EDUCATION

M.S. AQUATIC BIOLOGY, 1997 SUNY College at Brockport; Brockport, NY

Original Research Thesis: "Ultraviolet-B penetration in the water column and it's possible effect on *Bufo americanus*, the American toad."

B. S. BIOLOGY, 1994 SUNY College at Brockport; Brockport, NY

A.A.S. AUDIO-VISUAL TECHNOLOGY, 1974 Monroe Community College; Rochester, NY

Stephanie Ehinger, NMFS
510 Desmond Drive SE, Suite 103
Lacey, WA, 98503
phone: 360-534-9341 (wk)

Education:

School	**Time Attended**	**Majors**	**Degree**
Gymnasium Achim, Germany	October, 1980 to May, 1987	Math, Biology, German, Music	Abitur, May, 1987 Grade: 1.5
Universität Göttingen, Germany	August, 1987 to July, 1989	Botany, Chemistry Microbiology, Physical Chemistry	Vordiplom, July 1989 Grade: 1 "very good"
University of North Carolina, Chapel Hill	August 1989 to May 1990		
Universität Konstanz, Germany	October 1990 to July 1994	Limnology, Microbiology, Physiology	Diplom, July 1994 Grade: 1 "very good"[1]

Employment History

***June 2000 to present**:*
***Employer:** National Marine Fisheries Service, 510 Desmond Drive SE, Suite 103, Lacey WA*
I perform consultation under the Endangered Species Act section 7 and section 10. I work out of the Lacey office in the team for the South West Region of Washington and thus am mostly familiar with the Lower Columbia River and Puget Sound Evolutionary Significant Units for salmonids and steelhead. My subject specialties include restoration projects, bank stabilization, and pier ramps and floats. I have attended several training classes to strengthen my knowledge in these areas including: David Rosgen Fluvial Geomorphology Classes 1, 2, and 3, 2002-2006; WDFW Integrated Streambank Protection guidelines ,2003; Paul Bakke (USFWS) Geomorphology training, 2003, Craig Fischenich (USACE) Ecological and Engineering Considerations for Stream and Streambank Stabilization, 2001. I co-presented a poster on permitting of restoration projects at the Skamania Lodge 2004 River Restoration NW Conference. I completed the first two 10A1a permits for Enhancement of Survival to facilitate restoration projects in SW Washington. Streambank stabilization/enhancement is a component of both of these permits as well as of the COE restoration programmatic Opinion I am currently working on. Also, I am involved in recovery related project planning in the Grays River and the EF Lewis River.

[1] Education Credentials Evaluators, Milwaukee, WI, evaluated my Diploma for equivalency with US degrees.

April 1999 to June 2000:
Employer: *Department of Transportation, 310 Maple Park Avenue SE, PO Box 47331, Olympia, WA 98504-7331*
I am on interagency personnel assignment from WSDOT to the National Marine Fisheries Service (NMFS). At the NMFS I perform informal and formal Section 7 consultation of transportation related projects with respect to impacts on the recently listed salmon and steelhead. As an integral part of the Section 7 consultations I evaluate impacts of transportation projects and ensure that adverse impacts are avoided, or minimized and mitigated. Concluding these consultations, I write concurrence letters and Biological Opinions.
About 10 % of my time I spend representing the NMFS in multiagency meetings. In these meetings I inform action agencies, their designees, consultants, and tribes on general and project specific section 7 issues and I work on conflict resolution on controversial biological and fisheries issues with these parties. Another 10 % of my time I spend on developing strategic approaches to streamline the consultation process, including preparing and coordinating NMFS guidance.

April 1989 to April 1999*:*
Employer: *Department of Transportation, 310 Maple Park Avenue SE, PO Box 47331, Olympia, WA 98504-7331*
WSDOT is required under federal, state, and local jurisdiction to mitigate for wetland impacts and monitor the success of its mitigation sites. I worked as the team lead of the team that monitors mitigation sites. I supervised three contract employees.
I held the primary responsibility for planning and implementing WSDOOT's monitoring field season. That included but was not be limited to working with Regional environmental personnel in acquiring necessary information for setting up new mitigation sites, planning the field schedule, and assessing vehicle and field supply needs. My fieldwork included site setup, and bird, vegetation, and amphibian surveys. During July and August WSDOT's monitoring program conducts fieldwork using student interns. The first week of the internship is comprised of classroom teaching. I co-taught student interns in the classroom and acted as a field lead of a four-student intern team.
I also assisted the program manager in setting statewide strategies for annual monitoring of WSDOT wetland mitigation sites. I served as primary author of the annual monitoring report. Also, my job activities included writing research proposals and grant applications.

August 1996 to April 1989*:*
Employer: *Department of Transportation NW-Region, 15700 Dayton Ave N, Seattle, 98133-9710*
I independently prepared, developed, performed, and coordinate region-wide scientific and technical surveys of plant, animal and aquatic systems at locations of planned transportation facilities. The most frequent work I performed were wetland delineations, wetland mitigation, biological assessments, stream surveys, rare plant surveys, and critical area studies. Each study entails the analysis and evaluation of the effects of transportation construction and operation on the biological systems. For each study I wrote a technical report to document my field results and evaluations. If a planned

project produced environmental impacts I recommend measures that could be employed to avoid or minimize impacts. For unavoidable impacts WSDOT mitigates. I was a member of the interdisciplinary team that develops and decides on appropriate mitigation plans. For all projects I coordinated with our permit staff and landscape section. I also provided technical assistance for administering contracts for private consultants.

September 1995 to August 1996:
Employer: *Department of Ecology, Desmond Dr., Olympia, WA*
I evaluated several community analysis statistical software programs for analyzing extensive benthic macroinvertebrate and environmental data from Puget Sound and from streams. The programs selected for these analyses were CANOCO, CANODRAW, CORNELL ECOLOGY PROGRAMS, PRIMER and COMPAH. I developed and performed classification and ordination analysis on the freshwater and marine macroinvertebrate and environmental data. Special emphasis was placed on the correlation of biological and abiotic patterns. For the interpretation of the results I work closely with the members of my marine and freshwater teams. My analyses of freshwater benthic communities aided the evaluation of the effect of different forest and land use practices on benthic communities and water quality. I co-authored a report of the analysis of the stream macroinvertebrates and environmental conditions: *Plotnikoff, R.W. and S.I. Ehinger. 1997. Using Invertebrates to Assess the Quality of Washington Streams and to Describe Biological Expectations. Washington State Department of Ecology, Olympia, WA. Ecology Publication no. 97-332. 56 p.*

January 1995 to July 1995:
Employer: *Department of Ecology, Desmond Dr., Olympia, WA*
Recorded field conditions and collected and analyzed water samples from rivers and streams. Identified and sorted freshwater benthic macroinvertebrates. Collected marine sediment and benthic macroinvertebrate samples from Puget Sound.

August 1993 to September 1993:
Employer: Limnologisches Institut Konstanz***,*** *Universitätsstrasse, Postfach 55660, 78434 Konstanz, Germany*
The joint research project among several German universities and research institutes 'SFB 247: Stoffhaushalt des Bodensees' (cycling of matter in Lake Constance) was concerned with monitoring the quality of drinking water resources. Part of this effort was to study trends in and correlations among various aquatic habitat variables, ranging from primary production to fish biomass.
I gathered zooplankton data collected by different groups and developed and performed various scientific analyses with these data. Scientific analyses included the analysis of long-term data series of nutrient, phytoplankton, and zooplankton data. The objective was to determine optimum sampling intervals and procedures. The results allowed me to make recommendations towards sampling procedures to keep sampling costs (i.e. frequency of sampling trips) to a minimum.

July 1993 to December 1993*:*
Employer: Limnologisches Institut Konstanz***,*** *Universitätsstrasse, Postfach 55660, 78434 Konstanz, Germany*
I managed the German part of a joint Israeli-German research project. The objective of the research was to test the hypothesis that chelating agents influence the availability of iron to and growth and primary production of ambient Lake Constance phytoplankton. My responsibilities included planning and conducting laboratory experiments, supervising two technical assistants, providing technical assistance for further grant applications, and coordinating with the manager of the Israeli portion of the project. At the end of the project I wrote a report that was used as a basis for the final report and the publication that were written by the directors of the cooperating institutes, Prof. Tilzer, Germany, and Prof. Beerman, Israel.

July 1991 to October 1991*:*
Employer: *Bureau of Reclamation, Denver Colorado*
I worked on a water quality project in Upper Klamath Lake, Oregon. The overall objective was to improve the water quality to ensure the survival of local populations of two endangered fish species, short-nosed sucker, lost-river sucker .
I assisted in two studies. One evaluated the impact of farming and irrigation practices in the area on stream water quality. Another study identified limiting nutrients by means of nutrient loading studies and nutrient bioassays. I independently recorded field conditions, collected samples, performed and evaluated lab analyses, and performed data analysis on defined portions of the data for both studies. For the data analyses I wrote macros in the spreadsheet program QUATTRO PRO for the analysis of data from this research, and also worked with LOTUS123. I continued some data analysis on the evaluation of irrigation practices through my next semester at the university as part of a work/study course.
My internship was supported by the German Academic Exchange service (DAAD).

Kurt Leigh Fresh

TITLE:	Research Fisheries Biologist
INSTITUTION:	National Marine Fisheries Service
DEPARTMENT:	Northwest Fisheries Science Center

EDUCATION
M.S. Degree, Fisheries, University of Washington, Seattle WA, 1979.
B.A. Degree, Biology, University of the Pacific, Stockton CA, 1975.

POSITIONS HELD
Research Fisheries Biologist, NMFS, NWFSC, 2002-present
Fisheries Research Scientist, Wash. Dept. Fish. Wildlife, 1991-2002
Fish Biologist IV, Wash. Dept. Fish., 1983-1991
Aquatic Scientist, Envirosphere Co., 1983
Fish Biologist III, Wash. Dept. Fish., 1981-1983
Fish Biologist II, Wash. Dept. Fish., 1978-1981
Fish Biologist, University of Washington., 1978

PROFESSIONAL AND ACADEMIC HONORS (SELECTED)
Faculty Merit Award- 1976, University of Washington
W.F. Thompson Scholarship- 1977, University of Washington
Pink and Chum Salmon Workshop- 1983, Meeting Chairperson
Gutshop: Fifth Fish Food Habits Workshop- 1992, Co-Chair
American Fisheries Society- 1992, Chapter Secretary-Treasurer
American Fisheries Society- 1998, Chapter Vice President
American Fisheries Society- 1999, Chapter President

PROFESSIONAL AFFILIATIONS
American Fisheries Society
American Association for the Advancement of Science
Estuarine Research Federation
Pacific Estuarine Research Society
American Institute of Fishery Research Biologists

PUBLICATIONS (Chronological Order)

Peer Reviewed:

Tabor, R. A., B. A. Footen, **K. L. Fresh**, M. T. Celedonia, F. Mejial, D. L. Lowe, and L. Park. In Press. Predation of Juvenile Chinook Salmon and Other Salmonids by Smallmouth Bass and Largemouth Bass in the Lake Washington Basin. North American Journal of Fisheries Management.

Newell, J. A., **K. L. Fresh**, and T. A. Quinn. In Press. Arrival patterns and movements of adult sockeye salmon (*Oncorhynchus nerka*) in Lake Washington: implications for management of an urban fishery. North American Journal of Fisheries Management.

Fresh, K. L., T. W.-Echeverria, S. W.-Echeverria, and B. W. Williams. 2006. Using light permeable grating to mitigate impacts of residential floats on eelgrass *Zostera marina* L. in Puget Sound, Washington. Ecological Engineering **28**:354-362.

Tabor, R. A., **K. L. Fresh**, D. Paige, E. J. Warner, and R. J. Peters. 2006. Distribution and habitat use of cottids in the Lake Washington basin. American Fisheries Society Symposium No. **53**:25-40.

Koehler, M. E., **K. L. Fresh**, D. A. Beauchamp, J. R. Cordell, C. A. Simenstad, and D. E. Seiler. 2006. Diet and bioenergetics of lake rearing juvenile Chinook salmon in Lake Washington. Transactions of the American Fisheries Society **135**:1580-1591.

Scheuerell, J. M., D. E. Schindler, M. D. Scheuerell, **K. L. Fresh**, T. H. Sibley, A. H. Litt, and J. H. Shepherd. 2005. Temporal dynamics in the foraging behavior of a pelagic predator. Canadian Journal of Fisheries and Aquatic Sciences **62**:2494-2501.

DeVries, P., F. Goetz, **K. L. Fresh**, and D. E. Seiler. 2004. Evidence of a lunar gravitation cue on timing of estuarine entry by Pacific salmon smolts. Transactions of the American Fisheries Society **133**:1379-1395.

Beauchamp, D. A., C. J. Sergeant, M. M. Mazur, J. M. Scheuerell, D. E. Schindler, M. D. Scheuerell, **K. L. Fresh**, D. E. Seiler, and T. P. Quinn. 2004. Spatial-temporal dynamics of early feeding demand and food supply by sockeye salmon fry in Lake Washington. Transactions of the American Fisheries Society **133**:1014-1032.

Nowak, G. M., R. A. Tabor, E. J. Warner, **K. L. Fresh**, and T.P. Quinn. 2004. Ontogenetic shifts in habitat and diet of cutthroat trout in Lake Washington, Washington. North American Journal of Fisheries Management **24**:624-635.

Fresh, K. L., S. L. Schroder, and M. I. Carr. 2003. Predation by northern pikeminnow on hatchery and wild coho salmon smolts in the Chehalis River, Washington. North American Journal of Fisheries Management **23**:1257-1264.

Wyllie-Echeverria, S., J. R. Cordell, J. Skalski, T. Klinger, M. Stamey, C. Young, **K. L. Fresh**, and T. Wyllie-Echeverria. 2003. Seagrass density and abundance of epibenthic crustaceans: implications for outmigrating juvenile salmon in the Northeast Pacific. Gulf of Mexico Science **21**:120-121.

Mueller, K.W., D. P. Rothus, and **K. L. Fresh**. 2003. Underwater methods for sampling distribution and abundance of smallmouth bass in north temperate lakes. The Slate, American Academy of Underwater Sciences **3**:4-5,12.

Fresh, K. L., and G. Lucchetti. 2000. Protecting and restoring the habitats of anadromous salmonids in the Lake Washington Watershed, an urbanizing ecosystem, pp 525-544. *In*: E.E. Knudsen, C.R. Steward, D.D. MacDonald, J.E. Williams, and D.W. Reiser (eds). Sustainable fisheries management: Pacific salmon. CRC Press (Lewis Publishers) Boca Raton, FL

Fresh, K.L. 1997. The role of competition and predation in the decline of Pacific salmon and steelhead, pp. 245-276. *In*: D.J. Stouder, P. Bisson, and R. Naiman (eds.) Pacific Salmon and their Ecosystems. Status and Future Options. Chapman and Hall.

Simenstad, C.A., J. R. Cordell, L. Tear, L. Weitkamp, F. L. Paveglio, K. M. Kilbride, **K.L. Fresh**, and C. Grue. 1996. Use of Rodeo and X-77 Spreader to control smooth cordgrass (*Spartina alterniflora*) in a southwestern Washington estuary: II. Effects on benthic microflora and invertebrates. Environmental Toxicology and Chemistry **15**:969-978.

Paveglio, F.L., K.M. Kilbride, C.E. Grue, C.A. Simenstad, and **K.L. Fresh**. 1996. Use of Rodeo and X-77 Spreader to control smooth cordgrass (*Spartina alterniflora*) in a southwestern Washington estuary: I. Environmental fate. Environmental Toxicology and Chemistry **15**:961-968.

Simenstad, C. A. and **K.L. Fresh**. 1995. Influence of intertidal aquaculture on benthic communities in Pacific Northwest estuaries: scales of disturbance. Estuaries **18**:43-70.

Fresh, K.L. 1994. Lake Washington fish: a historical perspective. Lake and Reservoir Management **9**:148-151.

Stouder, D.J., **K.L. Fresh**, and R. Feller (eds). 1994. Theory and Application in Fish Feeding Ecology. Belle Baruch Library in Marine Science, No. 18. University of South Carolina Press, Columbia, South Carolina.

Weitkamp, L.A., R.C. Wissmar, C.A. Simenstad, **K.L. Fresh**, and J. O'Dell. 1992. Gray whale foraging on ghost shrimp (*Callianassa californiensis*) in littoral sand flats of Puget Sound. Canadian Journal of Zoology **70**:2272-2280.

Volk, E.C. S.L. Schroder, and **K.L. Fresh**. 1990. Inducement of unique otolith banding patterns as a practical means to mass mark juvenile Pacific salmon, pp. 203-215. *In*: N. Parker et al. (eds), International Symposium and Educational Workshop on Fish Marking Techniques. American Fisheries Society. Bethesda, MD.

Fresh, K.L. and S.L. Schroder.1987. Influence of the abundance, size and yolk reserves of juvenile chum salmon (*Oncorhynchus keta*) on predation by freshwater fishes in a small coastal stream. Canadian Journal of Fisheries and Aquatic Sciences **44**:236-243.

Quinn, T.P. and **K.L. Fresh**. 1984. Homing and straying in chinook salmon (*Oncorhynchus tshawytscha*) from Cowlitz River Hatchery, Washington. Canadian Journal of Fisheries and Aquatic Sciences **41**:1078-1082.

Simenstad, C.A., **K.L. Fresh**, and E.O. Salo. 1982. The role of Puget Sound and Washington coastal estuaries in the life history of Pacific salmon: an unappreciated function, pp. 343-364. *In*: V. Kennedy (ed.), Estuarine comparisons. Academic Press, New York.

Fresh, K.L., R.D. Cardwell, B.P. Snyder, and E.O. Salo. 1982. Some hatchery strategies for reducing predation upon juvenile chum salmon (*Oncorhynchus keta*) in freshwater, pp. 78-89. *In*: B. Melteff and R. Neve (eds.), Proceedings of the North Pacific Aquaculture Symposium, Anchorage, AK.

PRESENTATIONS, POSTERS, SESSION LEADER AT PROFESSIONAL MEETINGS (Recent)

2007. 2007 Puget Sound Georgia Basin Research Conference. Vancouver, Canada.
2005. AFS, Annual General Meeting, Anchorage, AK.
2004. Restore America's Estuaries. Seattle, Washington.
2003. 2003 Puget Sound/Georgia Basin Research Conference. Vancouver, Canada.
2003. Estuarine Research Federation National Meeting. Seattle, WA.
2001. 2001 Puget Sound/Georgia Basin Research Conference. Bellevue, WA.

Bret C. Harvey

CURRICULUM VITAE

Present Position: Research Fish Biologist

Current address: U.S.D.A. Forest Service
Redwood Sciences Laboratory
1700 Bayview Drive
Arcata, CA 95521-6098

EDUCATION:

University of Oklahoma	Zoology,	Ph.D.	6/83- 5/87
University of California, Davis	Ecology	M.S.	9/80-6/82
University of California, Davis	Wildlife and Fisheries Biology	B.S.	1/78-6/80
University of California, San Diego	Biology		9/76-12/77

Ph.D. dissertation title: Larval stream fish mortality and multi-trophic level interactions among stream fishes.

Specialty field: Aquatic ecology
Supporting fields: Ichthyology, Invertebrate zoology

Master's thesis title: The effects of suction gold dredging on fish and invertebrates in California foothill streams.

AWARDS, HONORS:

Weber State University Faculty Scholarship Awards;
Participant in U.S. National Academy of Sciences/Romania Academy of Sciences Summer Program for Young Investigators in Ecology/Environmental Sciences;
American Society of Ichthyologists and Herpetologists Raney Award for Ichthyology
University of Oklahoma, Department of Zoology, Research Associateship
Graduation with Highest Honors, U.C. Davis;
U. C. Davis, Wildlife and Fisheries Biology Departmental Citation;
U. C. Davis, Chancellor's "Outstanding Senior" award
Phi Kappa Phi Honor Society

PROFESSIONAL SOCIETIES (1st year of membership):

American Fisheries Society (1980)
American Society of Ichthyologists and Herpetologists (1983)
Ecological Society of America (1981)
North American Benthological Society (1981)
Sigma Xi (1987)

TEACHING EXPERIENCE:

1996 - present
Humboldt State University (as adjunct professor): Graduate seminars in Fisheries (Fish 685): AField experiments in fish ecology@ (Spring 1996, Fall 2001, Fall 2004, Fall 2006); AThe ecology of salmonids in streams: conventional wisdom vs. scientific evidence@ (Spring 1998). Graduate/Undergraduate seminars in Fisheries (Fish 495/685 and 580): AEvaluation of Scientific Papers@ (Fall 1999)

1988 - 1993
Weber State University (as assistant/associate professor, two courses per quarter plus seminars): General zoology, Aquatic ecology, Ichthyology, Animal ecology

1983/84
Teaching assistant, University of Oklahoma: Introductory zoology laboratory; Principles of ecology

1980/81
Teaching assistant, U.C. Davis: Physiological ecology of wildlife, Field studies in fisheries biology

RESEARCH EXPERIENCE:

1993 - present
Forest Service research topics: The influence of physical processes and habitat features on salmonid density, growth rates, and movement; Interaction of introduced species and physical conditions on native fishes; Habitat-dependent biotic interactions among stream fishes.

1989 - 1992
Weber State research topics: Fish-habitat relationships in streams; Bird and mammal predation in aquatic systems; Fish-invertebrate interactions in small streams.

1992
Consultant for Utah State University project on the distribution of northern pike in the Green River, Utah.
Participant in National Academy of Sciences sponsored collaboration between U.S. and Romanian scientists in the Mississippi Delta.

1991
Three week reconnaissance of the Danube Delta with a team of 10 U.S. and 12 Romanian scientists (sponsored by U.S. National Academy of Sciences).

1987/88
Post-doctoral research fellow, Oak Ridge National Laboratory - Toxicology Lab: Improvement of toxicity testing procedures using minnow larvae; Mortality of larval stream fishes in headwater streams; Size- and habitat-dependent predation risk in stream fishes; Competition among stream fishes.

1986/87
Research assistant, O.U.: Potential interaction between striped bass and black bass in reservoir environments.

1985/86
Research associate, O.U.: Doctoral dissertation work on larval stream fish ecology and trophic interactions among stream fishes (National Science Foundation [NSF] Doctoral Dissertation Improvement Grant).

1984/85
Research assistant, O.U.: Multi-level effects of an algae-grazing minnow (*Campostoma anomalum*) on north temperate streams (NSF Project).

1983
Research assistant, O.U.: Physicochemical tolerance and selectivity of freshwater fishes (NSF Project). Foreign Fishery Observer, National Marine Fisheries Service: Monitored catch of Japanese fishing vessels in the Bering Sea.

1981/82
Research assistant, U.C. Davis: Assessment of fish populations and instream flow requirements in small streams; A survey of fishes of the Suisun Marsh, CA; Instream flow and microhabitat requirements of native California fishes.
Personal contract with Pacific Gas and Electric Company: Trout scale analysis, Big Sulphur Creek, CA geothermal area.

1980 - 1982
Graduate Student Assistant, California Department of Fish and Game: Study of suction mining effects on stream fish and invertebrates.

1979
Researcher, U.C. Davis: Study of the feeding habits of Sacramento pikeminnow (U.S. Forest Service contract).

Kirstin K. Holsman, PhD
People for Puget Sound
911 Western Ave, Suite 580
Seattle, WA 98195104

Education

Doctor of Philosophy (Aquatic & Fishery Sciences): Autogenic ecosystem engineers and the influence of habitat complexity on patterns of intertidal migration and habitat use by subadult Dungeness crab, *Cancer magister*. University of Washington, School of Aquatic & Fishery Sciences, Seattle, WA. August 2006.

Scientific Illustration Certificate: University of Washington, Seattle WA, 2005.
Bachelor of Science (Fisheries): **University of Washington, Seattle, WA, 2000**

BIOGRAPHY:

Dr. Kirstin Holsman is a marine ecologist with over 8 years of experience in aquatic systems. Her work focuses on landscape patterns in ecology, energetic flow through food webs, and behavioral interactions that influence realized versus potential patterns of species' distributions. Her recent work has explored the ecology of decapod predators (specifically the Dungeness crab, *Cancer magister*) within Pacific Northwest estuarine communities increasingly affected by biotic and anthropogenic modifications. In particular, she has explored the relative contribution of various estuarine habitats and their corresponding communities to *C. magister* production, as well as the ecological role of crabs as mobile benthic predators. Her work adds to a growing awareness about the value of marine habitats to highly mobile predators (e.g. shorebirds, flatfish, and crab) and has provided Kirstin with opportunities to work directly with multiple scientific and non-scientific stakeholders. In addition to marine and estuarine ecology, she has also participated in international workshops on ecosystem-based management of marine resources and has experience working in freshwater systems on salmon ecology and genetics. As Director of Science for People For Puget Sound, Kirstin has focused on restoration of nearshore habitats and the impact of shoreline modifications on marine communities and ecosystem processes. She is also involved in efforts to recover marine species (e.g., native oysters, northern abalone, and southern resident orca) whose populations are severely depleted from changes to prey resources, habitat loss, and overfishing.

AREAS OF EXPERTISE:

Bioenergetic Modeling, Ecological Modeling, Ecological Theory, Estuarine and Intertidal Ecology, Landscape Ecology, Marine Invertebrate Taxonomy, Trophic Food Web Dynamics, Gut Content Analysis, Salmonid Life History, Statistics and Experimental Design, Acoustic Telemetry, HTML & Web design, Scientific Illustration, ArcInfo and ArcGis, GIS Analysis, Access Database Design, Genetic Techniques

POSITIONS HELD:
2006 - present Director of Science, People for Puget Sound, Seattle, Washington.
2004 - 2006 Graduate Research Assistant, School of Aquatic and Fishery Sciences, University of Washington, Seattle.
2001, 2003, & 2004 Graduate Teaching Assistant, FISH 310: Shellfish biology and ecology. School of Aquatic and Fisheries Sciences, University of Washington, Seattle.
2003 - 2004 Graduate Research Assistant, School of Aquatic and Fishery Sciences, University of Washington, Seattle. Western Regional Aquaculture Center (WRAC).
2000 - 2003 Graduate Research Assistant, School of Aquatic and Fishery Sciences, University of Washington, Seattle. Pacific Northwest Coastal Ecosystems Regional Study (PNCERS).
1999 - 2000 Research Technician, School of Fisheries, Seattle, Washington. Fisheries Research Institute (FRI).

PUBLICATIONS:
Holsman, KK, PS McDonald, and DA Armstrong. (2006) Intertidal migration and habitat use by subadult Dungeness crab *Cancer magister* in a coastal NE Pacific estuary. *Marine Ecology Progress Series.* 308:183-196.
McDonald, PS, KK Holsman, DA Beauchamp, BR Dumbauld, and DA Armstrong. 2006. Bioenergetics modeling to investigate habitat use by the nonindigenous crab, Carcinus maenas, in Willapa Bay, Washington. *Estuaries and Coasts*. Vol. 29 No 6B. pp 1132-1149.
Holsman, KK, DA Armstrong, DA Beauchamp, and JR Ruesink (2003) The necessity for intertidal foraging by estuarine populations of subadult Dungeness crab, *Caner magister*: Evidence from a bioenergetics model. *Estuaries* 26 (4B): 1155-1173.

COMMITTEE PARTICIPATION:
Puget Sound Nearshore Restoration Project: Steering Committee Member
Watershed Resource Inventory Area 9: Technical Committee Member
Trans-boundary Abalone Recovery Group: Community Involvement Member
Alliance for Puget Sound Shorelines: Habitat Restoration Team Member

ADDITIONAL AWARDS & APPOINTMENTS:
2006 Faculty Merit Award, School of Aquatic & Fishery Sciences, Seattle, WA.
2006 Best Student Paper Award, National Shellfish Association Annual Meeting, Monterey, CA.
2006 Second Place Student Paper Award, Pacific Coast Shellfish Growers Association Annual Meeting 2006, Friday Harbor, WA.
2005 Victor and Tamar Loosanoff Fellowship 2005 -2006
2004 Invited participant in expanded NCEAS 2004 Ecosystem-based management working group. NCEAS Santa Barbara, California, February.
2004 Invited participant in NCEAS 2004 Ecosystem-based management working group. NCEAS Santa Barbara, California, August.
2004 William H. Pierre, Sr. Fellowship 2004-2005
2003 Best Student Paper Award, Pacific Coast Shellfish Growers Association Annual Meeting 2003, Portland, Oregon.

2002 Best Student Paper Award, Pacific Coast Shellfish Growers Association Annual Meeting 2002, Newport, Oregon.

2002 Fisheries Memorial Scholarship 2002-2003

Professional Affiliations:

American Fisheries Society (AFS)
National Shellfish Association (NSA)
Western Society of Naturalist (WSN)
Estuarine Research Federation (ERF)
Pacific Estuarine Research Society (PERS)

Russell C. Ladley
6824 –Pioneer Way E.
253.845-9225
Puyallup, Washington 98371

SUMMARY

Fishery Biologist with expertise in natural resource mitigation, local, state and federal permitting SEPA, NEPA, state forest practice regulations, growth management, shorelines management and salmon recovery planning. Professional and confident when working with both external and internal clients. Reliably handles grant accounts and project budgets independently. Consistently produces professional products. Strengths include:

Effective Communicator
Professional Presentation Skills
Strong Advocate of Tribal Interests
Analytical and Results Oriented

Takes Initiative
Team Leadership
Self Managing

AREAS OF EXPERTISE

Watershed Restoration
Familiar with local, state and federal regulatory requirements for water quality, wetlands, shorelines protection, FERC licensing. Managed Fisheries programs grants, contracts and reporting requirements. Consistently provided timely and accurate responses to area managers, listening and proactively resolving disputes and maintaining good working relationships with co-managers.

Member of the Electron Dam Fish Passage negotiation team. Provided key elements to the Resource Enhancement Agreement for fish passage and restoration. Five year member of the Salmon Recovery Funding Board's Technical Advisory Group, Panel member for the Community Salmon Fund, 10 year member of Puyallup River Watershed Council and 17 year member of White River Spring Chinook Recovery Team.
Jointly worked to develop the White River Spring Chinook Recovery Plan, the Puyallup River Fall Chinook Management Plan and the Puyallup River Limiting Factors Analysis. Developed long term fisheries restoration and monitoring strategy to evaluate the success of the upper Puyallup River (Electron) enhancement program.

Proactively identified gaps in current fisheries resource management, researched and obtained improved protection of weak wild stocks, increasing fish returns to historical habitat.

Developed catalog of restoration opportunities in Puyallup River. Have worked with county and federal flood managers toward prioritizing land acquisition and levee setback projects over traditional channel hardening works. Identified and helped implement levee maintenance practice changes. Helped educate County and Army Corps of Engineers flood managers and maintenance staff about BMP's for fisheries protection.

Fisheries Management
Coordinate and participate in comprehensive salmonid monitoring program on the Puyallup River. Annually quantify distribution and abundance of adult salmon throughout the watershed. Oversee juvenile trapping programs. Coordinate, write and present grant proposals for research and data gathering projects. Submit performance updates and final reports in a timely fashion.

Provide written and oral testimony at a variety of forums ranging from local land use planning committees to County and State legislative hearings.

PROFESSIONAL EXPERIENCE

Puyallup Tribal Fisheries, Puyallup, WA	1988-2007
Resource Protection Manager	*1993 - 2007*
Field Biologist	*1988 - 1992*
Tulalip Tribe, Marysville, WA	1986-1987

Performed field research related to the Everett Navy Home Port project. This study involved beach seining throughout the near shore environment throughout the lower Snohomish River, Port Susan and Everett harbor. The study focused on identifying species distribution and abundance of salmonids and the duration of dependence on nearshore habitat.

EDUCATION

BS in Biology, School of Fisheries, University of Washington

TRAINING & DEVELOPMENT

IFIM Negotiation Training, HEP, IF 200
Training in wetlands using the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, Corps of Engineers Manual 1987
30 credits Civil Engineering Prerequisite Courses
Hydrologic Aspects of Watershed Analysis and Fish Passage

Doug R. Myers

Experienced marine biologist with geographically diverse background.

East Coast –

- Hempfield H.S., Landisville Pennsylvania award for excellence in the field of biology – 1983
- B.S. in Marine Biology from Millersville University, Millersville Pennsylvania – 1987, independent research project – Facultative schooling behavior of the mummichog, *Fundulus heteroclitus*
- President of campus environmental action group, Priority
- Educational travel in coastal environments from Maine to Florida and exposure to national scientific conferences.
- Participation in formative conferences for the Chesapeake Bay Program

Gulf Coast –

- Marine and aquatic naturalist interpretation, classroom, laboratory and field education, habitat restoration and native aquarium design and maintenance for Armand Bayou Nature Center in Houston Texas – 1988-1991
- M.S. in Environmental Science from University of Houston Clear Lake – 1995, Masters Project - A finfish survey of Armand Bayou Coastal Preserve.
- Environmental permit review, policy development, preserve management and field site assessment for the Texas General Land Office – 1992-1998
- Organized education programs, scientific surveys, national policy review and president of the Galveston Chapter of the American Cetacean Society – 3 years
- Christian youth counseling, individual and social development, nature appreciation and cultural awareness for Seabrook and Memorial United Methodist churches in Seabrook and Austin Texas – 10 years
- Educational travel in coastal environments from Florida to Texas as well as Rocky Mountain and desert southwest states.
- Participated on executive board and produced educational curriculum for Ecology Action of Texas

Pacific Coast –

- Fisheries and marine mammal biology, regulation enforcement, and cultural relations for Foreign Fishery Observer Program in Seattle Washington, the Bering Sea and Gulf of Alaska. – 1987-1988
- Wetlands and marine nearshore habitat policy review and development, scientific and technical advisory capacity, and interagency coordination for the Washington Department of Ecology and the Puget Sound Water Quality Action Team – 1998 – present.
- Board Vice-President , community relations, financial development and aquarist for Nisqually Reach Nature Center
- Educational travel in coastal and interior environments from British Columbia to Baja California and the Hawaiian islands of Oahu, Hawaii, and Maui.

International -

- Three week summer course – The Marine Biology of the Sea of Japan from Oki Islands Marine Biological Laboratory of Shimane University, Matsue Japan
- Three cruises on Japanese fishing vessels and one cruise on a Korean fishing vessel as part of observer program.
- Participation in trans-boundary resource inventory and management forums with Mexico and Canada.
- Educational travel in Mexico, Costa Rica, Germany, Australia, New Zealand

Thomas Ostrom
Suquamish Tribe
PO 498
Suquamish, WA 98392

EDUCATION
Degrees and Certificates:

BS. 1985. Western Washington University, Bellingham, WA.

MES. 1994. Yale School of Forestry and Environmental Studies, New Haven, CT.

Certificate in Wetland Science and Management. 1995. University of Washington, Seattle, WA.

Washington State Watershed Analysis Training. Certified in Hydrology, Fish Habitat, and Monitoring. 1996. Timber-Fish-Wildlife.

Training:

U.S. Environmental Protection Agency. Biological Assessment. 1997.

Timber-Fish-Wildlife: Ambient Monitoring. 1997.

Washington Department of Ecology. Western Washington Continuous Simulation Hydrology
Model (WWHM). 2001.

Washington Department of Ecology. Stormwater Management Manual for Western Washington
(the "2001" manual). 2001.

U.S. Environmental Protection Agency. Water Quality Analysis and Simulation Program (WASP). 2002.

The Northwest Environmental Training Center. Natural Resource Damage Assessment: A
Technical and Legal Analysis. 2004

RELEVANT EMPLOYMENT HISTORY

Environmental Biologist (2001-)
Suquamish Tribe, Suquamish, WA

Richmond Beach geoduck harvest certification project (2006-present). Project manager.

Coordinate multi-agency partnership to assess chemical and sanitary conditions of the Richmond Beach geoduck tract. Develop sampling and analysis plan including data quality objectives, coordinate field sampling, prepare field sampling and data summary reports.

Suquamish Tribe Crustacean research project (2006-present). Project biologist. Assist in developing work plans, sampling and analysis plans, coordinating field activities, and data analysis on population studies of Dungeness crab and spot prawn in Puget Sound.

Port Madison Indian Reservation environmental review ordinance (2006-present). Project manager. Coordinate with Tribal legal and policy staff on development of ordinance to guide Tribal review of land use proposals to insure protection of Tribal natural and cultural resources including nearshore, estruarine, freshwater wetlands, and stream environments on Reservation lands.

Seattle Ferry Terminal, Technical Advisory Group (TAG) – Washington State Ferries (2006-present). Participating Agency representative TAG. Provide comments and guidance on development of NEPA documents in support of major marine transportation facility.

Best Available Science – Kitsap County CAO Technical Advisory Committee (2004-2005). Committee member. Assist Kitsap County in compilation of Best Available Science for the update to the Critical Areas Ordinance including measures to protect freshwater and marine habitats from development.

ENVVEST (ENVironmental iNVESTment project) Technical Advisory Committee (TAG) (2003 – present). Tribal Technical Representative. Attend technical and policy meetings, assist and comment on development of TMDL (water clean-up plans) documents, participate in field data collection, and coordinate tribal policy.

Point Wells Oil Spill Unified Command (December 2003 – April 2004). Tribal On-Site Coordinator for inter-agency response team. Coordinate tribal policy and participate in making response and cleanup decisions.

Oil Spill Executive Team coordinator (December 2003 – present). Coordinate tribal policy on matters related to the Point Wells oil spill including spill response, public health, public information, claims for cleanup costs and natural resource damages, contracts with consulting experts, and communication with Tribal Council.

Natural Resources Damage Assessment (NRDA) for Point Wells Oil Spill (December 2003-Present). Tribal Trustee Representative. Work with responsible party representatives and state and federal natural resource trustees to develop restoration plan for natural resource damages associated with the Point Wells oil spill.

Puget Sound Regional Council (2004-05). Alternate Tribal Representative. Coordinate tribal positions on regional governance and represent those positions on Growth Management Policy Board of PSRC.

King County Brightwater – Executive Advisory Committee (2003). Tribal representative. Provide technical and policy guidance relating to siting and design of regional wastewater treatment facility.

King County Habitat Conservation Plan (HCP) (2003). Technical Advisory Committee member. Review, comment, and provide tribal guidance on HCP proposal from King County Wastewater Treatment Division, Department of Natural Resources and Parks.

Landuse review (2001-present). Review and comment on public and private landuse proposals that have potential to impact tribal resources or treaty rights.

On-reservation landuse (2001 – present). Review proposals and make environmental recommendations to Tribal Council.

Port Madison Enterprises (PME), Casino Expansion Project (2001-2003). Tribal technical lead in environmental review of Casino Expansion Project. Prepare and present staff recommendations on conditional approval of PME casino expansion plan, including stormwater pollution control plan and riparian mitigation plan. Attend construction meetings and assist contractors in complying with environmental conditions.

Kitsap County Chico Creek Alternative Futures project (2002-2003). Technical Advisory Committee member. Develop metrics to evaluate habitat conditions in the Chico Creek Watershed and to predict habitat response to a range of future conditions.

WRIA 15 Salmon Recovery Fund Board (2001-2003). Technical Team Member. Develop, review and prioritize local salmon habitat restoration plans with state and local agencies, and watershed stakeholders (2001-2003).
Washington State Water Quality Standards Review (2003-2004). Tribal representative in federal agency consultations on proposed changes to state water quality standards.

NOAA Fisheries and US Fish and Wildlife Service – ESA section 7 (2001- present). Coordinate tribal review and consultation with federal agencies under Section 7 of the ESA.

George Lane water supply improvement project – Section 7 (2003). Analyze effects of on-reservation project on ESA listed and candidate species. Prepare Biological Assessment.

Thermal Reach Monitoring Project. (2003-present). Project manager. Develop and implement quality assurance project plan for the monitoring of critical summer temperatures in fish bearing waters of the East Kitsap watershed (2003 – present).

Primary Cultural Resources Contact (2001- 2005). Review and comment on potential effects of proposed projects on the Suquamish Tribe's cultural resources. Participate in Section 106 consultations on behalf of the Tribe.

Biologist (1998) Pacific Watershed Institute, Seattle, Washington

Coordinate north Puget Sound salmon and steelhead habitat assessment for Northwest Indian Fisheries Commission.

Develop ecosystem-based production models for coho management as member of inter-agency Comprehensive Coho technical committee.

Develop interdisciplinary tools for conducting watershed analysis and management on mixed-use landscapes for US Environmental Protection Agency.

Habitat Biologist (1995-97) Point-no-Point Treaty Council, Hansville, WA
Conduct salmon and steelhead habitat assessments for Strait of Juan de Fuca streams (WRIAs 18 & 19).

Developed watershed specific strategies for habitat protection and restoration.

Research Hydrologist (1993-94) Yale School of Forestry, New Haven, CT

Develop models to characterize hillslope processes and shallow subsurface flow in Catskill water supply watersheds for New York City Department of Environmental Protection (DEP).

Aaron M. Prussian
P.O. Box 19141
Thorne Bay, AK 99919

Education

Graduate: Master's of Science in aquatic ecology, Dec. 1999, Idaho State University.
Undergraduate: Bachelor's of Science in Biology, Hillsdale College, Michigan,
High School: Saline High School, Michigan. 1990.

Relevant Experience / Research

Fisheries Biologist, GS-0482-09, U.S. Forest Service, Thorne Bay Ranger District, Thorne Bay, AK, Oct 2002-present. Duties include implementing projects developed in the Cobble Landscape Assessment related to watershed restoration. These include road storage, culvert replacement for fish passage, riparian thinning and other improvements, stream restoration for improved fisheries habitat and stream ecosystem function, and project effectiveness monitoring. In addition, I maintain the district's partnership coordination with The Nature Conservancy and Trout Unlimited, and work with other agency personnel to permit and design restoration projects and I work with other resource specialists, researchers, and native Alaskan groups to assist with projects related to watershed restoration and aquatic ecosystem science.

Fisheries Technician, GS-0404-09, U.S. Forest Service, Thorne Bay Ranger District, Thorne Bay, AK, Oct 2000-Oct 2002. Duties included fisheries and stream reconnaissance of proposed large and small timber sales (10%), collecting and identifying fish using minnow trapping and electrofishing techniques (10%), identifying stream channel types and classes according to Tongass Land Management Plan (TLMP) (10%), identifying aquatic habitat rehabilitation projects and habitat types (30%), stream community education in local schools (10%), identifying stewardship projects (5%), serving as project leader for the Cobble Landscape Assessment (20%), and team member on the Kasaan Watershed Project (5%). Also work cooperatively with local, state, and other federal agencies on federal development projects.

University of Alaska Anchorage's Environment and Natural Resources Institute (ENRI) 707 A Street, Anchorage, AK 99501; **3/00 through 3/02** Primary duties include development of rapid bioassessment methods for Alaska, including field collection of biological and chemical data (30%), taxonomic identification of macroinvertebrates (30%), development and use of Access database (15%), statistical analysis and report writing (25%), and supervising technicians. Other projects include developing methods for BMP evaluation of Kenai Peninsula forest roads for AKDNR, habitat evaluation for Chester Creek restoration for ADF&G, community education including Project WET and various school groups, assisting with Native American Fish and Wildlife Society courses, and environmental quality sampling and reporting for the Alaska Aerospace Development Corporation on Kodiak Island.

Graduate Research, Master's of Science: (Aug 1997 through Dec 1999) . Impacts of recreational and commercial suction dredge mining activity on Alaska stream ecosystems. Experience includes evaluation of streams using fluvial geomorphological concepts, habitat assessment, and water quality evaluation. Presented results to North American Benthological Society, 1999, and Northwest Biological Assessment Meeting, 1998. Other experience includes evaluating wildfire effects on streams around Yellowstone N.P. and Frank Church Wilderness (Idaho), stream metabolism of montane streams using closed chamber techniques, nutrient retention and uptake in streams using in-situ methods, estimating primary production and limiting nutrients using in-situ nutrient diffusers, transport of fine and coarse organic material, and sampling water chemistry and macrobenthos of wilderness streams.

Fisheries Research Technician: April 1996 through August 1997. U.S. Forest Service, Pacific Northwest Research Station, Juneau, AK. Supervised field collections of juvenile coho salmon and cutthroat trout population data. Experience includes collection by minnow trapping and electrofishing, taxonomic identification of fishes, collecting stomach content samples, benthic and terrestrial insect taxonomy, juvenile seasonal and habitat distribution, stream channel characteristics including discharge and channel cross-section, water chemistry, and riparian stand characteristics, and working with USFS personnel.

Biological Technician: April 1995 through December 1995. U.S. Forest Service Pacific Northwest Research Station, Juneau, AK. Michael McClellan and David Damore, Supervisors. Member of field crew for old-growth forest stand data collection for Alternatives to Clearcutting study.

Professional Affiliations

American Fisheries Society
North American Benthological Society

Personal Interests and Accomplishments

Collegiate Cross Country, Indoor and Outdoor Track.
Fishing, backpacking, skiing, kayaking, marathoning, and mostly outdoor endeavors.
Certified ETT (2001) and EMT, State of Alaska (2002)

References for Aaron M. Prussian

G. Wayne Minshall
Graduate Advisor, Faculty ISU
Campus Box 8007
Department of Biological Sciences
Idaho State University
Pocatello, ID 83209
(208) 236-2136

Mark S. Wipfli
Research Aquatic Ecologist

Michal J. Rechner

Education
Masters Degree, Environmental Studies
The Evergreen State College, Olympia, WA, August 2001
Emphasis: environmental law and policy.
Thesis: *The Effectiveness of Escalating Penalties for Repeat Clean Water Act Violations in Washington State*

Bachelor of Science Degree, Meteorology
The Pennsylvania State University, University Park, PA, May 1988
Completed Reserve Officer Training Program, Commissioned 2nd Lieutenant, U.S. Air Force

Experience

Environmental Planner 4 (Policy Unit Supervisor – Temporary)
Washington Department of Natural Resources
Dec 2006 – Present
- Supervisor of four Policy Unit staff
- Direct the development of programs, policies, guidelines, and procedures for implementation by Aquatic Resources region staff.
- Lead projects requiring the drafting of DNR legislative proposals and any related supporting documents and testimony used by Executive Management.
- Perform reviews of external legislative proposals and prepare fiscal analysis, data verification, and position papers on the proposals including any testimony used during hearings

Environmental Planner 3
Washington Department of Natural Resources
Jan 2001 – Dec 2006
- Assist in the development of programs, policies, guidelines, and procedures for implementation by Aquatic Resources region staff.
- Develop the necessary programmatic documents while collaborating with other Aquatic Resources staff and external stakeholders to ensure completeness and accuracy.
- Assist in the drafting of DNR legislative proposals and any related supporting documents and testimony used by Executive Management.
- Perform reviews of external legislative proposals and prepare fiscal analysis, data verification, and position papers on the proposals including any testimony used during hearings.
- Following legislative sessions, using inputs from region staff, I develop and finalize aquatic lands management programs, policies, guidelines, and procedures to comply with legislative mandates.
  Assist in the determination of State Environmental Policy Act (SEPA) applicability to actions taken by the Aquatic Resources division.

Derelict Vessel Removal Program Manager (Project position)
Washington Department of Natural Resources
Jan 2002 – Oct 2002

- Responsible for implementing a statutorily mandated program intended to effect the removal of vessels left abandoned or derelict within the water of Washington with a biennial budget of nearly $1 million.
- Using stakeholder outreach and in consultation with local, state, and federal agencies, I designed a program that encouraged maximum participation from local entities.

Developed program guidelines for external entities to follow to ensure reimbursement of removal costs; procedures for DNR staff to follow during removal operations; and emergency contracting procedures.

Environmental Specialist 3
Washington State Parks and Recreation Commission
Jun 2000 – Sept 2000

- Responsible for determining permit requirements for various construction and environmental remediation projects on Washington State Parks lands.
- Coordinated and obtained the required permits, including Hydraulic Project Approvals, Shoreline Permits and Exemptions, and Corps of Engineer permits.
- Conducted site visits at project locations to determine any further permit requirements and check for compliance.

Assisted in the research and compilation of Biological Assessments for various projects.

Military Service
Served on active duty in the U.S. Air Force for eight years, followed by three years in the U.S. Air Force Reserve.

Memberships and Affiliations

- Commissioner and Secretary, Tanglewilde Parks and Recreation District, Lacey, WA
- National Association of Environmental Professionals, Washington Chapter
- Public Employees for Environmental Responsibility

Neil Rickard
National Marine Fisheries Service, Lacey, WA
June 12, 2007

Education:
Bachelors Degree – Marine Biology, San Diego State University, 1972.
Masters Degree – Fisheries, University of Washington, 1980.

Experience:
WDG – Habitat, Sultan River Hydroelectric Project, 8/79 to 11/79.
WDF – Shellfish, Razor Clam Enhancement, 12/79 to 10/88.
WDF/WDFW – Habitat, Area Habitat Biologist, SEPA Coordinator, Aquatic Habitat Guidelines Coordinator, 10/88 to 6/01.
NMFS – ESA Fish Biologist, on contract from WDFW and WSDOT, 6/01 to the present.

Accomplishments:

I have almost 28 years experience as a professional fish biologist in the state of Washington.

As a shellfish biologist I developed the technology for large-scale transplant of subtidal juvenile razor clams to intertidal beaches for recreational fishery enhancement. Approximately 125 million clams were harvested and transplanted in 1985.

As an Area Habitat Biologist I administered the WDF/WDFW Hydraulic Code in writing Hydraulic Project Approvals for marine projects over much of south Puget Sound, the Washington coast, and the lower Columbia River over a ten year period. I represented the agency in actions under SEPA, NEPA, Shorelines, NPDES, etc.

As an ESA biologist I have consulted on over a hundred projects (mainly transportation) on ferry terminals, bridges, culverts, highway construction and expansion. I have written eight Biological Opinions on many of these project types. I am the lead NMFS transportation biologist and have represented the agency on the Columbia River Crossing Interstate forum, the NEPA Signatory Agency Committee, and other technical forums.

Ken Schlatter

Qualifications:

Statewide Permit Coordinator -WSDOT
March 2007 – Present
Work with Resource Agencies and DOT Regions to develop, implement, and monitor statewide permits for use in the construction of DOT projects and maintenance activities.

Acting Region Biology Program Manager - WSDOT
June 2006 to March 2007
Manage the biology program in the development of Biological Assessments, Wetland Delineation, Wetland Mitigation Design, Construction, and Adaptive Management activities.

Regional Maintenance Environmental Coordinator - WSDOT
October 2003 to June 2006
Work with the Region's Maintenance personnel to insure work be performed is consistent with the requirements of the Endangered Species Act and other environmental permit requirements.

Environmental Landscape Designer - WSDOT
July 1984 to October 2003
Design and prepare PS&E documents for Roadside landscapes and wetland mitigation sites. Oversaw construction and maintenance of projects.

Education:

Bachelor of Science Degree in Landscape Architecture
Washington State University, Pullman Washington

Bachelor of Science Degree in Business Administration
Portland State University, Portland Oregon

Water Crossing Structures:

Experience: As the Olympic Region Maintenance Environmental Coordinator, I work closely with the Region's Bridge Maintenance Crews reviewing their projects and establishing what type of permits and Best Management Practices (BMPs) to utilize. I also dealt with the ongoing issues of woody debris, scour holes, and gravel bed load associated with several of the Region's over water structures in concert with WDFW Area Habitat Biologist.

As the Olympic Region's Acting Biology Program Manager, I oversaw and reviewed Biological Assessments and Permit applications for several water crossing structure retrofit projects. This included dealing with the Services on ESA species and habitat. As a Landscape Designer, I reviewed preliminary bridge and associated structure plans to verify how it would fit into the overall project concept.

Interest: My interest in participating in the project is that I would like to contribute my experience and knowledge regarding the management of water crossing structures and environmental issues toward this collaborative effort in developing this white paper. This experience in turn would help broaden my understanding of the interrelationship between aquatic habitat and water crossing related issues and allow me play a stronger role in the future management of these issues within WSDOT. Also, my involvement in this project would create important opportunities to collaborate with other experts in the field. I would be able to provide a strong water crossing management perspective to the effort, which, in combination with the aquatic habitat issues would promote a more complete and accurate state of knowledge behind the subject matter.

Training – Various classes on the use of BMPs when working in, adjacent to, or over water related structures. Training on the Preparation of Biological Assessments which included analysis of impacts associated with in water and near water work activities.

Thom Seal, P.E., Ph.D.
Newmont Mining Co.
P.O. Box 669,
Carlin, NV. 89822

BUSINESS EXPERIENCE:

Fall 04 to Present	**<u>MANAGER METALLURGICAL TECHNOLOGY</u>** Newmont Mining Co. Nevada Leach – manage 12 operations. Heap leach patented recovery process, (inventor of **Hydro-Jex**) with design, construction, and commissioning. Biohydrometallurgy, water treatment plant projects, R&D projects (design, construction and commissioning of: flotation plant expansion and leach pad expansion). Extraction process for new ore - property development, mine reserve quantification and process development designs to enhance metal recovery. Duties also included manager of: metallurgical lab, Title V and **International Cyanide Code** compliance.
Spring 03 to Fall 04	**<u>SENIOR ENGINEER, P.E.</u>** Newmont Mining Co.- to Carlin NV. Gold metal Performance facilitator. Conduct business meetings to improve process performance, efficiency and cost savings.
Fall 00 to Spring 03	**<u>SENIOR ENGINEER, P.E.</u>** Newmont Mining Co.- Carlin NV. Leach Metallurgy for refractory heap leach (biohydrometallurgy) and oxide heaps leaching. Optimise biooxidation for grinding and CIL gold recovery for a 4 million-ton/year process facility. Metallurgical engineering and supervision of a 200 million-ton heap leach operation. Modeling: reagents, gold production, ore control, and laboratory data. Optimise: gold recovery, ore control and the recovery plant operation. Supervise technical support for bio and oxide heap leach operations.
Spring 00 to Fall 00	**<u>SENIOR METALLURGICAL ENGINEER</u>** Newmont Mining Co.-Carlin NV. Gold recovery in CIL and CIC for oxide and roasting milling operations. 20,000-ton/day operation of ground slurry and solutions. Optimised gold recovery and reagent utilisation. Improved sampling and metallurgical accounting. Supervised technical support.
Summer 98 to Spring 00	**<u>SENIOR METALLURGICAL ENGINEER</u>** Newmont Mining Co.-Carlin NV. Refractory ore oxidation by roasting in a 10,000 ton per day plant. Ore delivery and blends, grinding, air classification, roasting, gas clean-up, sulphuric acid production, metallurgical accounting, and statistical analysis for the roasting plant to tank leaching. Supervision (3

technicians), and quality control for all sampling. COMPUTER: ACAD, Excel, Word, Mill System, Purchasing (MIMS), and Lab System.

Summer 97 to Summer 98 — **SENIOR PROJECT METALLURGIST** Newmont Gold Co. - Carlin NV.
Bringing 2 oxide/refractory deposits into production, designed & operated process AMD water treatment plant, modelled & published a heap leach solution management research program, optimised heap leach reagent utilisation, performed refractory (biooxidation & ammonia thiosulphate) leach modelling to optimise recovery and reduce costs, recovery and budget costs for a 30 million-ton/year leach operation. Designing closure system for acid mine drainage. Solving metallurgical problems as they surface.

Summer 95 to Summer 97 — **SENIOR METALLURGICAL ENGINEER** Newmont Gold Co.-Carlin NV.
7 Heap leach operations: oxide and refractory leach, placement, reagents, neutralisation, solution management, closure, bioleach, thioleach, acid mine drainage and documentation. CIC operation: carbon kinetic loading, metallurgical balance, department supervision (3 engineers), and QC.

METALLURGICAL LABORATORY: bioleach, oxide milling for mill 4 (grinding, recovery, ore characteristics, and stockpiles), roasting, cyanide leaching.
COLLEGE INSTRUCTOR: Taught four college courses at Great Basin College in Elko, NV. Two courses in chemistry, one course in laboratory science and one course in metallurgy.

Spring 95 — **CHIEF METALLURGICAL ENGINEER** DeLamar Silver Mine-Jordan Valley Or. Kinetic study on milling and cyanide leaching circuit, optimized Merrill-Crowe cementation, Grinding and leaching parameters on existing/new deposit, thickener control/operation. Quality control on laboratory data. Lab supervision and mill support.

June 88 to Dec 94 — **CHIEF METALLURGICAL ENGINEER:**
Differential Engineering Inc.
METALLURGICAL ENGINEER Remote field sampling of deposits (placer, lode and wastes) with grids, drills, and heavy equipment, surveying locations, and managed logistics. Testing of samples with mill design and operation; assaying, crushing, grinding, gravity concentration, classification, extensive flotation, HYDROMETALLURGY: leaching (tank, heap, and pressure with precipitation, loading and stripping), filtering, thickening, solvent extraction, bioleaching, electro-winning and electro-refining, PYROMETALLURGY: roasting, smelting and refining, chemical refining and quantitative analyses using electronic instruments to evaluate

chemical composition and environmental parameters. Including: deposit evaluation (Lotus), reports (WP), flowsheets, and design development of: circuits, pilot plant to full production with expansions (AutoCAD).

MINERAL PROCESS SUPERIENTENDANT Operation of extractive mills. Optimised parameters for energy consumption, recovery, time and reagent consumption. Configured and conducted bulk testing-pilot projects on ores. From the tests: evaluate deposits (Lotus), write reports (WP), and develop flowsheets and design: circuits, pilot plant, full production (AutoCAD). DESIGNED AND OPERATED: three laboratories for chemical & metallurgical testing and production support. MINING: blasting, excavation, crushing, screening, heavy equipment operation. CCT, QCT for concrete: slump, mix designs, and plant operation. SUPERVISE Mill production, engineers, technicians, laboratory and mining (surface and underground) operations. PURCHASING: reagents, equipment and supplies. SAFETY Conducted safety program in mill and mining (MSHA) and solved safety problems. HEAVY EQUIPMENT OPERATOR: Backhoe, trackhoe, D-7 cat, small crane, road grader, dump trucks, cement trucks, and track drill. CDL: Hazard, tanks and trailers.

ENVIRONMENTAL ENGINEERING Evaluate wastes, design systems for waste (hazardous) treatment, transportation and disposal, write and obtain permits (Canada and USA), and supervise construction and operation.

May 87 to Aug. 87 — **ENGINEER** Asamera Minerals Inc: Helped design, build and operate a Bioleach/Cyanide pilot plant for gold extraction. Computer, engineer supervision, laboratory and construction.

April 83 to Aug. 86 — **CHIEF ENGINEER/OPERATOR** Differential Energy Inc: Operated and managed a 30 ton/day gold mill, 7000 acre gold and silver mine in Oregon, and 600 acre copper mine in Alaska. Acquired 4 patented mines in Oregon. Conducted remote core drilling. Designed and built a final gold extraction system. Supervised crew of 9 miners, 4 surveyors and technicians. Oregon explosive permit. SURVEYOR: Mine, geophysical and cadastral surveys in Oregon and Alaska. Logistics and supervision.

April 80 to April 83 — **CHIEF ENGINEER/MILLWRIGHT** Gasifier Energy Inc: Designed and constructed 10 kW co-generation plant using novel refractory design. Differential Energy Inc: Designed and built a 10 Kw hydroelectric system and a 50-gal/hr fuel alcohol plant. Supervision and heavy equipment.

EDUCATION – LICENCES - REGISTRATION:

SME	Founding Registered Member of the Society for Mining, Metallurgy and Exploration (SME) # 2888660RM (Qualified Person for SEC)
Ph.D.	University of Idaho, Mining Engineering-Metallurgy (2004)
M.S.	University of Idaho, Metallurgical Engineering (1988)
B.S.	Oregon State University, General Science-Environmental Chem (1976)
P.E.	**Mining/Mineral Process – Professional Engineer – Nevada # 15921 - Current**
MSHA	Instructor, Code QAL, IS – U.S. Dept. of Labor

ACTIVITIES:

Member of SME (P.E. Committee), NWMA, EOMA, Eagle Scout & Counsellor, COLLEGE INSTRUCTOR and former Land Survey Advisory Committee Chair at Great Basin College, Elko, Nevada. Current: CDL (Hazard/Tanks – Oregon). Enjoy the outdoors, hunting, fishing and hiking. Ph.D. degree in Mining Engineering-Metallurgy: Research in "Enhancing Gold Extraction from Heap Leach Operations". Inventor of the Hydro-Jex Process.

Sheri Sears

WORK HISTORY

2005-Present ***Resident Fish Manager ~ Colville Confederated Tribes ~ Fish and Wildlife Department***

General management of all resident fishery projects and for planning, developing, designing, and oversight of professional biological studies, research, or resource assessments, and providing the analysis, assessment, and interpretation of the results and preparation of final written reports, and the Program biologist responsible for all of the Program's biological activities within the Resident Fish sub-division of the Fish & Wildlife Program; prepares, assesses, and interprets resource information or regulations, regularly involving inter-Program or external coordination; and is the Program specialist on issues affecting resident fish or fish habitat in an area comprised of all Districts within the Reservation and resident fish within boundary waters.

The biologist with major technical assistance responsibility for fish mitigation, management, and coordination with outside agencies including but not exclusive to Columbia Basin Fish and Wildlife Authority (CBFWA), Inter-Mountain Province (IMP) Oversight Committee, Upper Columbia United Tribes (UCUT), Transboundary Gas Group, Lake Roosevelt Water Quality Council, Environmental Protection Agency (EPA), Department of Ecology (DOE), Washington Department of Transportation (WADOT), United States Forest Service (USFS), Washington Department of Fish and Wildlife (WDFW), Washington Water Trust (WWT), United States Fish and Wildlife (USFW), United States Army Corp of Engineers (USACE), watershed planning efforts, and Internal Land Use Board.

Provided consultation for the Environmental Protection Agency's Upper Columbia Risk Investigation and Feasibility Study (RI/FS) under the CERCLA process to determine human health and ecological risk from Tech Cominco releases of contaminates into the Upper Columbia River. Member of the Colville Confederated Tribes Risk Assessment Core Team. Assisted in the development of the Lake Roosevelt "Conceptual Site Model" (CSM) for the RI/FS and the Ecological Assessment Work plan.

Developed and managed studies to determine impact from the proposed Columbia River Water Management Plan drawdown by Washington Department of Ecology's Programmatic Environmental Impact Statement.

Wildland Fire Situation Analysis (WFSA) Team leader since 2004, the team conducts cost risk benefit analysis of proposed plans to control wildfires. Determines resources at risk and provide plan and alternative plans to reduce the risk and cost of wildfires. I also have participated in the Burned Area

Emergency Rehabilitation and Stabilization Team (BAER Team) since 2000 conducting fish and wildlife impact assessments following wildfires and preparing written assessments and recommendations for resource rehabilitation and stabilization of burned lands. Prepare the Burned Area Emergency Rehabilitation documentation of assessments and mitigation plans following a wildfire including annual and final reports.
Starting in 2001 I assisted with the development of the Fish and Wildlife Management Plan and the Tribes Plan for Integrated Resource Management as well as the Tribe's Forest Practice Codes and the Hydraulic Codes.

2001-Present ***LR Tributary Adfluvial Rainbow Trout Habitat Improvement BPA Project Manager ~Colville Confederated Tribes ~ Fish and Wildlife Department***

Coordinate habitat surveys, data collection, population density data collection, and analysis of adfluvial rainbow trout and kokanee habitat status and fish passage barriers within the tributaries of Lake Roosevelt. Coordinate habitat improvement planning, implementation, and monitoring of improvements. Coordinate with other Lake Roosevelt Projects, BPA, Tribal, County, Conservation District, Federal agencies, and land owners for cooperative efforts in habitat improvements. Fiscal responsibility for BPA funded Project budget.

Assess status of and the potential for stream habitat improvements that would increase adfluvial rainbow trout and kokanee use of Lake Roosevelt and its' tributaries. Prioritize, determine, propose, and coordinate future projects on Lake Roosevelt tributaries that would provide the greatest increase to a naturally reproducing Tribal subsistence and recreational adfluvial rainbow and kokanee fisheries. Supervise 1-2 field technicians. Provide technical assistance to all Fish and Wildlife Department Programs. Calculate flow rates and peak flow volumes to determine culvert size requirements and wrote hydraulic permits for all stream crossings on the Colville Reservation and on Tribal Lands located off the Reservation in the ceded North Half.

1999-2001 ***PPP-Fish and Wildlife Habitat Biologist ~ Colville Confederated Tribes ~ Fish and Wildlife Department***

Conduct inventory, field surveys, analysis, formulation, and recommendation of sound management and conservation strategies for all wildlife and fisheries habitats and resources of value to the Colville Confederated Tribes. Review, evaluate, and prepare written reports in support of fish and wildlife habitats and resources for the integrated planning 3-P process. Actively participate in the 3-P process at weekly District meetings. Prepare written plans based on best management practices, scientific principles, and modeling associated with fish and wildlife habitat and resource management, including timber harvest and grazing affects on fish and wildlife. Perform calculations and statistical evaluations of land use, fish and wildlife habitats/resources, and required mitigation with the use of GIS information and computer programs.

Represent the Fish and Wildlife Department and its goals and objectives in consultations, conferences, and meetings with private persons, Tribal Members, Tribal Programs and Departments, Inter-Tribal Agencies, Federal Agencies, State Agencies, City and County governments, as well as the general public.

Design and conduct field surveys, inventories, and monitoring of fish and wildlife populations and habitats for research, timber harvest watershed management plan compliance, and verification of adaptive management decisions; in coordination, with various Tribal programs, outside agencies, and the general public. Participate in the integrated planning of Range Management Improvement Plans with various Tribal departments, lessees, and NRCS staff. Research and prepare oral, written, and audiovisual presentations for the Colville Business Council, Council's Natural Resource Committee, Tribal Members, and the general public for various project proposals, information, clarification, and presentations.

Provide technical, GIS, mapping, and computer support for the programs within the Fish and Wildlife Department. Perform as Fish and Wildlife's BAER Team member. Field assessment of wildfire and fire suppression associated impacts on fish and wildlife populations and habitats/resources. Planning and implementation of burned area emergency rehabilitation mitigation with preparation of written reports and specification sheets for Federal Fire, and BIA review for obtaining Federal funding for Burned Area Emergency Rehabilitation.

Researched and wrote the new Fish and Wildlife section of the revised Colville Confederated Tribes Wildfire Management Plan. Participate in inter-agency sub-basins wildfire and prescribed fire management planning. Reviewed and consulted with Fish and

Wildlife Department staff and prepared Department's response to Draft Environmental Impact Statement (EIS) for the Integrated Resource Management Plan (IRMP)

Served on the planning committee for the Columbia River Inter Tribal Fish Commission during 2001 and continue to assist in writing the Total Daily Maximum Loads (TMDLs) for total dissolved gas and temperatures for the main-stem of the Columbia River and with CRITFC planning.

Conducted an investigation into the loss of water from Elbow Lake by special Colville Business Council request. Headed up inter-departmental team of resource specialists to assess cause of water loss. Contracted with environmental firm Brown and Caldwell to conduct test well sampling to determine geo-hydrology of site. Made recommendations to the Business Council for future monitoring for management of lake fisheries.

Calculate flow rates and peak flow volumes to determine culvert size requirements and write hydraulic permits for all stream crossings on the Colville Reservation and on Tribal Lands located off the Reservation in the ceded North Half.

1999: ***Fisheries Biologist Rufus Woods Gas Bubble Disease Study ~ USGS ~ Biological Division***

Conducted fish population and gas bubble disease studies on Rufus Woods Lake. Included electro-fishing, beach seining, acoustic tagging and tagged fish location using hydrophone. Operated powerboats (inboard and outboard), GPS Unit, radar navigation, hydrophone, and water quality monitoring equipment. Conducted electro-shock and beach seining fish collection for species identification, weight, length data collection, and scales collection for age analysis. Surgically inserted acoustic tags into selected species. Repeatedly located tagged fish collecting water chemistry perimeters, depth fish located at, and condition of fish. Data was used to write the biological basis for the current development of total dissolved gas TMDLs for the Upper and Lower Columbia River.

1997-1998: ***Field Technician ~ Steven's County Conservation District***

Planned and conducted stream habitat assessments on four creeks within the Jumpoff Joe watershed. Determined ownership of the property along the assessment areas with use of U.S Geological Maps and public data from Steven's County Assessor's Office. Conducted notification and obtained permission from the property owners for the access to study sites on private lands. Researched and determined assessment criteria. Developed field worksheets. Conducted assessments, including stream measurements (wetted and bankfull), riffle and pool determination and measurements for longitudinal habitat distribution, sinuosity, silt load, stream bank condition and stability, riparian vegetation, Wolman pebble count, densiometer reading of canopy closure, stream type categorized by gradient and confinement (Rosgen), wildlife signs and behavior, fish and redd presence, large woody debris inventory, and recording of field notes. Developed a 72-page technical report of field conditions and a computerized database of field information.

1996-1997: ***Environmental Intern ~Department of Ecology, ERO***

Interpreted and compiled summaries of scientific and medical data on air pollution, used by the Washington State Department of Ecology in regulation and policy development and implementation of air quality programs, such as grass seed burning. Assisted in the compilation of technical research studies and related information for use in Department of Ecology regulation and policy development. Assisted in responding after inquires, complaints, and requests for technical assistance regarding scientific background and technical implementation of Dept. of Ecology air quality compliance requirements. Development, maintenance and utilization of computerized air pollution databases used in support of technical projects, public information and education, and regulation and policy development

Conducted analysis, evaluation, interpretation, and review of data for technical accuracy. Used in writing reports and making recommendations to assist higher-level staff in preparation for public meetings, hearings, and workshops. Created a multi-volume library of published newspaper articles and press releases on general air quality issues and the grass seed burning issue, dating from 1982 through 1997, for the Department of Ecology staff and general public information.

Coordinated the research on specific aspects of air pollution, to assist staff in presentation of environmental education material for elementary school classes. Coordinated the research and developed a multi-volume environmental air quality particulate matter public education library. Which included medical studies, emissions records and studies, ideas and proposals for alternatives to grass seed field burning, economic impacts of banning grass seed field burning, and the economic impacts of proposed alternatives to burning. Used in the development of the Department of Ecology's environmental impact statement (EIS) for the Grass Seed Burning Rule Amendment.

Assisted in operation and maintenance of air monitoring equipment, including high volume and TEOM samplers for monitoring of particulate matter (PM_{10}) and ($PM_{2.5}$), carbon monoxide, sulfur dioxide, and ozone air concentration levels. Assisted in on site source inspection and data collection for federal and state ambient air quality standards compliance and source determination.

1995: Waste Water Treatment Intern ~ City of Cheney
Preformed identification and microscopic photography of microorganisms in activated sludge. Conducted sample collection, preparation, and microscopic examination of organisms in various stages of wastewater treatment. Planned, coordinated and conducted staff training workshops in microscopic identification of microorganisms including a slide presentation of photographed organisms. Researched an developed a manual on microscopic identification of indicator organisms, currently used for staff training and reference in many Eastern Washington wastewater treatment facilities.

Hugh Shipman
Shorelands and Environmental Assistance Program
Washington Department of Ecology
3190-160th Avenue SE
Bellevue WA 98008-5452

Position (since 1989)

Coastal geologist with Shorelands Program of the Washington Department of Ecology. Provide geological and scientific support to agencies and local governments in areas of coastal geomorphology and engineering geology, with emphasis on shoreline processes, longshore sediment movement, coastal natural hazards, and human impacts on shoreline environment. Tasks include policy guidance, project review, expert testimony, public education and technical outreach, and representation of agency on advisory committees and technical workgroups.

Education

1988	Ph.Candidate	*University of Washington*, Seattle WA	Geological Sciences
1986	M.S.	*University of Washington*, Seattle WA	Geological Sciences
1981	B.S.	*Dartmouth College*, Hanover NH	Earth Science, Engineering

Professional Affiliations

Coastal Education and Research Foundation, Northwest Geological Society, Geological Society of America, American Shore and Beach Preservation Association, American Geophysical Union

Selected Publications

Shipman, (2007, in prep.), A Geomorphic Typology of Puget Sound Nearshore Landforms, Puget Sound Nearshore Restoration Project.

Shipman, 2004, Coastal bluffs and sea cliffs on Puget Sound, Washington, in Hampton, M.A., and Griggs, G.B., eds., Formation, Evolution, and Stability of Coastal Cliffs -- Status and Trends: Professional Paper 1693, U.S. Geological Survey, p. 81-94.

Finlayson and **Shipman**, 2003, Puget Sound Drift Cells: The importance of waves and wave climate: Puget Sound Notes, v. 47, p. 1-4.

Shipman, 2001, Beach nourishment on Puget Sound: A review of existing projects and potential applications, Puget Sound Research 2001, Puget Sound Water Quality Action Team, Olympia.

Shipman, 2001, Coastal Landsliding on Puget Sound: A review of landslides occurring between 1996 and 1999, Washington Department of Ecology, Olympia.

Shipman, 2000, Puget Sound Landslide Web Site, www.ecy.wa.gov/programs/sea/landslides.

Zelo, **Shipman**, and Brennan, 2000, Alternative Bank Protection on Puget Sound Shorelines, Department of Ecology, Olympia.

Gerstel, Brunengo, Lingley, Logan, **Shipman**, and Walsh, 1997, Puget Sound Bluffs: The where, why, and when of landslides following the holiday 1996/97 storms, Washington Geology, 25, 1, 17-31.

Shipman, 1997, Shoreline Armoring on Puget Sound, Puget Sound Notes, 40, 2-5.

Canning and **Shipman**, 1994, Coastal Erosion Management Studies in Puget Sound, Washington: Executive Summary, Department of Ecology, Olympia.

Charles A. "Si" Simenstad
http://www.fish.washington.edu/people/simenstd/CV.html

Curriculum Vitae

Position-Affiliation Address

Research Professor
Coordinator, WETLAND ECOSYSTEM TEAM
School of Aquatic and Fishery Sciences
Box 355020
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Education

B.S., 1969, Fisheries, University of Washington
M.S., 1971, Fisheries, University of Washington
Thesis title: The feeding ecology of the rock greenling, *Hexagrammos lagocephalus*, in the inshore waters of Amchitka Island, Alaska.

Positions Held

- Research Professor, School Aquatic & Fishery Sciences, University of Washington, 2006-present
- Research Associate Professor, School Aquatic & Fishery Sciences, University of Washington, 2001-2006
- Fisheries Biologist II–Senior Fisheries Biologist, Fisheries Research Institute, University of Washington, November 1972 to July 2001;
- Fisheries Biologist II, Fisheries Research Institute, University of Washington, 1971-1972

Professional Memberships

- American Association for the Advancement of Science (Fellow)
- American Institute of Fisheries Research Biologists
- Ecological Society of America
- Estuarine and Coastal Sciences Association
- Estuarine Research Federation
- Man and Water Network
- Pacific Estuarine Research Society

- Sigma Xi
- Society for Ecological Restoration
- Society of Wetland Scientists
- Western Society of Naturalists

Honors and Positions

1993 University of Washington, PSO Award for Excellence
1994 Fellow, American Association for the Advancement of Science
1998-2003 *Estuaries* Editorial Board; Associate Editor, Habitat Restoration and Wetlands
2005-2007 Council Member, Estuarine Coastal Sciences Association

Research Interests-Expertise

- Estuarine and nearshore marine ecosystem structure and dynamics, focusing on trophic interactions, especially those of detritus-based food webs; use of stable isotopes to trace trophic pathways
- Landscape ecology of coastal wetlands; influence of landscape structure on fish behavior and ecology
- Coastal wetland restoration ecology; planning and functional assessment of restored, created and enhanced wetlands
- Estuarine ecology and life history diversity of juvenile salmonids, and ecology of their epibenthic (crustacea) prey such as harpacticoid copepods and gammarid amphipods
- Coastal ecosystem management, with emphasis on watershed influences on estuarine processes
- Community ecology of nearshore marine fish assemblages of the North Pacific, especially related to structuring influence of predators

Principal Current Research Activities

- *Puget Sound Nearshore Ecosystem Restoration Program*; October 2004 – present; Principal Investigator; US Army Corps of Engineers; participate in and serve as Co-Chair of PSNERP Nearshore Science Team; $83,405
- *Ecosystem Classification System for Lower Columbia River and Estuary Landscapes*; October 2004 – present; Principal Investigator; Lower Columbia River Estuary Program/Bonneville Power Administration; design and implement a ecosystem classification framework for the Columbia River estuary; $63,334 (continuing)
- *Shellfish Kinetics (*sub-project of larger Pacific Northwest Center for Human Health & Ocean Studies [H2O Center]); July 2004 – present; Principal Investigator; National Science Foundation/National Institute of Environmental Health; assess intertidal macroinvertebrate assemblage filtration on phytoplankton that can produce toxin (domoic acid); $93,005

- *Historic Habitat Opportunities and Food Web Linkages of Juvenile Salmon in the Columbia River Estuary and Their Implication for Managing River Flows and Restoring Estuarine Habitat;* September 2003 – present; Principal Investigator; NOAA-Northwest Fisheries Science Center/Bonneville Power Administration; evaluate the effects of habitat change and flow regulations on historic and current estuarine food webs that support diverse juvenile salmon estuarine life histories; $161,499 (continuing)
- *Salmonid Use of Restored Estuarine Wetlands: Regional Applications of the Salmon River Estuary Study;* March 2003 – present; Principal Investigator; Oregon Sea Grant, as subcontract through Oregon Department of Fish and Wildlife; determine the relative effects of wetland habitat condition and landscape position on marsh habitat use and performance by juvenile salmon in diverse estuarine environments undergoing wetland restoration; $116,562 total.
- *Estuarine Habitat and Juvenile Salmon: Wetland Habitat Utilization and Salmon Ecology in the Lower Columbia River and Estuary*; September 2002 – present; Principal Investigator; NOAA; participate in multi-institutional, interdisciplinary study of juvenile salmon ecology in Columbia River estuary; $85,000 (continuing)
- *San Francisco Integrated Wetland Monitoring Program (IRWM)*; September 2002 – present; Principal Investigator; CALFED, as subcontract through San Francisco State University; conduct interdisciplinary research to evaluate indicators of ecosystem performance of restoring estuarine wetlands in San Francisco Bay; $478,750

Assessment of Estuarine and Nearshore Habitats for Threatened Salmon Stocks in the Hood Canal and Eastern Strait of Juan de Fuca, Washington State: Phase 2; December 2000 – present; Principal Investigator; Point-No-Point Treaty Council; conduct research on intertidal eelgrass landscape structure of juvenile chum salmon in Hood Canal and the eastern Strait of Juan de Fuca, Washington; $85,778

Publications

Peer-Reviewed Journal Articles

Isakson, J. S., C. A. Simenstad, and R. L. Burgner. 1971. Fish communities and food chains in the Amchitka area. *BioScience* 21:666-670.
Simenstad, C. A., J. A. Estes, and K. W. Kenyon. 1978. Aleuts, sea otters, and alternate stable-state communities. *Science* 200:403-411.
Volk, E. C., R. C. Wissmar, C. A. Simenstad, and D. M. Eggers. 1984. The relationship between otolith microstructure and the growth of juvenile chum salmon under different prey conditions. *Can. J. Fish. Aquat. Sci.* 41:126-133.
Simenstad, C. A., and J. R. Cordell. 1985. Structural dynamics of epibenthic zooplankton in the Columbia River Delta. *Verh. Internat. Verein. Limnol.* 22:2173-2182.
Simenstad, C. A., and R. C. Wissmar. 1985. $\delta^{13}C$ evidence of the origins and fates of organic carbon in estuarine and nearshore marine food webs. *Mar. Ecol.-Prog. Ser.* 22:141-152.

Wissmar, R. C., and C. A. Simenstad. 1988. Energetic constraints of juvenile chum salmon (*Oncorhynchus keta*) migrating in estuaries. *Can. J. Fish. Aquat. Sci.* 45:1555-1560.
Duggins, D. O., C. A. Simenstad, and J. A. Estes. 1989. Magnification of secondary production by kelp detritus in coastal marine ecosystems. *Science* 245:170-174.
Shreffler, D. K., C. A. Simenstad, and R. M. Thom. 1990. Temporary residence by juvenile salmon of a restored estuarine wetland. *Can. J. Fish. Aquat. Sci.* 47:2079-2084.
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Simenstad, C. A., C. D. McIntire, and L. F. Small. 1990. Consumption processes and food web structure in the Columbia River estuary. *Prog. Oceanogr.* 25:271-298.
Simenstad, C. A., L. F. Small, C. D. McIntire, D. A. Jay, and C. R. Sherwood. 1990. An Introduction to the Columbia River Estuary: Brief History, Prior Studies, and the Role of the CREDDP Studies. *Prog. Oceanogr.* 25:1-14.
Cordell, J. R., C. A. Simenstad, and C. A. Morgan. 1992. Establishment of the Asian calanoid copepod *Pseudodiaptomus inopinus* in the Columbia River estuary. *J. Crustacean Biol.* 12:260-269.
Cordell, J. R., C. A. Simenstad, and C. A. Morgan. 1992. The Asian calanoid copepod *Pseudodiaptomus inopinus* in Pacific Northwest rivers--biology of an invasive zooplankter. *N.W. Environ. J.* 8:164-165.
Shreffler, D. K., C. A. Simenstad, and R. M. Thom. 1992. Juvenile salmon foraging in a restored estuarine wetland. *Estuaries* 15:204-213.
Simenstad, C. A., and J. R. Cordell. 1992. Species and assemblage diversity of nearshore epibenthic harpacticoid copepods--natural and human influences. *N.W. Environ. J.* 8:154-155.
Weitkamp, L. A., R. C. Wissmar, C. A. Simenstad, K. L. Fresh, and J. G. Odell. 1992. Gray whales foraging on ghost shrimp (*Callianassa californiensis*) in littoral sand flats of Puget Sound, U.S.A. *Can. J. Zool.* 70: 2275-2280.
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Simenstad, C. A., D. O. Duggins, and P. D. Quay. 1993. High turnover of inorganic carbon in kelp habitats as a cause of d ^{13}C variability in marine food webs. *Mar. Biol.* 116: 147-160.
Hassett, R. P., D. O. Duggins, and C. A. Simenstad. 1993. Egg production rates of the neritic marine copepod *Acartia tumida* Willey in the Aleutian Archipelago. *Polar Biol.* 13: 515-523.
Ruckelshaus, M. H., R. C. Wissmar, and C. A. Simenstad. 1994. Scale of habitat quality relevant to mussel growth in a well-mixed, temperate estuary. *Estuaries* 17: 898-912.
Boesch, D. F., M. N. Josselyn, A. J. Mehta, J. T. Morris, W. K. Nuttle, C. A. Simenstad, and D. J. P. Swift. 1994. Scientific assessment of coastal wetland loss, restoration and management in Louisiana. *J. Coast. Res.*, Spec. Issue 20. 103 pp.

Simenstad, C.A., D.J. Reed, D.A. Jay, J.A. Baross, F.G. Prahl and L.F. Small. 1994a. Land-margin ecosystem research in the Columbia River estuary: investigations of the couplings between physical and ecological processes within estuarine turbidity maxima. Pp. 437-444 i*n* K. Dyer & B. Orth (eds.), *Changing Particle Flux in Estuaries: implications from science to management* (ECSA22/ERF Symposium, Plymouth, September 1992), Olsen & Olsen Press, Fredensborg.

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Baross, J. A., B. Crump and C. A. Simenstad. 1994. Elevated microbial loop activities in the Columbia River estuarine turbidity maxima. Pp. 459-464 *in* K. Dyer & B. Orth (eds.), *Changing Particle Flux in Estuaries: implications from science to management* (ECSA22/ERF Symposium, Plymouth, September 1992), Olsen & Olsen Press, Fredensborg.

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Paveglio, F. L., K. M. Kilbride, C. E. Grue, C. A. Simenstad, and K. L. Fresh. 1996. Use of Rodeo® and X-77® Spreader to control smooth cordgrass (*Spartina alterniflora*) in a southwestern Washington estuary: I. Environmental fate. *Environ. Toxicol. Chem.* 15: 961-968.

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Prahl, F. P., L. F. Small, B. Sullivan, J. Cordell, C. A. Simenstad, B. C. Crump, and J. A. Baross. 1998. Biogeochemical gradients in the lower Columbia River. *Hydrobiologia* 361:37-52.

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Reisewitz, S. E., J. A. Estes, and C. A. Simenstad. 2006. Indirect food web interactions: sea otters and kelp forest fishes in the Aleutian archipelago. *Oecologia* 146:623-631.
Simenstad, C. A., D. Reed, and M. Ford. 2006. When is restoration not? Incorporating landscape-scale processes to restore self-sustaining ecosystems in coastal wetland restoration. *Ecol. Engineer.* 26: 27-39.
Visintainer, T. A., S. M. Bollens, and C. A. Simenstad. 2006. Community composition and diet of fishes as a function of tidal channel order: A field study in China Camp Marsh, San Francisco Estuary. *Mar. Ecol. Prog. Ser.* **321**: 227-243.
Koehler, M. E., K. L. Fresh, D. A. Beauchamp, J. R. Cordell, C. A. Simenstad and D. Siler. 2006. Diet and bioenergetics of lake-rearing juvenile Chinook salmon in Lake Washington. *N. Am. J. Fish Mgmt.* 135: 1580-1591.

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Toft, JD, JR Cordell, CA Simenstad, LA Stamatiou. 2007. Fish distribution, abundance, and behavior along city shoreline types in Puget Sound. *N. Am. J. Fish. Mgmt.* 27:465-480.

Direct Involvement in Committees, Symposia and Meetings
Current Membership

- Scientific Advisory Board, Port Townsend Marine Science Center, April 1986-present
- Research Advisory Committee, Padilla Bay National Estuarine Research Reserve, 1989-present
- Winchester Tidelands Restoration Advisory Group, South Slough National Estuarine Research Reserve, June 1993-present
- Board of Advisors, University of Washington Educational Outreach Certificate Program in Wetland Science and Management; April 1994-present
- Coastal Environment Science and Technology (CEST) Panel, US-Japan Agreement on Natural Resources (UNJR); January 1998-present
- Scientific Advisory Group (SAG), Interagency Ecological Program (IEP), San Francisco Bay; December 1998-present
- Man and Water AB, International Network (MAWN); 1999-present
- Science Work Group, Lower Columbia River Estuary Program; April 2000-present
- Board of Advisors, University of Washington Educational Outreach Program in Environmental Regulation; April 2001-present
- Scientific Advisory Committee, Sea Resources; September 2001-present
- Co-Chair, Puget Sound Nearshore Ecosystem Restoration, Nearshore Science Team; January 2002-present
- National Scientific Advisory Panel, San Francisco Bay Salt Pond Project, California Coastal Conservancy, March 2003-present
- Executive Steering Committee, University of Washington Earth Initiative, May 2004-present.
- Program Committee, Steering Committee, 2nd National Conference on Ecosystem Restoration (April 2007), May 2006-present.
- ESA Compliance Science Panel, Washington Department of Natural Resources, June 2006-present.
- Louisiana Coastal Protection and Restoration Authority Integrated Planning Team (IPT), Science and Engineering Review Team (SERT), August 2006-present

Contributing author, Synthesis and Assessment Product (SAP 4.4), Strategic Plan of the U.S. Climate Change Science Program, September 2006-present

Manuscripts Reviewer

- American Naturalist
- American Zoologist
- BioScience
- Bulletin of Marine Science
- CALFED Science Program
- Canadian Journal of Fisheries and Aquatic Sciences
- Canadian Journal of Zoology
- Coastal Management Journal
- Coastal Shelf Research
- Copeia
- Ecological Applications
- Ecological Engineering
- Ecological Monographs
- Ecology
- Environmental Biology of Fishes
- Environmental Conservation
- Environmental Management
- Estuaries
- Estuarine, Coastal and Shelf Science
- Fishery Bulletin
- Hydrobiologia
- Journal of Applied Ecology
- Journal of Experimental Marine Biology and Ecology
- Limnology and Oceanography
- Marine Biology
- Marine Ecology-Progress Series
- Northwest Environmental Journal
- Northwest Science
- Oikos
- Restoration Ecology
- Science
- Southeastern Naturalist
- Transactions of the American Fisheries Society
- Vegetation

Emily J. Teachout

Education:

Bachelor of Science. The Evergreen State College, Olympia, Washington, 1992.

Applicable Employment Experience:

January 2000 to Present: U.S. Fish and Wildlife Service – Fish and Wildlife Biologist/Transportation Liaison. Review transportation projects for compliance with the National Environmental Policy Act, Endangered Species Act, Fish and Wildlife Coordination Act and other regulations. Participate in multi-agency transportation planning efforts to avoid and minimize impacts to sensitive species and habitats. Develop watershed level mitigation strategies in conjunction with stakeholders. Participate in development of large-scale wetland mitigation banks. Write Biological Opinions and review Environmental Impact Statements. Develop policy guidance.

January 1999 to January 2000: Washington State Department of Ecology – Environmental Specialist 4. Conducted Section 401 of the Clean Water Act review of projects that would impact wetlands. Evaluated mitigation plans. Reviewed monitoring reports for compliance and effectiveness. Technical lead for a three-person team conducting a study of the effectiveness of wetland mitigation throughout Washington. Coordinator of the Washington State Wetland Function Assessment Project. Worked with a team to develop standardized, numerical, methods for assessing the functions of wetlands. Coordinated committee meetings comprised of state, federal, and local agency staff, private consultants, and environmental group representatives. Conducted trainings for method users.

January 1997 to January 1999: The J.D. White Company – Associate Ecologist. Conducted wetland delineations and developed mitigation and restoration plans, prepared Environmental Impact Study (EIS) documents, and managed permitting efforts. Project types included transportation improvements, surface mines, development permitting, and salmon enhancement projects. Founded and coordinated "The Ecologist's Forum", a group of professional biologists, ecologists, and other scientists that met monthly.

February 1995 to January 1997: Aqua Tierra Environmental Consulting – Restoration Specialist. Performed restoration planner, wildlife biologist, and regulatory coordinator tasks. Work focused on bioengineering approaches for restoring aquatic systems.

Larry Wasserman

Larry Wasserman did not submit the requested information

APPENDIX B		
PEER REVIEW OF WDFW WHITE PAPER (2006): Small-Scale Mineral Prospecting		
PEER REVIEW COORDINATOR NOTE: Five individuals reviewed and comment on this white paper. Each was assigned a number, 1 through 5. Each individual's comments are identified by that number at the start of his/her comments for a particular cell in the reviewers comments column. The comments are from that reviewer until the start of a paragraph begins with the number of another reviewer.		
SECTION	**SUB-SECTION**	**REVIEWER'S COMMENTS**
Executive summary		4 If "little information is found… and additional research is underway… but information was not available…" it is improper, inappropriate, and unprofessional to (Es-5) to infer "based on our review and the available scientific literature, additional measures and managements strategies could be implemented to further reduce the impacts of small-scale mining." There is not a clear path from the science to the recommended measures. This paper and the recommendations to the Gold and Fish pamphlet and permits should be put on hold until sufficient <u>sound</u> science is completed. The authors of any white paper should have actual small mining field experience. 5 Expand water quality section to include disturbance of areas with high levels of contamination of water and substrates. Temperature should be included it is addressed later and should be included in executive summary. It may be more common than described in areas where stranding may have occurred. When listing recommendations add enforcement to the short list in the executive summary it is extremely important aspect of reducing potential impacts.
	Recommended Habitat Protection, (ES-5)	4 It is unscientific, inappropriate and unprofessional to recommend "fourteen mitigation/conservation measures and four management recommendations" without <u>sound science</u> to base the recommendations upon. There is not a clear path from the references to the recommended measures. All mining on public lands must follow the Mining and Minerals Policy Act of 1970, P.L. 91-631, 84 Stat. 1876 and decisions

		from the US courts like: April 25, 2005: In an important victory for western property owners, the United States Ninth Circuit Court of Appeals has ruled for Pacific Legal Foundation, and Idaho rancher Verl Jones' family. The Ninth Circuit has just put environmentalists on notice that now they are going to have to give courts legitimate evidence of a likelihood of harm—they can't get away with destroying people's lives on baseless allegations anymore!
1 Introduction		4 "Sec 10 of the ESA, ITP may be issued for otherwise lawful activities that could result in the "take" of ESA-listed species…" Under professional and sound science, an objective specific scientific study must be undertaken to demonstrate an activity would result in a take. Inferences from non-related studies are biased, inappropriate and unprofessional, plus it is not sound science and does not follow a clear path.
2 Objectives		4 To "estimate the circumstances, mechanisms and risk of incidental take potentially, or likely resulting from small-scale mining activities" from the "best available scientific information" is not sound science and does not follow a clear path. This white paper is about creating "BMP's for avoiding, minimizing, or mitigating for the risk of an incidental take of potential covered species." The way to reduce the potential risk is to prohibit the activity! 9th US Circuit Court, Jones April 2005. This is not sound science, but unscientific inferences and speculation. Only an objective specific scientific study undertaken to demonstrate an activity would result in a "take" will be sound science.
3 Methodology		4 In my professional opinion, "internet searches (mostly conducted using the Google® search tool)" are not a sound scientific literature review. There is a multitude of factors resulting in a Google site listing, of which sound science is not included. A literature review of "scientific" works includes an exhausting review of the professional journals on the subject, using abstracts, etc. These sources are not usually available through Google but a paid source or library. I have a Masters and Ph.D. in Engineering and am a

		licensed Professional Engineer. "The white paper was amended based on the comments provided by WDFW". Were these comments and amendments based upon <u>sound</u> science or political opinions with an agenda? This white paper is sounding more like a "white" wash than a white paper, based on WDFW's political inferences, influences and opinions and not based on <u>sound</u> science. In my professional, scientific opinion, this white paper is not a scientific paper, but an unscientific opinion concluded and expressed by the authors of woven fragments of science pieced together and taken out of context, to support a predetermined conclusion supported by those that funded this work. This white paper is light on <u>sound</u> science on the effects of small mining, and heavy on inferences of science unrelated and without a clear path to small-scale mining.
4. Activity description		4 "The 1999 Gold and Fish pamphlet serves as the HPA permit for mining and prospecting activities…" In these 8 years of permits is there any <u>sound</u> science that determined an endangered or threatened species has been taken when following the permit guidelines? Where is the science with the appropriate scientific citation?
	4.1 Definition of small-scale mineral prospecting	3 Line 3. It is unclear if suction dredging is included in the definition of small-scale mining. 4 Good
	4.2 *Gold and Fish* pamphlet	3 Pg 4-3, line 8. Does <u>every</u> stream in the state have an allowable work window? 4 Brief but good. Need to list citations of references of scientific studies based upon observations on species before, during and after the use of the 1999 Gold and Fish pamphlet and permit. 5 In the discussion of "highbanking" that "aggregate is supplied to the highbanker by means other than suction dredging." However, this is inconsistent with table 2 that lists "highbanking/sucton dredging" as a combination of activities.

	4.3 Other HPA permitting options	5 The word "past" should be added to the "200 ft landward of the OHWL". Could be misunderstood to mean the first 200 ft of the "OHWL".
	4.4 Environmental setting and geographic location of small-scale mineral prospecting activities	3 Pg 4-5, line 1. Since activities conducted under the Gold and Fish pamphlet are not tracked, it makes it impossible to determine the geographic scope of those activities. How can the potential impacts be determined if the scope and extent of the activities can't de determined? 4 It appears that the Gold and Fish pamphlet with individual HPA's is working well.
5 Species and habitat use		3 Same comment as 4.2 – does each and every stream in the state have timing criteria?
6 Conceptual framework for assessing impacts		1 The mechanisms in Table 8 don't strictly fit into the conceptual framework that precedes it - unless "habitat structure" is very loosely defined. This doesn't seem like a big problem, but the issue may reduce the clarity of the document. I did not perceive significant value in the inclusion of the conceptual framework - the paper simply seeks to identify process connections between mining and certain biological responses. 2 The reasons for this section are generally unclear, and the framework seems very linear and simplistic. I think this section could be enhanced with some discussion on the importance of an impact pathway, and possibly why the framework is so generalized. Specifically, it seems that the "habitat processes" box doesn't fit well and that the framework should split after the habitat structure box, leading to both the habitat processes and ecological function boxes. From a stream ecosystem perspective, ecological function is largely a function of structural components. The processes that form habitat are the same processes that form the structural components, so I'm not sure where habitat processes fit in this framework. It also seems that this idea could be better researched utilizing more relevant documentation on the influences of disturbances to stream ecosystems, and there is plenty

		of literature describing this structure versus function idea. An explanation of how this section is pertinent to the development of the 7 impact mechanisms would be helpful. Currently, there appears to be little or no discussion about how the impact pathway and the impact mechanisms are connected, or why its relevant. Last sentence, 2nd paragraph: "alternations" or "alterations".
7 Direct and indirect impacts		2nd paragraph, 1st sentence: remove "…plus impacts related to…" Maybe mining could be both detrimental and beneficial to the other mechanisms as well. 2nd paragraph, 2nd sentence: indirect impacts could cover many items, not just macroinvertebrates. They may include their food sources, habitats, and whole suite of items…however small scale mining has only researched this more tangible items. Again, some additional discussion of the potential indirect effects of mining might be beneficial, even if it utilizes literature from other substrate disturbing activities such as road building, gravel removal, etc. 4 Table 7 does not list if the species is endangered, threatened, etc, just the species that could be impacted by the in stream mining. Figure 2 on page 6-1 is a "conceptual model" not a scientific study. This white paper does not present any <u>sound</u> scientific link with small-scale mining and the conceptual "impact pathways" inferred. "Potentially covered species are vulnerable to adverse influences of mineral prospecting via certain impact mechanisms" Where is the scientific literature review reference or citation? 4 Professionally I have real trouble believing "In cases where specific literature concerning the effects of small-scale mineral prospecting on potential covered species was not located, research conducted either with other, similar species or by associated mechanisms was used as a surrogate." WHAT BAD SCIECE! In this white paper there are no quotes from

		the scientific literature citations, only generalizations and inferences, conceptual models, associated mechanisms and surrogates! There is not a clear path from this conceptual model to sound science.
	7.1 Excavation/ entrainment	3 Pg 7-3, line 5. “Entrainment…” this statement seems too subjective given the fact that the scope and extent of the activity is unknown. 4 …fish eggs, fry and larvae can become entrained…(7-3) Where is the scientific literature review reference citation? There is not a clear path from sound science to this inference of can. 5 First sentence stated “…involve excavating aggregate from the channel bed and sorting …” Not all classes of streams allow removal from the bed should define “channel bed” in definitions as below the “OHWL”.
	7.2 Wading	4 The sited scientific literature review reference is on angler wading, not mining. This is a presented scientific inference or assumption and does not represent a clear path. This is BAD SCIENCE. This is a small mining permit not a fishing license. 5 The final paragraph on wading should discuss that this impacts the food sources such as macroinvertebrates in the same manner and should refer to the Prey Based Alteration section.
	7.3 Substrate modification/channel hydraulics	1 7.3.1 "Substrate changes in two California streams, as a result of small-scale mining activities, influenced macroinvertebrate density and diversity (Harvey 1986)." Does this point belong here, or in the section on indirect effects? 7.3.2 "benefit or impact" ---> unclear disjunction 7.3.2 This section contains examples of citation of papers that do not provide direct evidence for a statement or the origin of that statement. I believe the strength of the report would be increased to the extent this approach to citations can be avoided. 7.3.2 Harvey (1986) provides evidence of a clear

		negative response of riffle sculpins to elevated substrate embeddedness due to dredging. These results should be relevant to some of the non-game fishes of concern - at least *Cottus marginatus*. 7.3.3 See Suttle et al. 2004 for additional information on the influence of substrate embeddedness on invertebrates (Suttle, K. B., Power, M. E., Levine, J. M., and McNeely, C. 2004. How fine sediment in riverbeds impairs growth and survival of juvenile salmonids. Ecological Applications 14:969-974). The issue may be less about overall abundance than about differences in vulnerability to predation by fish. 7.3.3 4th paragraph from the bottom of the section: "The study results demonstrated that the silt layer induced the observed mortality, as mussels were unable to maintain themselves under these conditions." This sentence can be deleted, it does not seem to provide any new information. 7.3.3 Last sentence: I can't remember anything in Harvey 1986 about silt remaining after winter streamflows. I think the paper notes in the Discussion the absence of evidence of dredging following high winter streamflows. 3 7.3.2, pg 7-7, line 15. "The likelihood…" This statement may not be supportable given the unknown scope and extent of the activity. 7.3.2, pg 7-8, line 4. The gold and fish pamphlet "requires" avoiding fish eggs, not requests. 7.3.3, pg 7-9, line 3. "In all cases…"Even impacts that are short in duration can have cumulative impacts – and since the scope and extent of the activity is unknown, this statement may not be supportable. 4 Notice: "Limited scientific information is available regarding the effect of mineral prospecting on stranding, and no observations of stranding have been reported in the literature to date". Thus without sound scientific studies, there is no clear path to any recommended measure. It is important to note some <u>sound</u> science (7-6) "Salmonid fishes have been

		documented to spawn in previously dredged areas (Hassler et al. 1986; Somer and Hassler 1992) and have been found to selectively spawn in tailings, even where sufficient natural substrate exists (Harvey and Lisle 1998). While "research has not been conducted on the subsequent recruitment of fry to the population from these redds. Given the loosely consolidated nature of the tailings, it has been <u>postulated</u> that spawning may be less productive". There is not a clear path from any <u>sound</u> science to this inference of "Postulated". "More information about the relative stability of tailings and their use for spawning is needed…" (7-7) "If sediment deposition occurs after spawning, this process <u>can</u> harm eggs and pre-emergent fry." There is not a clear path from <u>sound</u> science to this inference of can. Why not a quote from the citation? This white paper must have <u>sound</u> scientific quotes from the literature. There are many: "can, could, may, has the potential, can potentially, likelihood, inferred, therefore, it appears likely that potentially, opinion, conceivable to assume, have assumed, that might increase the likelihood, potentially influenced, general consideration, can be interpreted, potentially disrupted, have the potential for some take, widely applicable to potentially covered species, debatable, expected, most likely, could be adversely affected, can occur, difficult to quantify, level of uncertainty, use of assumptions, could use additional study, researchers suggest, could enhance," etc leading to inferences that are inappropriate, without a clear path, with an unprofessional judgment resulting. Use of these words is not <u>sound</u> science! Most of the (NMFS) citations are "Biological Opinions" and thus are not <u>sound</u> science. Science deals with facts, data from field studies, by competent scientists, not "Opinions"! Good science would compare the effects of small mining with the natural winter and spring runoff. There needs to more scientific work in this area. (7.3.3) There is not clear path or direct quote from Miller et al (2001), Bolton, and Shellberg (2001), Leopold (1964), or Montogomery (2001), etc. to "…<u>potential</u> alterations to channel morphology resulting from <u>mineral prospecting activities</u>…" will harm or "take" a species.

		5 7.3.1 Discussion should include a statement that the there is potential for substrate modifications to pool depths can also increase local temperatures to lethal levels this would be especially important if stranding does occur. 7.3.3 Stern (1988) percentages of damage averaged over the two year period 17.4% with undercutting of banks reaching as high as 47%. Percentages of damage could indicate the level of compliance monitoring and enforcement required.
	7.4 Water quality modifications	1 Harvey 1986 includes turbidity information (see Figure 4 of that paper) that could be included in this section. 7.4.1: "Indirect mechanisms such as exposure to predation " This statement should indicate that turbidity can be expected to reduce predation risk (Gregory, R. S. and Levings, C. D. 1998. Turbidity reduces predation on migrating juvenile Pacific salmon. Trans. Am. Fish. Soc. 127: 275-285). 7.4.1: After providing much detailed information, I think this section might benefit from a stronger concluding statement that links observed increases in turbidity below dredges to their likely consequences for population dynamics. The available evidence suggests that biologically meaningful effects on populations are not likely in many settings (assuming commonly observed dredge densities). 2 There is discussion on the impacts of TSS on fish, one on invertebrates, and a subsection on feeding and respiration impacts, but within this subsection are section on the impacts from metals, water temp, and petroleum. These should be individual subsections. 11th paragraph, 3rd sentence: what are elevated levels of turbidity, and for what duration is it likely irrelevant to primary production? Do suction dredges meet this criteria? In Alaska, many dredges operate all day, elevating turbidity for long periods of time. This may not be an issue in larger rivers, but in smaller creeks the compounding issues of extended time and greater area could be very relevant to primary production rates. The lack of knowledge in this area should also be included in the Data Gaps

		section. 3 Page 7-14, line 14. This ecology study also looked at contaminants, why aren't they mentioned here? 7.4.2.1, pg 7-23, line 18. "However…" Difficult to predict based on the unknown scope and extent of the activity. 7.4.2.1, pg 7-23, line 26. "According…" Difficult to predict based on the unknown scope and extent of the activity. 4 There is absent sound scientific studies in this white paper comparing the effects of small mining with winter and spring runoff effects on water quality. Small mining occurs during daylight hours and is cyclical in the effect on water quality, "Usually, the zone of influence is small and the duration short, such that the effects might simulate the levels achieved during a natural precipitation event (7-18)." Thus there is no clear path or direct quote from the literature review presented to link small mining. "Based on the reviews of previous biological opinions described above, activities that allow considerable increases in suspended sediment have a high risk of incidental take of potentially covered fish species exposed to this condition." There is not a clear path from "review of biological opinions" to the "high risk of incidental take". Opinions are not sound science, but just opinions, inferences and are biased! "Direct evidence of water quality effects of small-scale mining on mussel, limpet, and snail species is lacking" (7-19). It is not sound science to: "Given a direct lack of evidence, inference of potential effects based either on the life history characteristics of the potentially covered invertebrate species or other similar shellfish species is used for the balance of this section." This statement has no clear path, is inappropriate, and reflects unprofessional judgment. 5 Water quality modifications are dependent on the existing levels of contamination in the water and sediments. In areas such as the Upper Columbia and Hanford that have high levels of contamination disturbance can re-suspend heavy metals and other

		contaminates into the water column and transport them downstream. Under the CERCLA process persons responsible for actions that transport contaminates can be held liable for clean-up of the site. I would highly recommend that areas above Grand Coulee Dam on the mainstem of the Columbia River and near the Hanford reach be closed altogether for any small mining activities. On page 7-17 first paragraph needs to include some information on assumptions (amount of activity, area of activity, etc.) that NMFS used to reach this conclusion. The conclusion appears to be inconsistent with their findings. Bullets on same page of 7-17 need to add a bullet for the effects on food sources. 7.4.2.1 On page 7-25 the second paragraph needs to include a statement that this is dependent also on the level of contamination present in a specific area. The third paragraph should discuss the fact that local small pools created from disturbance may over heat impacting stranded organisms. At the end of the fourth paragraph the USEPA provisions for fueling should be used as standards within the "Fish and Gold" pamphlet and there should be a requirement to certify equipment.
	7.5 Channel dewatering/ obstructions	4 "the risk of take due to upstream passage delay of migrating fish is considered low."(7-26) In my opinion, It appears that the Gold and Fish pamphlet's requirements are adequate. 5 Channel dewatering can also lead to over heating of the water.
	7.6 Prey base alterations	1 Referencing the paragraph that begins: "Another macroinvertebrate study on the American River in California found the effects of dredging on invertebrates to be localized (Harvey et al. 1982)." This paragraph seems to be reporting information also covered in the peer-reviewed publication cited earlier in the section (Harvey 1986). The only information on benthic invertebrates included in Harvey et al.(1982) not included in Harvey (1986) are from the Yuba River. Harvey et al. (1982) notes these data are "difficult to interpret due to late initiation of sampling and dissimilarity of stations". They probably don't

		deserve specific coverage in this document. Referencing the statement: "In its biological opinion for 18 suction dredging permits in LoLo Creek, Idaho, on the Clearwater National Forest, NMFS concluded it was unlikely the amount or availability of fish food would change as a result of small-scale suction dredging in the creek because (1) a very small percentage of the stream bottom was affected and (2) almost all food of juvenile salmonid fishes is related to water column drift (NMFS 2006o)." Point #1 seems valid. Point #2 seems questionable on two counts: 1) salmonid fishes feed heavily from the benthos under certain conditions and 2) w/ the exception of terrestrial insects, drifting invertebrates come from the benthos. 3 Page 7-30, line 6. “This level…” Difficult to predict based on the unknown scope and extent of the activity. 4 “the abundance and taxa richness values 262 to 525 feet (80 to 160 meters) downstream of dredging were similar to control values (Prussian et al. 1999). This study concluded that small-scale suction dredging caused only localized reductions in macroinvertebrate abundance.” This is an example of sound science and is unfortunately missing from the majority of this white paper. This section is the most scientific of the white paper. But, it would be best to use quotes from the literature. 5 Include impacts of wading on food sources. In paragraph two on page 7-27 increased drift of macroinvertebrates associated with increased turbidity may not lead to an overall severe depletion it will alter the distribution of prey and correspondingly the feeding areas of fish. Since you are discussing prey based alteration the related impacts to fish should be included in the discussion. On page 7-27 fifth paragraph discusses the impact on macroinvertebrates from a 3-inch diameter suction dredge intake has a similar study been done with a 2-inch suction dredge intake. There is a significant difference between a 2-inch and a 3-inch when looking at macroinvertebrates and a 2-inch intake is much more common. This should be listed as a data gap.

	7.7 Disturbance	3 Page 7-30, last line. Difficult to predict based on the unknown scope and extent of the activity. What about localized, intense uses? 4 "Conceivable to assume" and "the anticipated influence on potentially covered species is speculative" is not based on sound science and is inappropriate, does not follow a clear path and is unprofessional in judgment. Do the study, do the science!
8 Cumulative impacts of small-scale mineral prospecting		1 It may be worth considering potential interactions between temperature and dredging-related disturbances (elevated suspended sediment, petrol spills) in the cumulative effects section. From the first paragaph: "This discussion does not address the impacts of unrelated activities on species or their habitats that may be a more watershed-dependent evaluation." Should some sort of discussion be attempted? I would say yes, because in some settings the combination of dredging (even dredging done as delicately as possible) and other conditions and processes may cause cumulative effects. Example: Activities that have altered thermal regime combined w/ dredging-related disturbances (elevated sediment, petrol spills). I believe this Council on Environmental Quality definition of cumulative impacts is widely accepted: "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." This also raises the issue of looking at dredging consequences in a more site-specific manner - I consider this an important point raised elsewhere in the document (including Section 11). 3 Pg 8-2, line 10. "The geographic…" This underscores how critical understanding the scope and extent of the activity is to determining the potential

		impacts. 4 "This study did not provide specific information regarding the types or magnitude of the water quality impacts. We have assumed the anticipated effects resulted from changes in turbidity" and "in the absence of restrictions on the number of dredges operating within a stream, the potential for cumulative impacts remains, and "the number of mining operations in a stream are all factors that might increase the likelihood of cumulative impacts from small-scale mining."(8-1) These statements are not based on sound science and are inappropriate, do not follow a clear path and are unprofessional in judgment. Do the study, do the science!
9 Potential for take and qualification of risk		1 The last paragraph before Section 9.1 makes an important point about cumulative effects that might be broadened to include the cumulative effects of different activities. 3 Pg 9-5, line 14. "Potential impacts…" May not be enough evidence to support this statement. Potential exists for Gold and Fish compliant equipment to be in the water for the entire work window. Dredges may also be in the water during a work window but be impacting overlapping life stages of potentially covered species of fish. 4 Table 12 is based on "These determinations are based on general consideration of the species distribution" and "can be interpreted" (9-4-5). These statements are not based on sound science and are inappropriate, do not follow a clear path and are unprofessional in judgment. Do the study, do the science! Remember, "Little information is available on potential thresholds based on the available literature presented in Section 7."(9-5) So how can one professionally based upon sound science make a statement "small-scale mineral prospecting has the potential to generate considerable risk of take when the cumulative impacts of multiple permits are considered,"? This is BAD SCIENCE, is inappropriate and is a "white wash"!

	9.1 Evaluation of *Gold and Fish* pamphlet restrictions and risk of take	4 It is always better, in my professional opinion, to make regulations clear, but make it clear to a high school level vocabulary, not a lawyer's.
	9.2 Evaluation of relative risk of take	1 Provides support for site-specific management of mining activities. 2 9th paragraph, last sentence. Given the available literature on the extent of damage that could occur in small streams with high levels of fines, why would the potential for take in these stream only by moderate and not high. Wouldn't invertebrate species have a high potential for take because of their relative immobility and specificity of habitat? 3 Pg 9-14, line 1. Of the four things in this sentence relating to the risk of taking potentially covered species, all are known except for the type, extent, and duration of mining impact. Without this, can the potential for take really be determined? Pg 9-14, line 14. "The Gold and Fish…" The pamphlet requires shellfish beds be avoided and when encountered, shellfish must only be avoided by 200ft. As for spawning areas, GF only requires that eggs be avoided, not spawning areas. Pg 9-15, line 3. "The relative…" Presence of species includes when GF equipment are within a work window and overlaps with other species life stages. Pg 9-16, line 1. "Moderate risk…" Risk could be more than moderate based on the scope and extent of the activity. 4 It has become clear in this white paper, that the authors use unsound science, make inferences, assumptions, etc. so how can we scientifically believe "based primarily on the best professional judgment of the analysis team and go beyond the empirical data available in the literature" and "categorizations are intended to be widely applicable to potentially covered species." (9-6) These statements are not based on sound science and are inappropriate, do not follow a clear path and are unprofessional in judgment. You cannot have a "clear need to implement conservation

		measures to reduce the risk of take." based on BAD SCIECE. This statement has no clear path, is inappropriate, and reflects unprofessional judgment. It does represent a biased political agenda. Do the study, do the science! Table 13 is a result of this biased political agenda, should be discarded pending sound scientific studies and has no clear path to the spotty science inferred in this white "wash" document. The classification of "high risk of take" has no clear path, is inappropriate, and reflects unprofessional judgment because it is not based on sound science. 5 Local managers should be consulted for life stage data for specific populations of concern and recommendations for work windows in specific streams being developed with the counties to insure protection of species of concern. On page 9-16 in the first paragraph it states that "the majority of research studies have shown only temporary (30 45 days) and localized impacts…" The 30-45 day period is during the annual growth phase that is between a 90-150 day period. Growth during the late fall, winter, and early spring is limited therefore an impact of one-third to one-half of the growth season is not low. Registration of small mining activity locations would allow to control the concentration of activity in small streams with high fines or clays that would have the potential for higher impact.
10 Data gaps		4 There is a need to do sound science and "not many of the studies reviewed for this paper were related to small-scale mining impacts." Do the science than revisit the recommendations to the Gold and Fish pamphlet's requirements if required. 5 I agree with your research recommendations but I think additional information of small diameter suction intake is needed. Is there a critical intake size that if less than a specific diameter significantly increases risk to aquatic organisms?
	10.1 Mineral extraction and processing methods	2 1st paragraph, 2nd bullet: the suction dredges on the Fortymile were all 12" hoses, while those in the Chatanika and Resurrection streams were smaller.

		Effects on primary and secondary production, stream metabolism and nutrient retention and processing would be useful as well. Several researchers in Alaska are currently investigating the effects of salmon spawning on nutrient transport and retention. While the shear abundance of salmon spawning is different that suction dredging, it seems possible that repeated turnover of substrate from dredging might have similar influences. 4 "We assume that impacts would either be reduced or similar to suction dredging"(10-1). This statement is not based on <u>sound</u> science and is inappropriate, does not follow a clear path and is unprofessional in judgment.
	10.2 Direct impacts of the covered activities to potentially covered species	1 Harvey (1986) provides evidence of a clear negative response of riffle sculpins to elevated substrate embeddedness due to dredging. These results should be relevant to some of the non-game fishes of concern - at least *Cottus marginatus*. 4 "Effects on these species were inferred from the literature based". This statement is not based on <u>sound</u> science and is inappropriate, does not follow a clear path and is unprofessional in judgment. Wait for the research to be completed! These statements sum up this unscientific white wash paper: "research is needed" and "additional information is necessary to assess the impacts of small-scale mining…" and "empirical data is lacking" and "is sorely needed" (10-2), and "is generally lacking in the literature assessments."(10-3)
	10.3 Indirect impacts of the covered activities to the potentially covered species	4 Again, do the study, do the science before recommending measures: "Additional studies are needed", "Species-specific work is needed", and "Further work is needed"
	10.4 Cumulative effects of the covered activities to the potentially covered species	1 This section might suggest a specific study design. This seems like an issue that could be effectively addressed in an extensive (perhaps pairwise) comparison of fish and invertebrate attributes of streams that have been heavily dredged versus those that haven't.

		4 “Researchers suggest the impacts could increase” This statement has no clear path, is inappropriate, and reflects unprofessional judgment.
	10.5 Conservation measures, best management practices, and mitigation	1 My perception is that another key issue that could be addressed in this section is the need to know to what extent BMPs are followed. For example, re-contouring of the stream bottom to eliminate dredging piles and holes is no doubt often a very valuable step in reducing ecological effects, but it's hard to imagine that dredgers always complete this time- and energy-consuming requirement. 4 In professional scientific opinion, do the science first, and then make recommendations to modify the BMP, not make prudent measures based on incomplete and BAD SCIENCE! 5 Compliance monitoring is also needed along with enforcement.
	10.6 Management recommendations	4 A system is not needed to tracking small-scale mineral prospecting. Ask for volunteers, do the science! 5 Mitigation recommendations in Table 15 should be expanded on in this section.
11 Habitat protection, conservation, mitigation, and management strategies		1 Mitigation/Conservation Recommendation #7, to: "Limit activities based on the size of a stream." This seems quite reasonable; is it meant to apply specifically to dredge spacing, as indicated by the text? "Reporting life history timing on major channel networks within WRIAs would allow WDFW to easily identify overlap between potential sensitive life-history stages and work windows in each stream, increasing the flexibility to call for extra precautions when necessary to avoid sensitive areas and to institute less restrictive precautions if overlap does not occur in a given stream." I considered this a particularly valuable recommendation for site-specific analyses.

		I think the suggestion to compile information on the distribution of dredging is particularly valuable. Combined with the idea that prospecting may be one of several human activities affecting populations of concern, I believe the two previous points argue strongly for employment of site-specific info to the extent possible in formulating regulations. 2 Habitat protection, conservation, mitigation, and management strategies #8: the distance between dredges should possibly incorporate the size and channel type of the stream. For instance, a small steep gradient stream might need longer distances between miners because of the overall area that could be affected, whereas a larger mainstem stream could possibly handle more concentrated mining because the overall affected area, or relative footprint, might be less. Management Recommendations: Very glad to see that this document recommends accounting for the number of miners, their locations, and timing of mining activity. Its especially difficult to manage resources without knowledge of the activities potentially affecting that resource. 4 Hunting, hiking, road building and mining are part of our national heritage. We would not have our network of interstates and roads if a white paper was conducted with such biased opinions and inferred science. "However, minimization measures commonly required under the Gold and Fish pamphlet should limit the dispersion of sediment, and most small-scale mining activities will normally result in only temporary increases in turbidity commensurate with a natural precipitation event."(7-23). It is true that <u>no</u> use will "reduce the impact of small-scale mining and the potential take of potentially covered freshwater species". "Based on our review of the pamphlet and the available scientific literature" is an opinion, not based on <u>sound</u> science. "Additional rules stating that <u>potential</u> spawning areas should be avoided…" This recommendation is a political motivated suggestion and is an attempt to stop or retard small mining. The "Gold and Fish pamphlet

		currently specifies that "incubating fish eggs or fry shall not be disturbed" is sufficient. (11-5) Why not do like Idaho "government personnel identify site-specific spawning areas before the mining season and these areas are made known to miners." It is important to follow "once research has established the proper distance relationships" prior to changing the Gold and Fish pamphlet. "However, little information is available on the impacts of specific small-scale mining activities in small or headwater streams… We recommend using four channel sizes as an initial starting point" Again, recommendation based on little information. (11-7) "The influence of potential water quality impacts from suction dredging can exceed 200 feet. We therefore recommend increasing the required distance between suction dredging operations to a round number of 300 feet…"(11-8) Again, This statement is not based on sound science and is inappropriate, does not follow a clear path and is unprofessional in judgment. "Given the potential for downstream impacts from any one small-scale mining operation and the almost complete lack of information on cumulative impacts associated with multiple operations, we recommend restricting the number of permits allowed per surface area of stream in any one year."(11-8) Again, this statement is not based on sound science and is inappropriate, does not follow a clear path and is unprofessional in judgment. Do the SCIENCE! "we recommend the following changes to the current permitting procedure:" (11-9). Request the miners volunteer their location for scientific studies. Do not add additional restrictions or bureaucracy when science has not shown it to be needed or necessary. No annual reports or permits!
TABLES		
Table ES-1 Principal impact mechanisms		4 Use only the sound scientific studies from small scale mining.
Table 1 Potentially covered		4 Use only covered species and list their classification in table.

freshwater and anadromous fish and wildlife species		5 Kokanee should be added to the list of potentially covered species for streams in the blocked areas above Grand Coulee and Chief Joseph Dams. Tribal sensitive species and is being considered for potential Federal listing.
Table 2 WDFW classification of small-scale mineral prospecting activities		5 The word “past” should be added to the “200 ft landward of the OHWL”. Could be misunderstood to mean the first 200 ft of the “OHWL”.
Table 3 Distribution of small-scale mineral prospecting activity in 2006		1 This table's legend is not strictly correct, in that it provides information only on non-standard HPAs, a small proportion of overall mining activity.
Table 4 Frequency of authorized equipment use-classes based on WDFW individual HPAs in 2006		
Table 5 Classes I and II small-scale mineral prospecting general work windows and potentially covered species by county		2 Table does not contain the potentially covered species by county – just county, work window and WRIAs. 4 Use only covered species and list their classification in table.

Table 6 Range of potentially covered freshwater and anadromous species		4 Use only covered species and list their classification in table.
Table 7 Habitat requirements of potentially covered species		1 Correct the spelling of *Rhinichthys* for both dace species. 4 Use only covered species and list their classification in table. 5 Redband rainbow trout on the east side of the Cascades are able to tolerate higher stream temperatures and lower oxygen levels than the coastal rainbow trout. This native species evolved with the warmer stream conditions found in many Eastern Washington streams. They are being recovered in several streams and lakes and rapidly replacing the stocking of coastal rainbow trout. Steelhead in the Okanogan enter the streams for spring spawning and emerge in July.
Table 8 Principal impact mechanisms evaluated		3 Does this include re-suspension of sediments and contaminants 4 Use only the sound scientific studies from small scale mining.
Table 9 Summary of small-scale mining impact citations reviewed and referenced		1 I couldn't figure out why the list of 'references cited' was not always a subset of 'references reviewed' (see the row for cumulative effects). Also: references to "Ecology 2004" and "Ecology 2005" in Table 9 are unclear because "Washington State Department of Ecology (Ecology)" does not appear until section 7.4 4 Use only the sound scientific studies from small scale mining.

Table 10 Unintended channel morphological changes associated with small-scale suction dredging in Canyon Creek, California		4 Need more sound science.
Table 11 Comparison of stream length to stream distance influenced, upper Skagit tributary		4 Do the sound science. Do not make inferences. Study small mining.
Table 12 Summary of potential for incidental take of potentially covered freshwater and anadromous fish species		4 Do the sound science. Do not make inferences. Study small mining and scientifically determine the potential for incidental take.
Table 13 Summary of risk of take related to small scale mineral prospecting activities		1 Word processing error: Several of the "high risk" bullet statements in this table refer to "construction timing". "Salmonid fish eggs are typically buried beneath 8 to 15 inches of gravel depending upon the species and grain size of the available substrate. Median egg pocket depth is typically greater than 12 inches deep." I'm not sure about this justification for a change in estimated risk based on dredging deeper or shallower that 1 foot. Many of the salmonids and probably all of the non-game species deposit eggs shallower than 1 foot. See: DeVries,P. 1997. Riverine salmonid egg burial depths: review of published data and

		implications for scour studies. Can. J. Fish. Aquat. Sci. 54:1685-1698. Might include under high risk activities: leaving unstable gravel tailings in stream reaches with listed fall-spawning fish (but this point is well made in the text), 4 Do the sound science. Do not make inferences. Study small mining.
Table 14 Size range of study streams		4 Do the sound science. Do not make inferences. Study small mining.
Table 15 Additional mitigation, conservation, and management strategies recommended for minimizing the impacts of small scale mineral		1 Mitigation/Conservation Recommendation #5: A crepuscular peak in salmonid feeding is not a consistent feature of many systems, but another rationale for the recommendation is simply to limit the total amount of time each day that fish feeding might be directly affected. Mgmt. Recommendation #3: This recommendation could include an effort to quantify current levels of compliance with guidelines. 4 Management recommendations are based on a political agenda and not sound science. These recommendations are inappropriate, do not follow clear paths and are unprofessional in judgment. Do more science and ask for miners to volunteer in small mining studies. Do not modify the Gold and Fish pamphlet and permits until the sound science is done! 5 I concur with your recommendations
Table 16 Influence of distance from small-scale mineral prospecting to return to ambient levels		1 Harvey 1986 also provides relevant turbidity information. 4 Needs more science, only one reference per recommendation. No quotes. Use of inferences.

FIGURES		
Figure 1 Stream locations of various classes of small-scale mineral prospecting activities		4 OK – Good in color.
Figure 2 Conceptual framework for assessment		4 Need to put in the place for sound science to measure the impacts. Inferred impacts are not sound science.
Figure 3 Overlap of counties and numbered water resources inventory areas in Washington state		4 OK, but needs more detail with streams identified and the exact location of endangered species.
APPENDICES		
Appendix A *Gold and Fish* rules and regulations for mineral prospecting and placer mining in Washington state		4 None there. Do not update the Gold and Fish pamphlet and permits without conducting sound science on small mining operations.
Appendix B Proposed species list		4 Do the sound science before listing. 5 Please add kokanee above Chief Joseph and Grand Coulee Dams.

Appendix C 2006 mineral prospecting HPA permits		4 OK
Appendix D Map of WRIAs in Washington state		4 None

GENERAL QUESTIONS

1. List any additional sources of information you have not already identified that should have been reviewed and incorporated into the analysis. Are there any sources that were used that you feel should not have been? Why?	4 There should have only been science from the study of small mining used. The rest of the references are inferred to represent the effects of small mining and are unscientific in that they are taken out of context, are inappropriate, without a clear path, with an unprofessional judgment resulting. All the papers not on small mining should not have been used. I recommend the continued undertaking and completion of sound science on the effects of small mining prior to any recommendations, or changes in the Gold and Fish pamphlet and permit. Decisions from the US courts like: April 25, 2005: In an important victory for western property owners, the United States Ninth Circuit Court of Appeals has ruled for Pacific Legal Foundation, and Idaho rancher Verl Jones' family. The Ninth Circuit has just put environmentalists on notice that now they are going to have to give courts legitimate evidence of a likelihood of harm—they can't get away with destroying people's lives on baseless allegations anymore! A professional scientist should only use quotations and the results of sound science on the issue only. No inferences models or assumptions. 5 Tribal databases have considerable stream data that should be added to the proposed database. It would be good to include the database in an already existing one such as StreamNet.
2. In general, what aspects of the paper do you feel are particularly flawed? Why? How could they be improved?	1 I concluded the document might be strengthened by more broadly addressing the issue of cumulative effects and perhaps more strongly emphasizing the notion of site-specific analyses and regulations. The paper points out the importance of spatial variation in the distribution of mining, its likely physical effects, and animals of concern. It seems the fairness and effectiveness of mining management would increase to the extent such

	information is incorporated in decision making. My perception is that a natural addition to the site-specific approach is recognition of other prior and ongoing consequences of human activities affecting species of concern: the level of acceptable mining activity could be influenced by whether or not other activities are already affecting populations of concern. The abbreviation of points in a couple of the tables slowed down my understanding of the document. Given that many readers will focus specifically on the tables, it may be appropriate to include a little more detail in them. 3 The assessment of the potential for take may not be fully estimated because of the lack of knowledge of the scope and extent of the activity. 4 Use quotes from scientific papers! No inferences. The recommendation were political in nature and are inappropriate, do not follow clear paths and are unprofessional in judgment, being not based on <u>sound</u> science. The use of the statements: "can, could, may, has the potential, can potentially, likelihood, inferred, therefore, it appears likely that potentially, opinion, conceivable to assume, have assumed, that might increase the likelihood, potentially influenced, general consideration, can be interpreted, potentially disrupted, have the potential for some take, widely applicable to potentially covered species, debatable, expected, most likely, could be adversely affected, can occur, difficult to quantify, level of uncertainty, use of assumptions, could use additional study, researchers suggest, could enhance," etc, do not belong in a scientific paper and lead to inferences that are inappropriate, without a clear path, with an unprofessional judgment resulting. Use of these words is not <u>sound</u> science! The greatest flaw I saw was the recognition that some areas of the Columbia River and other steams may have been heavily impacted in the past by historic activities and disturbance of these areas would carry a significantly higher risk to aquatic organisms. The subject should be included in your discussion and recommendations to place a moratorium on activities in these areas until contamination levels have been reduced to acceptable levels. To an untrained eye a slag beach may look like black sand.

3. In general, what aspects of the paper are particularly well done and successfully convey the information	1 Notwithstanding my comments about looking more broadly at cumulative effects, I thought the section describing available info on the effects of multiple dredges was particularly well done. I considered the call for information on the state-wide distribution of dredging (Sec. 10.6) a particularly valuable recommendation, because it would be an important contribution to site-specific analyses. The important suggestion to take a more site-specific approach to mining management (by gathering info on the current extent of dredging and its overlap with likely ecological hotspots) could receive even greater emphasis. 4 "All data presented in the study suggested turbidity levels remained below levels regarded as adverse sublethal impacts to salmonid fishes. A separate study in Butte Creek, California, a stream with an average streamflow of 7.2 cfs, found that operating six small dredges (nozzle diameter of < 6 inches) on a 1.2-mile stretch of stream (5 dredges per mile; approximately one dredge per 1,050 feet) had no additive impacts in terms of water quality, aquatic insects, and fish density (Harvey 1986). A study on the Yuba River that investigated the effects of suction dredge mining on a 6.8-mile (11-kilometer) stretch of river with approximately 40 dredges (5.9 dredges per mile; approximately one dredge in 900 feet) found no additive effects (Harvey et al. 1982). Further, a study of 59 stream reaches in Oregon's Siskiyou National Forest found no significant cumulative effects from suction dredging on total abundance of salmonids (Bayley 2003). This is the best science presented in this white paper. It could have been better if there were quotes and not used "suggested" in the first sentence, an inference and not good science. 5 Overall I think the paper was well done. I concur with your recommendations and found your diagrams very descriptive and useful in conveying the zonal information.

4. Please provide any additional comments.	1 Available information on the effects of small-scale mineral prospecting falls far short of providing a firm basis for regulations that might be appropriate for the protection of highly valued animal populations. I concluded this document incorporates available information and goes beyond it appropriately to yield a reasonable set of recommendations. Details in the References: *Bayley, P. 2003 needs biographic data. *Use of first names v. initials inconsistent (see Bolton and Shellberg). *See Everest, F.H. 1969. Habitat selection and spatial interaction of juvenile Chinook salmon and steelhead trout in two Idaho streams. Doctoral Dissertation, Forest Sciences. University of Idaho. 77pp. Cited in NMFS 2006o. Use Everest and Chapman instead, for ease of access? Everest, F. H. and Chapman, D. W. 1972. Habitat selection and spatial interaction by juvenile chinook salmon and steelhead trout in two Idaho streams. J. Fish. Res. Bd. Canada 29: 91-100. *Add middle initial to Harvey (B.C.) and Lisle (T.E). *Naiman spelling *Nakamoto and Kisanuki - more biographic data needed. 2 Overall, this document compiles and interprets the existing literature on in-stream mining well. However, it could utilize more recent literature on the effects of stream disturbance on primary production and biological processing of nutrients and organic matter in the indirect effects section. The paper uses some older research on the potential effects on stream biota from other disturbances such as turbidity and sediment, but neglects to acknowledge the potential effects on those other components. Glad to see that a statewide database of mining activity is recommended. While it may be more effort for the miners, a database will certainly help track the effects of mining activity, especially in popular areas. 4 Hunting, hiking, road building and mining are part of our national heritage. We would not have our network of interstates and roads if a white paper was conducted with such biased opinions and inferred science. This paper and the recommendations to the Gold and Fish pamphlet and permits should be put on hold until sufficient sound science is completed. The authors of any white paper should have actual small mining field experience.

	5 The potential for impact is specific to stream size and conditions as well as concentration and duration of the impacting activity. To minimize the impact specific knowledge is needed for each stream and population of concern so that restrictions on activity can be specific enough to protect the resources while allowing for the freedom of personal enjoyment of small mining activities.

APPENDIX C		
Peer Review of Overwater Structures and Non-Structural Pilings White Paper		
PEER REVIEW COORDINATOR NOTE: Six individuals reviewed and comment on this white paper. Each was assigned a number, 1 through 6. Each individual's comments are identified by that number at the start of his/her comments for a particular cell in the reviewers comments column. The comments are from that reviewer until the start of a paragraph begins with the number of another reviewer.		
SECTION	**SUB-SECTION**	**REVIEWER'S COMMENTS**
Executive summary	Overview	1 The description of "impacts mechanisms" in paragraph 4 in both unclear as to what the mechanism is and confuses mechanisms (e.g., increased shading) with biological effects (e.g., decreases in submerged/emergent vegetation). The mechanisms should be clearly rewritten to delineate what the mechanism is (<u>increased</u> shading, <u>degraded</u> water quality, <u>altered</u> current/wave energy) and the generalized biological effects associated with the impact mechanism (decreases in submerged vegetation; increased turbidity, decreased dissolved oxygen, increased PAH/metals; increased erosion, substrate modification) should be discussed in Section 7. There is an artificial distinction made between freshwater and marine biological effects associated with increased shading (decreases in submerged/emergent vegetation) and alteration in wave/current energy (increased erosion, substrate modification). While it is certainly true that there are some differences in processes (e.g., wind driven currents, tidal currents, stream flows) and types of vegetation, the analysis would greatly benefit by combining the discussion of vegetative and hydrologic impacts. Specific impacts (e.g., disruption of drift cells) should be addressed throughout this document and all future iterations within this larger ecological context. 2 The Executive Summary is inadequate as a summary for several reasons. An Executive Summary should do just that- summarize and not simply repeat what was done. First, there is no discussion of any sort of conceptual model or

		framework. I believe that clearly articulating the conceptual framework is clearly needed in the Ex Summary. To some degree, this is more important than some of the details of what the specific impact mechanisms are. Second, a major point of the White Paper should have been that impacts depend upon a variety of site-specific attributes of the structure and the species being considered. Third, all impact mechanisms are treated the same. There is no integrative analysis that says or tries to conclude what the major issues are. There is no discussion of major data gaps or cumulative effect. Fourth, potential risk of take, which is supposed to be discussed, is simply discussed as an on-off sort of issue. There is no real presentation of risk. Fifth, there were many more potential mitigation measures presented in the text yet very few presented in Ex Summary. 3 The first paragraph contains an ESA definition of "take". Often 4(d) rules contain "take" prohibitions which are much more specific (e.g., see original proposed listing of pacific salmon species and 4(d) take prohibitions). The overview section discussion on ESA should also discuss the recovery standard (vs. jeopardy) that results from the designation of critical habitat. Presumably, many of the activities discussed in this document will occur in critical habitat, whether already designated or potentially designated (for covered but not listed species). Section on littoral vegetation discusses federal agency treatment of loss of eelgrass as a loss of "essential" habitat. Do you mean "critical" habitat? You should explain the meaning of "essential" especially since it may be confused with another federally defined term – essential fish habitat. Noise should include, more generally, vibrations (see note under section 7.5 below). 4 The fact that overwater structures associated with a Marina are excluded from consideration should be explained, e.g., that

		they will be treated in a separate white paper. Here, it sounds like the HPA doesn't apply to marinas. o The list of impact mechanisms is a bit of a mixed bag, e.g., they include actual mechanism of impact (such as shading, noise or artificial light) as well as attributes that are vulnerable to being impacted (such as littoral vegetation, water quality, etc.). Recommend consolidating into one perspective, either the stressor or the stressed. o The Executive Summary is a bit "fluffy:" An Executive Summary should focus on factual results, not a listing of what was done and the parts of the report. o Critical information on that actual mechanism of "take" is lacking in many cases. For instance, shading is discussed without any description of the actual physical or ecological processes whereby juvenile salmon or other fish or wildlife or their habitat is at risk of impairment to the effect that the organism is threatened by harassment, harm, pursuit, hunting, shooting, killing, etc. Similarly, littoral drift is described as an impact, but nothing is described that provides any indication about what it is about littoral drift that can change deleteriously! o Some terms are treated very cavalierly, seemingly without scientific basis. For instance, "potentially covered species also have demonstrated *dependence* [emphasis mine] on riparian and shoreline vegetation" would indicate that there is scientific data showing reduced survivorship of fish or wildlife as a function of reduced or impacted riparian and shoreline vegetation. At the minimum, even in an Executive Summary, the mechanism and functional relationship should be described. o It would seem that if a stressor effect on fish is "well established" the authors should provide detailed information on the specific nature of the risk. o Shouldn't the relative toxicity of <u>specific</u> components of non-point source and other pollutants be described

		○ Why do hydraulic changes have to be limited to channels? Wouldn't this apply to any fluvial or tidal current? And, why are habitat destruction, embedding, scour and loss of riparian vegetation restricted to streambeds? Why would a natural process such as "loss of riparian vegetation due to bank erosion" considered an impact when it is a very natural process in naturally dynamic streams, floodplains and estuarine/marine shorelines? The process and mechanism behind channel dewatering impact is not described. 5 USFWS and NOAA can collectively be referred to as "the Services" 6 P. ES-3:The measures listed to help "avoid and minimize incidental take from impacts to riparian and shoreline vegetation" don't really do that. Preparing a vegetation plan does not include the action to replace lost vegetation functions, in the short-term, or account for temporal loss. Monitoring reports do not avoid or minimize impacts, especially if no additional (adaptive management) actions are taken. "Saving large trees and root wads for later use in restoration efforts" does not replace, reduce, or minimize loss at that site. It also doesn't make sense to only prohibit removal of riparian vegetation in areas of high erosion hazard. Riparian functions exist in all riparian areas, not just areas of high erosion potential. Buffers should be listed as the highest priority action to protect riparian areas. The discussion of "noise" does not seem to account for pressure waves associated with pile driving – this can be lethal. What about noise associated with activities that occur after construction. Impacts seem to be narrowly construed and confined only to construction. Regarding water quality impacts, refer to some of the recent work done by Tracy Collier (NMFS), Sandy O'Neil, and Jim West (WDFW). P. ES-5: The statement "the HPA program itself offers the best means of measuring these impacts…" is untrue. The program does nothing to measure impacts and only offers a means of reducing impacts

		through mitigation, which is inadequate. The section on Littoral Drift does not appear to consider beach wrack and backshore productivity, along with associated prey production (prey used by covered and potentially covered spp). In addition, there is no reference anywhere in the paper to armoring and other modifications (and their impacts) frequently associated with overwater structures. This is a major flaw in this work. Under "Vessel activities" (P. ES-6): The list of bullets should include: Release of oils, waste, and other contaminants.
	Shading	1 The mechanism addressed here is actually <u>increased</u> shading and as a result, this section and all future references to the mechanism should be changed throughout this document and all future iterations to reflect that fact.
	Littoral Vegetation	1 Littoral includes lacustrine and marine shorelines. The use of the term exclusively for marine systems and the exclusion of lacustrine systems is inaccurate and inappropriate and should be changed throughout this document and all future iterations. Eliminate the artificial distinction in affects to vegetation from shading (littoral vs freshwater) throughout this document and all future iterations. Littoral vegetation is not an impact mechanism, it is a component of aquatic ecosystems. Decreases in vegetation as a result of shading is an effect not a mechanism. 5 It would be more accurate to state that eelgrass "could" be considered an adverse effect to listed species, rather than saying it is almost certain to result in take.

	Freshwater vegetation	1 Freshwater vegetation is not an impact mechanism; it is a component of aquatic ecosystems. Decreases in vegetation as a result of shading is an effect not a mechanism.
	Noise	1 The description of noise as an impact mechanism should include reference to on-going operational impacts for the structure, as well as construction.
	Water quality	1 Water quality is not an impact mechanism, water quality degradation is. In addition to the effects listed, overwater structures may also degrade water quality as a result of fuel spills, discharge of gray and/or black water, and heavy metals in paints and/or stormwater. As these are also components of the effects related to the structures, they should also be included in the HCP potential effects analysis. As water quality degradation may also effect sediment quality, the analysis should also include a discussion of sediment quality degradation as a result of overwater structures. The statement that the risk of take as a result of stormwater treated in accordance with Washington's water quality standards is misleading and likely unproven. The Department of Ecology only requires NPDES stormwater permits for industrial, municipal and construction related discharges, and has virtually no treatment or technical requirements for existing municipal systems. While construction of the structures addressed here may require a stormwater permit, there are no requirements addressing the on-going discharges that result from operation of the facility/structure, resulting in potentially significant acute and chronic water and sediment quality impacts. Since the current practices for non-permitted discharges are generally suggestions (e.g., best management practices), with no monitoring required, the statement that "current practice effectively addresses most potential impacts…" is also misleading and unproven. 5 This section implies that TSS is the primary concern from stormwater post-treatment. We would

		disagree, as we see levels of dissolved metals and other contaminants that are above biological effect thresholds in treated stormwater. Low-impact-development (LID) approaches are more effective. A good example of an overwater structure employing these measures is the proposed Mukilteo Multi-Modal Ferry Terminal. They are using pervious pavement and other LID strategies to reduce their water quality impacts.
	Channel hydraulics	1 Channel hydraulics is not an impact mechanism, it is a component of ecosystem function. The mechanism should be rephrased to include all alterations of sediment transport resulting from overwater structures.
	Littoral drift	1 Littoral drift is not an impact mechanism, it is a component of ecosystem function. The mechanism should be rephrased to include all alterations of sediment transport resulting from overwater structures. Littoral includes lacustrine and marine shorelines. The use of the term exclusively for marine systems and the exclusion of lacustrine systems is inaccurate and inappropriate and should be changed throughout this document and all future iterations. As stated, bullet 3 is neither an avoidance or minimization measure – it's simply sampling with no apparent design application.
	Substrate modification	1 Substrate modification is not an impact mechanism, it is an effect associated with alterations of sediment transport processes. While the type of site specific modification may differ between systems (e.g., deposition of shell hash, bed coarsening) in occurs in riverine, lacustrine and marine systems.
	Channel dewatering	1 Similarly to other mechanisms and effects described here, dewatering during construction of overwater structures may occur in riverine, lacustrine and marine systems.
	Vessel activities	1 As previously stated, this document is inconsistent in defining effects mechanisms and biological effects. The 3 bullets listed here are neither one of the 12 mechanisms defined in the overview, nor are they mechanisms – they are biological effects.

		The discussion overlooks the benefit of siting decisions in avoiding effects to sensitive habitats and species and seems to assume that the construction will be allowed regardless. This is inappropriate both in an analysis of take and as part of a natural resource planning exercise.
1 Introduction		3 The discussion of when section 7 ITPs are issued is incorrect in the first paragraph. Approval from NOAA or USFWS is triggered not by virtue of there being a listed species only, but by a federal action (e.g. a corps permit). The primary purpose of adding section 10 to ESA was to allow for ITP coverage of non-federal actions. The introduction states that "marinas" will be the subject of a separate white paper. The RCWs define "marina" as follows (suggest including this on page 4-1): "Marina" means a public or private facility providing boat moorage space, fuel, or commercial services. Commercial services include but are not limited to overnight or live-aboard boating accommodations. Thus many "docks, piers, floats, ramps," etc. will be considered under the WAC rules as "marinas" because the definition depends on use rather than physical description. Area habitat biologists have made determinations that an overwater structure (e.g. pier/ramp/float) proposal is a "marina" instead of a pier/dock and applied the rules for "marinas" accordingly. This may be an important distinction since the impacts on listed species may depend in part on the intensity of use of the constructed facility.
2 Objectives		4 The last objective states that "policy directives" will be one of the measures considered for avoiding, minimizing, or mitigating the risk of incidental take. Does this include modifications to the HPA regulatory language and legislation? If so, this should also be described in the Introduction. If not, what exactly is meant by "policy directives?"

3 Methodology		4 Do the documents described under (c include the primary scientific, peer-reviewed journal literature? Because it is essential that such literature be a primary source for this assessment, this should be made explicitly clear, perhaps as a unique listing here? 6 Regarding the literature review, copies of HPA's and biological opinions are not scientific literature. In addition, the project team, composed of consultants, seems to leave out those that actually have experience with the HPA process/program (i.e., on-the-ground field experience), which is critical for understanding the effectiveness of implementation. How many WDFW habitat biologists (with years of experience) were part of the project team, or have reviewed these white papers. Without experienced input, these papers lack credibility.
4. Activity description		1 The implication that the Army Corps of Engineers is the only other source of construction and/or operational conditions is inaccurate. Additional conditions may also be imposed by Washington DNR under its management authority for state-owned aquatic lands, by local entities under the authority of the Shoreline Management Act, and by the Washington Department of Ecology. In addition, it should be noted that when there are conflicting conditions the most restrictive one applies. 2 It would be useful to point out that the official WDFW activity description of the various structures is not necessarily consistent with definitions used in other areas, such as Rhode Island. For example, some areas consider a dock to be a fixed height structure. This needs to be considered when interpreting the effects overwater structures based upon studies from other regions. 3 The activity description requires more detail. This section states that the analysis of the paper addresses the activities described in this section (the "lawful" activities). Is the analysis "cradle to grave," i.e. does

		it address ongoing impacts from operation *and maintenance* of the structure until the structure is removed? Also, why not go into some detailed discussion of non-permitted, but legal and dependent activities (such as vessel operations) causing indirect impacts (perhaps a table of activities [direct and indirect] that may cause impacts should be developed)?
5 Species and habitat use	Table 3	1 Reproductive timing, spawning, incubation and emergence should be specified or indicated as unknown. The citations WDNR 2006a and 2006b are incorrect. Washington DNR created a single document addressing 6 groups of species (herptofauna, birds, fish, invertebrates, marine mammals and plants) and 86 individual species in 2005. The correct reference is: Washington Department of Natural Resources. 2005. Covered Species Technical Paper. Aquatic Resources Program. Olympia, WA. Please correct throughout this and all future documents. Chinook salmon, Habitat, paragraph 3 – The reference to spring-run fish as immature is incorrect. 2 The material which is mostly presented in Table 3 that describes Habitat Requirements is not especially useful. The type of discussion of Habitat Requirements of potentially covered species that would be useful would require many pages and be beyond the scope of this document. Rather than provide incomplete descriptions that can be misleading because of their brevity, I think a better approach would be to list some key references for habitat requirements for each species where that is available. For example, sources such as Groot and Margolis, Hart, Whitney and Wydoski, Love et al., and Scott and Crossman could be used for many of the fish habitat requirements. 4 Latin binomials in Table 2 (as well as Table 1) need to be validated with up to date nomenclature (e.g., AFS, Fishbase). If juvenile salmonids are at all included in this

		assessment, there is no real rationale for excluding some Tidal Reference Areas for some (sockeye, pink) and citing "all" for others. Wydoski and Whitney (2003) is an exceedingly poor source for juvenile fish distributions in estuarine/marine waters, while there are considerably better sources (albeit many gray literature) for more comprehensive information. In addition, eulachon aoccur in TRA9, at a minimum, longfin smelt and Dolly Varden are probably in all TRA, etc. This is not parallel to all the various rockfish species, that probably do not occur in all TRA, but their distributions are not known enough to discern the TRA. Someone hasn't done their homework.
6 Conceptual framework for assessing impacts	Table 4	1 The previously described impact mechanisms are described here as Pathways. In addition to the confusion between mechanism (increased shading) and biological effect (loss of vegetation), the authors have introduced yet another way of describing the elements to be addressed. As stated previously (see general comments), the consistent definition and use of terms is critical to the success of HCP planning and the terms used in this and all future iterations/uses of this document should be standardized. See comments related to Executive Summary. 2 It is laudable that a Conceptual Framework is presented and consistently applied throughout the document. I had several problems with the impact pathways that were identified. First, it took me a long time to figure out (and I think I have this right) that the second and third impact pathways were actually removal of these types of vegetation (ie non-shading), mostly during construction. I would make that clear. Second, I recommend that to simplify the discussion, that littoral drift and substrate modification be combined into one category (e.g., entitled substrate modification) as was done in the original Marine OWS White Paper. A major problem with this and subsequent chapters is that the presentation of material is extremely

		erratic, as if it was written by many different people but not actually edited or blended into something consistent. Specific problems include: The material in the original white papers is used inconsistently. Sometimes conclusions or synopses of the original White Papers are provided and other times they are not. In some cases, whole paragraphs are lifted from original the White Papers and dropped into the document verbatium. Is this plagerism? It is not clear why these particular sections are important and were included. Several of the subchapters below are written with no summary or conclusions. Some sections have a concluding paragraph others do not. Topic sentences or paragraphs are rare. I believe that each section would be easier to follow if a consistent format to each subsection was followed. This also applies to subsequent chapters. For example, one could have used the following systematic approach: 1. Issue (e.g., shading). Brief description. 2. What causes the impacts (e.g., the decking)? Factors that affect impact- e.g., size of structure. 3. Summary of original White Paper conclusions. Are these still applicable- ie do authors agree with them (in the case of shading- effects on vegetation, animals, behavioral changes, predation). 4. What are the conclusions after the new, updated information is added. 4 Bottom pg 6-1: don't the last three sentences belong in Methodology?
7 Direct and indirect impacts		1 See comments related to Executive Summary. In addition to the continued confusion between mechanism (altered sediment transport) and biological effect (substrate modification), the authors have introduced yet another way of describing the elements to be addressed (controlling factors) but do

		not clearly define what these factors are for each impact mechanism/pathway. The text also fails to clearly define what habitat structure elements are included with each mechanism/pathway/controlling factor. As stated previously (see general comments), the consistent definition and use of terms is critical to the success of HCP planning and the terms used in this and all future iterations/uses of this document should be standardized. 2 There was almost no attempt that I could detect to evaluate any of the information/references as to the quality of the information. All information seemed to be pretty much treated the same. Clearly, there are some studies that are "better" because they were peer reviewed, more comprehensive, more local or something of the like. CTED even has published guidelines for what is "best available science" which could have been applied here. It is a major and significant weakness of the document that impacts are not divided into three categories: construction of the structure, the structure as built, and operations (e.g., vessel use). Each of these three involves different impacts, have different data gaps, and can requires a different set of mitigation/management measures. I strongly believe that the document would be much more useful in terms of serving as the foundation for a BO if it treated each of these three phases of a project separately. IT is clear that the major issue with OWS is shading. And, shading is an impact pathway that can have a variety of effects, including impacts on vegetation, impacts on animal behavior, and impacts on animal abundance. I am not clear at all why littoral vegetation is treated as an impact pathway. The pathways are shading or direct loss of eelgrass such as by grounding of construction barge. I think that all issues relative to shading should be treated in that section. Then, any additional issues relative to littoral vegetation should then be discussed in the next section as an impact pathway.

		3 See comment under 4. above. Most of the identified construction impacts could occur during maintenance activities – thus constituting a longer-term direct or indirect impact. Also see comments concerning cumulative vs. indirect impacts below under the Cumulative impacts section. 4 Why wouldn't "habitat processes" be involved in these impact pathways? Seem counterintuitive?
	7.1 Shading	1 7.1.1 Fish Vision, 2nd paragraph, 2nd to last sentence – Typo: "Brownan and Hawryshyn (1994, in Nightingale and Simenstad 2001b) report this loss of ultraviolet sensitivity to be size-dependent rather than age-dependent and ~~to~~ likely correlated~~s~~ with the time when fishes move from shallow to deeper water." 2 1. It is clear that the major issue with OWS is shading. Why this is not stated directly and highlighted is unclear to me. It is actually stated as a conclusion in the management measures section. 2. Clearly, the impact of shading will depend on attributes of a structure- height over water, length, etc. Thus, a large commercial size wharf will have a more significant impact potentially than a single family residential structure. I found no discussion of any of these attributes in this section. A table of attributes with references, impact issues with each, etc. would have been very useful. This is also important to impacts on vegetation. 3. Statement made just above Section 7.1.3 about prey availability and migration behavior. Where are the references to support this statement? 4. One thing never considered here is that some species may be attracted to a OWS. The primary issues are assumed to be negative. 5. Section on Predation (7.1.4). I do not agree

		with the categorical conclusion from Carasquerro's 2001 review that fish attraction to structure is linked to shade. In fact, as I read the literature, there is no agreement on which is the major issue, shade or the structure, suggesting it may depend on circumstances. For example, literature on FADs (Fish Aggregating Devices) suggest it is probably the structure. Work I was involved with in Lake Washington (I recognize it is unpublished and unavailable to the authors) suggests it is probably structure. Should note here that while increased predation in marine waters due to OWS effects is generally assumed, it has never been documented. 6. Paragraph dealing with potential predators of salmon juveniles in saltwater is poorly done. There are many references that could have been used to list the species that are actually known to be predators of juvenile salmon including lists provided in Fresh (1997) and Fresh et al. (1981) and many other citations. The previous marine OWS had more information on marine predators of juvenile salmon that was not used. 7. Page 7-7. A number of conclusions from Carresquero (2001) are listed on this page. I examined the material in the 2001 FW OWS White Paper. In general, I disagree with most of these conclusions. I examined a variety of literature such as the Black Bass AFS Symposium, various papers, work in Lake Washington and conclude the following: a. SM Bass are not really that opportunistic. They feed mostly on sculpin, other fish, and crayfish. b. SM Bass are major predators of juvenile salmon ONLY in certain circumstances depending on species, type (hatchery vs wild) and so on. c. Most studies show that SMB are associated with structure of some kind and LMB with vegetation. d. Based upon my review of the literature, it is not at all clear if it is shade or structure that is the major factor affecting fish distribution. As

		far as I can tell, it depends on many factors such as species of predator, system and so on. This type of statement should be qualified. 3 The distribution and density of eelgrass varies from year to year. When a proposal for a new overwater structure is considered, a snapshot of local eelgrass distribution is taken. Yet shading from the structure could preclude future recruitment. 4 It would be important to not that population and diversity level data is relatively rare when it comes to shading effects, so saying that they are "severely limited" requires considerable proof and specific citation; not that some of these citations do not derive from the Pacific Northwest yet are referred to as such. It would probably be much more appropriate to say that shading affects the distribution and behavior, and in some circumstances performance (e.g., feeding) of some species. The fish vision section implies that light sensitivity is fixed, which is not the case. All fish are capable of some range of light adaptation. This is an important point to make when relating lighting conditions to the observed fish behaviors, which follows. The broad assertion in the last sentence in Section 7.1.2 needs a literature citation. In Section 7.1.3, given that you're mostly talking about anadromous fish, shouldn't the freshwater information come before the marine/estuarine environment information, commensurate with the fishes' ontogeny? First ¶, Section 7.1.4: use "non-indigenous" or "introduced" instead of "exotic"? Literature coverage appears to be relatively complete under shading topic, although there's not a lot of evidence of more contemporary literature sources.

	7.2 Littoral vegetation	1 7.2, 1st paragraph, last sentence – While the rule does require that structures be designed or located to avoid effects to eelgrass and kelp, the reality is that permits are routinely written for structures that do **not** avoid impacts. Rather, the structures are conditioned to minimize or compensate for effects resulting in an ever-increasing loss of habitat structure and function. In addition, permits are regularly written for construction of structures on state-owned aquatic lands when the applicant has failed to obtain the permission of Washington DNR, as well as for structures that may violate Washington DNR's land use planning efforts. As part of a take analysis, this document needs to address the disconnect between legal requirements and actual permit conditions. 3rd paragraph – The attribution (PSNERP 2003) for the photic zone is incorrect. 8th paragraph – Ambient light is neither an impact mechanism nor one of the 12 alleged mechanisms previously described. In addition, this paragraph includes 2 previously unidentified impact mechanisms – direct disturbance and vessel interactions. As stated previously, the consistent definition and use of terms is critical to the success of HCP planning and the terms used in this and all future iterations/uses of this document should be standardized. 7.2.1, 2nd paragraph - This paragraph fails to link the strings of declarative sentences describing existing research and mechanisms with biological effects. In addition, the text overlooks effects related to the shade shadow – see: Diefenderfer, H.L., C.G.C. Roegner, R.M. Thom, E.M. Dawley, A.H. Whiting, G.E. Johnson, K.L. Sobocinski, M.G. Anderson, and B.D. Ebberts. 2005. Evaluating Cumulative Ecosystem Response to Restoration Projects in the Columbia River Estuary, First Annual Report 2004. Draft submitted to Portland District, U.S. Army Corps of Engineers. Pacific Northwest National Laboratory. PNNL-15102.; Thom, R., G. Williams, and H. Diefenderfer. 2005. Balancing the Need to Develop Coastal Areas with the Desire for an Ecologically Functioning Coastal Environment: is

		Net Ecosystem Improvement Possible? Restoration Ecology 13:193-203.; Washington DNR 2005. Habitat Classification Verification and Activities Effects Report, Aquatic Resources Program 7.2.1, 2nd paragraph, 4th sentence – The statement that increased structure height above the bottom is the most important characteristic correlated with eelgrass is incorrect. The most important characteristic is thought to be increased height above the water's surface. 7.2.3 – As an analysis of take, this section should also address biological effects associated with on-going operational activities. 2 1. Most of the front part on the functions of eelgrass and macroalgae is pretty boilerplate. It could have been simply listed with key references in a table and thus save some text. 2. Page 7-11. In reality, the depth at which attached macrophytes grow depends upon place in Puget Sound. In the Straits there is kelp growing to at least 50 ft. In the main basin, or near river mouths, this depth is much shallower. 3. One eelgrass function that seems to have been forgotten is eelgrass as a source of carbon for detritus based food webs. 4. One small technicality is that I do not think that kelp or eelgrass are necessarily just thought of as littoral vegetation. They can clearly grow well outside the littoral. 5. The section 7.2.1 is inadequate. There are many other references that could have been used to make this more complete- Shafer, Fresh et al., etc. What is the major finding or conclusions of their review of the literature? 6. Probably the number one (or number 2) management issue for OWS in marine waters is impacts on eelgrass. This issue is dealt with in slightly more than two pages that provide almost no conclusions, summary. What did the original

		marine OWS paper conclude? Why not use these conclusions and build from them? 3 Page 7-14: in addition to shell-hash around pilings attracting burrowing crabs, see Ron Thom's study at the Clinton terminal (?) – there was mention of the large number of adult crabs, stars, etc. attracted to sessile prey organisms growing on pilings and their possible role in loss of eelgrass. 4 There are definitely incidences of subtidal Z. marina extending deeper than -10m (see more recent WDNR reports; check with S. Wyllie-Escheverria). o The phrase "with *Harpacticus* spp. less likely to be found in low-light conditions and *Tisbe* spp. found in areas high in detritus, irrespective of light levels" is considerably ambiguous, and I would question that interpretation. o Juvenile Dungeness crab are NOT an important salmonid prey species; LARVAL crabs are, but primarily only for juvenile coho salmon. o I know of no rigorous scientific evidence to support this assertion: "Forage fish and juvenile Pacific salmon species preferentially use eelgrass over other habitats." Section 7.2.3: Although not associated with OWS construction, isn't boat anchoring also a significant eelgrass disturbance factor in areas of intense boating activity? 6 Littoral vegetation includes backshore and salt marsh veg. The discussion of eelgrass should include some discussion of epihhytes and associated inverts. that are important prey for listed and potentially listed spp. This includes macroalgae and backshore vegetation. 7.2.2: Need to include disturbance to backshore and terrestrial vegetation, not just aquatic veg.

	7.3 Freshwater aquatic vegetation	1 The listed benefits are applicable to all aquatic systems and reinforce that the biological effects to vegetation have been artificially separated into 2 categories (littoral and freshwater). 3rd paragraph – Similarly to section 7.2, this paragraph also includes previously undefined impact mechanisms. As stated throughout these comments, consistency is critical to the success of HCP planning and the terms used in this and all future iterations/uses of this document should be standardized. 7.3.2, 7.3.3 – As HPAs tacitly authorize the existence of a structure, the analysis of take should also address the biological effects associated with on-going operational activity. 2 Over five pages are spent discussing effects on riparian zones. In my opinion, this is way too much discussion for the level and scope of impacts. Many OWS are built in areas that have already been cleared of riparian zone. And, the discussion is pretty much a standard boilerplate primer of the functions of riparian areas. No conclusions or perspective on the scope and significance of this issue are provided. 3 7.3.2 Is "direct disturbance" the result of construction activities? Add to this section the direct impact of future maintenance activities on freshwater aquatic veg. Similarly for 7.3.3, include vessel activities associated with maintenance of overwater structures. 7.3.4 Noxious weeds – this appears to be an indirect effect of vessel activity. 4 Should lentic and lotic freshwater environments be distinguished in terms of characteristics, processes, functions and impacts? Section 7.3.1: Why is there no information or guidance on required light levels (PAR) for vegetation growth and development and what

		depths that typically occurs in for this region?
	7.4 Riparian and shoreline vegetation	1 The list of bullets are neither impact mechanisms nor biological effects – as written they are simply factors to be considered and/or components for ecosystem health. Please rephrase them to indicate if they are new, previously unidentified impact mechanisms or biological effects. 7.4.1, 2nd paragraph, 2nd sentence – Be specific in defining adverse health effects (loss of reproductive fitness, increased metabolism, death, or?). 7.4.2, 2nd paragraph – The last 2 sentences are essentially saying the same thing. 7.4.3 – The last sentence of paragraph one and paragraph 2 are essentially the same thing. 7.4.3, 3rd paragraph – The information presented here is also true for marine and lacustrine systems and should be included as part of the analysis. 7.4.3, 4th paragraph, 3rd sentence - The information presented here is also true for freshwater systems and should be included as part of the analysis. 7.4.3, 4th paragraph, 4th sentence – While correct, the use of the word nutrients here is misleading. Since terrestrial development actually increases supplies of organic nutrients (e.g., fertilizers, sewage), it may be more accurate to refer to detritus. 7.4.4 – This section overlooks the importance of groundwater recharge and fails to explain how alterations in groundwater flow effect stream temperature. 7.4.5, 3rd paragraph – In addition to the sentences here being repetitive, the text overlooks the importance of large woody debris in riverine systems. 4 Section 7.4.1: why is “regime” needed in the title? o Section 7.4.2: Is the discussion of detrimental effects of increased sediments from vegetation removal going to conflict with the shoreline armoring assertion of the importance of estuarine/marine shoreline sediment delivery? Should make sure they tell the same story.

		Perhaps talk about "unnatural levels" of sediment delivery? But, this would still tend to conflict with natural mass wasting events? Maybe the term to us would be exceeding "normative sediment delivery"? o Section 7.4.3: The title of this section in incongruent with the other titles, which do not use the "altered" etc. adjective o Organic matter supporting aquatic food webs usually isn't grouped under nutrients, which usually refers to inorganic nutrients that drive production; just call "organic matter" to distinguish them? Section 7.4.5: Maser and Sedell (1994; From the Forest to the Sea), St. Lucie Press) and Simenstad et al. (2003; AFS Symp. 37: 265-277) provide more detail about large wood in estuaries and coastal ecosystems. 6 Need a list of "benefits" as was provided in 7.3. Suggest adding citations for Brennan and Culverwell (2004) and Brennan (2007) to citations in first paragraph – with reference to marine shorelines. The second sentence in the last paragraph on p.7-15 (i.e., "solar radiation has long been recognized….") is a direct quote from Brennan and Culverwell (2004) and should be cited as such. P. 7-17, 3rd paragraph: In addition to Murphy and Meehan, include Brennan and Culverwell 2004 re: allochthonous inputs. Middle of the page, sentence starting with "Alterations of intertidal and subtidal areas by…" change (i.e. eelgrass, algae) to (e.g., eelgrass, algae, and littoral vegetation)
	7.5 Noise	1 While the discussion of noise and pile driving is well done and thorough, the discussion of noise from on-going activity and construction overlooks log term effects and effects to species energy resources as a result of flight induced by the noise or avoidance and the accompanying loss of habitat. 2 In general, I found this section to be useful and material fairly well presented. However, one impact that is not discussed is the impacts on gametes in the adults before they are spawned. For example, eggs being carried by a female salmon could be damaged

		by pile driving activities. 3 Need to discuss the potential effects of vibrations created by pile driving. Vibrations are known to affect incubating eggs of salmonids (e.g., see Jensen 2003. New mechanical shock sensitivity units in support of criteria for protection of salmonid eggs from blasting or seismic disturbance. Canadian Technical Report of Fisheries and Aquatic Sciences 2452.) Again, overwater structures require maintenance that, if it involves replacing piles, can produce similar effects at discrete times during the life of the structure.
	7.5.1 Pile Driving	5 Paragraph 7 states that it is not sufficient to extrapolate information among species. This would be better stated as "…it is difficult to extrapolate…" We currently do extrapolate among species with those caveats stated because there is such a dearth of data. ▪ The discussion of physical impacts on page 7-26 could also cite USFWS bi-ops on the Hood Canal Floating Bridge and, most recently, the SR 167 Extension project as well as the well-publicized CalTrans projects and Bud Abbott's monitoring reports. ▪ The discussion of thresholds is a bit confusing because it states that not enough is known to provide discrete thresholds, and then goes on to describe the Services' thresholds. State the concern resulting from a lack of data and then describe current practices. ▪ The term "adopted" thresholds implies a regulatory process (i.e., Federal Register notice), which has not occurred for pile driving. We have used specific levels as thresholds in our analysis, and try to be consistent with other offices, but I wouldn't go so far as to say we have adopted any of them formally. ▪ The 150 dBrms level is more of a guideline than an effect threshold. In other words, we

		would expect sound pressure levels above 150 dBrms to potentially alter important behaviors. Whether or not those behavioral effects rise to the level of "adverse effect" or "take" is a matter of duration, location, timing, and other factors. ▪ The citations for 180 dB peak and 150 dBrms should be the most current biological opinion from each Service. Probably SR 167 Extension project. ▪ The last paragraph needs some re-wording based on the following: Hastings and Popper 2005 was a review primarily of published literature, it excluded much of the gray literature that the Services are required to consider; the difference between we would like to move towards using an SEL metric but a single strike criterion is problematic because it doesn't account for the fact that energy accumulates with multiple strikes of a pile (see CalTrans monitoring reports by Bud Abbott). For clarity you might just want to note that there is ongoing discussion of refining the criteria and possibly using different metrics and not confuse the reader with terms like interim single-strike and dual criteria. There should probably be a discussion of what typical pile installation projects of the type and size expected (or the range) can produce. These data are available for most of the pile types and sizes that we see used in Washington.
	7.6 Water quality	1 In addition to the effects listed, overwater structures may also degrade water quality as a result of fuel spills, discharge of gray and/or black water, and heavy metals in paints and/or stormwater. As these are also components of the effects related to the structures, they should also be included in the HCP potential effects analysis. 7.6.4 – The discussion of sediment contamination should include effects associated with stormwater. 7.6.5 – The discussion overlooks effects associated with stormwater nutrient inputs and accompanying decreases in dissolved oxygen. 7.6.8 – This section is incorrect. While the

		Department of Ecology does regulate water and sediment quality, there are no regulations associated with nonpoint source discharges. 2 Over 16 pages are spent discussing water quality impacts. Most of this discussion reads as a straight literature review with limited analysis, interpretation or integration. What are major issues with water quality? Are pH changes something we should really be worried about? In general, I disagree with much of the discussion on suspended sediment problems in marine waters. While data supports suspended sediment being a major management issue in fw, I do not think you can extrapolate fw to saltwater. The waters of Puget Sound, especially near major deltas and shallow mudflats can be notoriously turbid naturally during high flows, wind and so on. So, lots of suspended sediments is something fish in Puget Sound have had to adapt to. There is literature that suggests that one of the benefits of estuaries to juvenile salmon is higher levels of turbidity which can provide a refuge from predation (see Gregory and Gregory and Levings). 3 7.6.5 Dissolved oxygen impacts – impact of localized DO reduction will likely impact less motile species or life stages. Also, must consider removal of old piles for maintenance and for removal of the structure after its useful life is over. In addition, mitigation associated with construction of new overwater structures usually includes removal of derelict structures, some of which have very dense fields of piles which, when removed, could create greater DO reductions than construction activities. To water quality impacts should be added the indirect effect of copper leaching from antifouling paint added to the hulls of boats using overwater structures. The loading of copper from hull leachate can be significant relative to other sources, including stormwater (see Johnson et al. 1998. Copper Loading to U.S. Navy Harbors. SSC San Diego. Tech. Rpt. 3052). Since many boats (especially

		smaller recreational boats) are used in both marine and freshwater systems, the copper impact should be considered in both marine, and freshwaters (though toxicity would likely be higher in freshwater). 4 Section 7.6.2: Effects of turbidity on salmon should be qualified by life history stage and habitat; e.g., juvenile salmon passing through estuaries can adapt/tolerate relatively high turbidity levels, which in such cases is often considered beneficial (for predator avoidance), that would not necessarily be desirable for freshwater phases. Section 7.6.8: What actual species of contaminants are involved with stormwater runoff, and what are the levels of fish and invertebrate sensitivity to each? 6 In the first paragraph, suggest adding some language that describes impact mechanisms from associated activities (e.g., petroleum products, waste, cleaning agents, etc from vessels and associated upland activities). 7.6.1. Although operation of equipment or storage of material within the floodplain is “commonly prohibited under HPA authority”, the reality is that it would be more accurate to say that it is restricted or limited, but does happen, even under the HPA. 7.6.4. The determination of potential sediment contamination prior to a project is not a common practice, unless there is a known history of contaminated sediments. 7.6.7. As piles, decking, and other supporting structures degrade, or are abraded, over time, contaminants are released into the water and are not accounted for or controlled (other than recent and expensive efforts to remove them from beaches). The fact that treated wood products are still allowed in marine waters poses a problem and should be stated as such. P. 7-29. The description of contaminant concentrations diminishing with distance from the structure downplays the impact and importance of this issue. Dilution is not the answer. We are seeing food web linkages throughout the food web (e.g.,

		salmon and orcas). This needs to be described as a cumulative impact and individual impact. Even though long-term accumulation of metals at the base of pilings "has not been reported" it doesn't mean that it may not be a problem. This is vague and it would be more accurate to state that it has not been evaluated, but does have the potential for long-term and cumulative impacts. Need to discuss recent findings of higher levels of PAH's in resident salmonids/those with longer resident times. Not sure what you mean by "direct exposure". There is obviously an effect based on current studies. The reference to Brooks (2004) may or may not be credible. My understanding is that he works for the pressure treated wood industry. Was this peer reviewed literature and is it credible???? 7.6.8. The statement that "stormwater impacts are mitigated by regulations" is inaccurate. Stormwater impacts are often not evaluated or addressed, especially for SFR developments/exemptions. Note that the EPA has identified nonpoint source pollution as the major contributor to degraded water quality.
	7.7 Channel hydraulics	1 As an analysis of take, this section should also either include a discussion of biological effects from shoreline structures associated with overwater structures (fill, armoring, breakwaters), or refer to the appropriate whit paper. 2 I do not understand and disagree with the application of a freshwater fluvial analysis to large sections of this document. Many pages are written here on Channel Hydraulics and in section 7.10 on Dewatering. I do not understand why a 2-page discussion of LWD was needed. How many OWS projects, bridges or pilings affect LWD? While there may be some limited instances of these issues occurring (such as construction of bridges), they do not warrant such an extensive discussion- they are simply not that big a deal in my opinion. It would have most useful to see a small one page discussion of this issue and then conclusions offered as to the significance of this issue.

		3 Page 7-44, second paragraph states that overwater structures have little capacity to alter channel gradient. If the in-channel support structure slows water velocity, it often will cause sediment deposition upstream and scour downstream of the overwater structure. This alters the local channel gradient. 7.7.2. Again, maintenance of overwater structures should be considered. LWD is often removed from the upstream side of OWS to protect the integrity of the structure (check on how many emergency wood removal HPAs are issued each year). This will affect the supply of LWD to downstream channel/habitat units. This probably occurs in nearshore marine areas as well, affecting the downstream end of drift cell units.
	7.8 Littoral drift	1 As an analysis of take, this section should also either include a discussion of biological effects from shoreline structures associated with overwater structures (fill, armoring, breakwaters), or refer to the appropriate whit paper. 2 I would recommend combining this section and 7.9 since the biggest issue is effects of littoral drift on sediments/substrate. I found that much of this section had been lifted directly from the Marine OWS WP. 6 Washington state has about 2500 miles of shoreline in Puget Sound and most are composed of sand/gravel, not cobble. See other comments offered for Bank Stabilization paper. 7.8.2. Limiting sediment movement and deposition also limits the establishment and maintenance of backshore vegetation, not just eelgrass.
	7.9 Substrate modifications	1 As an analysis of take, this section should also either include a discussion of biological effects from shoreline structures associated with overwater structures (fill, armoring, breakwaters), or refer to the appropriate whit paper. Paragraph 3 is incorrect – the rule allows up to 20% of an individual raft or float to ground.

	7.10 Channel dewatering	2 In the last five years, what is the number of OWS projects/HCP actions, either bridges or docks/piers that have involved dewatering a channel? 4 Section 7.10.5: Recolonization rates for benthic invertebrates also depends extensively on season/time of year.
	7.11 Artificial light	4 See major update in Nightengale *et al.* (2006).
	7.12 Vessel activities	1 Vessel traffic may also result in take as a result of fish strandings. 4 Section 7.12.1: Should describe large scour hole at Clinton Ferry Terminal, likely created by ferries; evident in 2003(?) LiDAR imagery; R. Thom (PNL BMSL) probably has documented it; could also include in 7.12.2, but may not involve eelgrass at depth. 6 The discussion of vessel activities seems to be focused on construction and not on long-term associated activities and impacts. These need to be addressed. 7.12.1. Vessel wakes, especially from large commercial vessels, has a profound effect on shallow water habitats (e.g., increased frequency and wave energy striking the beach/bank, redistribution/suspension of sediments, bank erosion, displacement of SAV and shoreline vegetation and wood debris, disruption to flora and associated fauna). While not well studied, easily observable and some information could be gleaned from the studies of ferry wakes in Rich Passage.
8 Cumulative impacts of overwater structures and non-structural pilings		1 2nd paragraph – Please clarify if the statement attributed to Nightingale & Simenstad also applies to riverine and lacustrine systems. 2 As I noted above, there was almost no attempt that I could detect to evaluate any of the information/references as to the quality of the information.

		As I noted above, there was almost no attempt that I could detect to evaluate any of the information/references as to the quality of the information. 3 Cumulative vs. indirect effects. Cumulative impacts are not limited to those that would not have occurred but for the issuance of the HPA (that is the definition of an indirect effect). Cumulative impacts are the result of adding the impact of a project to those resulting from other past, present, and reasonably foreseeable future actions, regardless of who undertakes the action (see 40 CFR 1508.7). To evaluate cumulative effects/impacts will probably require consideration of geographical location/context of additional overwater structures. The Recovery Plan for PS Chinook (and perhaps other plans) may provide such context as well as descriptions of the ambient conditions at a local level of many of the impact pathways used in this paper's analysis. The discussion about accidents (e.g. spills) says that that can only be predicted in a statistical sense. That is true of all of the impacts discussed in this paper. The proviso at the end of the section should be removed – it has nothing to do with cumulative impacts.
	8.1 Shading	1 Cumulative impacts of shading may also eliminate littoral vegetation along an entire waterbody. 3rd paragraph - The statements here are also true for riverine and lacustrine systems. 2 Page 8-3. Regardless of what these authors have implied or concluded, I would be very cautious about ascribing the depressed status any salmon population to OWS in the marine environment. At best one could make a conceptual linkage that it has contributed but there is no quantitative data that I am

		aware of to support this. 4 It would be worthwhile, were possible to describe the pathway of impact, e.g., in this case, fragmentation of naturally contiguous intertidal/shallow subtidal eelgrass.
	8.2 Littoral vegetation	4 A little confusing, since eelgrass is addressed in previous section on shading. But, it should be noted that Dowty et al. (2005) methodology may not be at the appropriate resolution to detect cumulative effects unless the impact (signal/noise ratio) is very large "foraging habitat may not be a limiting factor for juvenile salmon in Puget Sound" may be true for many salmonid species/life history phases, but note Wissmar and Simenstad (1988. Energetic constraints of juvenile chum salmon (*Oncorhynchus keta*) migrating in estuaries. Can. J. Fish. Aquat. Sci. 45(9):1555-1560; and, 1998. Variability of estuarine and riverine ecosystem productivity for supporting Pacific salmon. Chapter 6. Pages 253-301 *in* G.R. McMurray and R.J. Bailey (eds.), Change in Pacific Northwest Coastal Ecosystems. Proceedings of the Pacific Northwest Coastal Ecosystems Regional Study Workshop, August 13-14, 1996, Troutdale, Oregon. NOAA Coastal Ocean Program, Decision Analysis Series No. 11. NOAA Coastal Ocean Office, Silver Spring, MD. 342 p.) 6 While quantification of impacts may not be precise, a loss is a loss and the losses do add up, especially when considering the full suite of alterations to the natural environment. Quantification is limited, but our understanding is not.. Also need to include littoral vegetation (i.e., backshore and saltmarsh veg.) in the discussion.
	8.3 Freshwater aquatic vegetation	
	8.4 Riparian and shoreline vegetation	3 Another indirect impact arises from armoring to protect the overwater structure. Marine overwater structures are almost always accompanied by shoreline armoring. 4 As with 8.8, below, there is an obvious cumulative

		effect pathway for riparian and shoreline vegetation impacts that should at least be mentioned/conceptualized, i.e., large wood delivery. 6 I would recommend reviewing Brennan (2007) for a general overview/assessment of the larger scale/historical impacts/changes to marine shoreline vegetation. Citation: Brennan, J.S. 2007. Marine riparian vegetation communities of Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-02. Published by Washington Sea Grant, Seattle, Washington. I disagree with the statement that the threshold for impacts at the watershed scale cannot be quantified. It will not be easy, but could be modeled, with values (scores) assigned, based on known or assumed functions. This has already been done for nearshore assessments (e.g., Bainbridge Island).
	8.5 Noise	2 I found this conclusion to be a bit simplistic. It implies that a single source of noise is irrelevant which I disagree with. One pile driver in the right place could have a significant impact not only on individual fish but on a group of fish as well. And, lots of noise from many different sources could clearly also be bad as Earle points out. 6 To say that cumulative impacts are unknown is not entirely true, based on studies that have been done at a smaller scale. It is not clear what scale is being suggested here. It is also likely (easy to assume) that as the sources and amounts of impacts increase, so do the adverse effects (both cumulative and synergistic). I believe it is legitimate to state this (as is stated in section 8.9: "certain changes can be anticipated").
	8.6 Water quality	1 As part of a take analysis, the cumulative impacts of stormwater associated with the structure should also be addressed here. 6 This section is too narrowly focused on turbidity and piles (treated wood) and doesn't seem to include marine shorelines. Need to include all other inputs that are associated with permitted activities.
	8.7 Channel hydraulics	1 While Washington Fish and Wildlife does have the authority to require monitoring for impacts

		associated with authorized projects, it seems that this authority is only applied over a short time span. Therefore, without explicit direction to expand monitoring/sampling efforts to explore longer term impacts, it is unlikely that the HPA process will result in addressing this data gap. 6 As stated elsewhere in my comments, the HPA program is a poor measure of impacts because monitoring and adaptive management are very limited, at best.
	8.8 Littoral drift	4 Although there is no documentation per se, littoral drift cells are the perfect place to conceptualize cumulative effects, particularly non-linear impacts that are dependent on where and how much of particular components of drift cells are developed with OWS! The authors are doing a disservice by not at least describing this potential; they provide "best judgment" observation and speculation in other sections.
	8.9 Substrate modifications	6 This section is missing any discussion of marine systems (???).
	8.10 Channel dewatering	6 I disagree with the statement: "…it seems unlikely that HPA-authorized activities would result in measurable cumulative effects except in the case of rare species…." Based on my experience, it seems highly likely that HPA activities result in significant cumulative effects. Cumulative effects are not just about a single project, or a single activity at an individual site. These statements seem to illustrate a poor understanding of real project effects.
	8.11 Artificial light	6 The first sentence seems contradictory – salmon migration delays are affected by artificial light, so the implications are known, right? This implication is further supported by the next sentence related to predation (another effect). The last sentence in this paragraph is also confusing. There is inconsistent application/coverage of scale issues and it is unclear what scale this paper is covering (regional-scale or project scale???). I believe this also leads to poor assumptions (i.e., I believe it could easily be assumed that cumulative effects at a larger scale could result in a loss of listed and potentially listed spp.).
	8.12 Vessel activities	6 Similar to some of my concerns expressed in other sections, this section seems to downplay cumulative

		impacts because no assessment has been performed. I believe it is legitimate to assume that as the number of sources and degree of impacts increase, the likelihood of adverse impacts increases.
9 Potential risk of take		2 I am unclear what the purpose of this section was- is this type of Y-N discussion of risk what was asked for. While the table is helpful I do not believe it goes far enough. It seems too arbitrary since there is no real way for a reader to evaluate how the table was populated. For example, what were the conditions under which a 'U' was assigned? Some discussion should be provided as to what information was being considered for each species and how a Y, N, or U was assigned. Risk implies to me something other than a yes or no but more of an evaluation of degree or level. For example, I believe the table could be improved by adding degrees of risk- e.g., high risk, medium risk or low risk should be assignable for many of the boxes in the Table 3 and further making clear how the various boxes were filled in. It might also be useful to have some sort of integrated measure where we are provided some sort of idea whether an OWS presents a significant risk to a species or population or ESU or something similar. Again, to be repetitious, this section suffers from inconsistent presentation of information. There are a number of pages (e.g., material on Section 9.7) where the material has little to do with take. Several sections in the Chapter 9 are really additional material on impacts that are expansions of the material in Chapter 7.0. For example, a nice discussion of scour and deposition are provided which would have worked better in Chapter 7. 3 In general, consideration of indirect and cumulative impacts is not incorporated into the take risk determination. Also, the impacts from maintenance (some described in comments above) of overwater structures were not covered in risk determination. 6 I realize how difficult it is to make general statements about the potential of risk, but I also don't believe that simply complying with regulations

		results in no potential for take. The types of impacts and how they are expressed vary greatly between sites, projects, and at various scales, even for similar types of projects. Avoidance is the only way to assure no risk.
	9.1 Shading	1 While the Hydraulic Code may lack specificity a to the light requirements of individual vegetative species, the data is available. Recent work by Washington DNR HCP staff scientists found that freshwater species (e.g, *Ceratophyllum demersum, Chara spp., Egeria densa, Hydrilla verticillata)* light requirements range from 2 to 30% of surface light surface light; while kelp and eelgrass requirements range from 0.1 to 29% of surface light. Referneces: Barko, J.W., and R.M. Smart. 1981. Comparative influences of light and temperature on the growth and metabolism of selected submersed freshwater macrophytes. *Ecological Monographs* 51: 219-235.; Duarte, C.M. 1991. Seagrass depth limits. *Aquatic Botany* 40: 363-378.; Harley, M.T., and S. Findlay. 1994. Photosynthesis-irradiance relationships for three species of submersed macrophytes in the tidal freshwater Hudson River. *Estuaries* 17: 200-205.; Luening, K. 1980. Photobiology of seaweeds: Ecophysiological aspects. International Seaweed Symposium, Goeteborg, Sweden, 11 Aug 1980.; Meyer, B.S., and A.C. Heritage. 1941. Effect of turbidity and immersion depth of apparent photosynthesis in *Ceratophyllum demersum*. *Ecology* 22: 17-22.; Sand-Jensen, K., and T.V. Madsen. 1991. Minimum light requirements of submerged freshwater macrophytes in laboratory growth experiments. *Journal of Ecology* 79: 749-764.; Schwarz, A-M., A. de Winton, and I. Hawes. 2002. Species-specific depth zonation in New Zealand charophytes as a function of light availability. *Aquatic Botany* 72: 209-217.; Sheldon, R.B., and C.W. Boylen. 1977. Maximum depth inhabited by aquatic vascular plants. *American Midland Naturalist* 97: 248-254. 2 It is interesting that conclusions to the impact section are presented here but not in either Section 7 or 8. However, I do not know how the conclusions are derived. For example, no where in the shading section does it say, nor does it provide the

		information or an analysis, that the primary impact of shading is on underwater vegetation. How was this conclusion reached? I could not get there from the material presented in Section 7.1. What was the available data or analysis and where was it presented that allowed the authors to conclude that shading impacts could be extrapolated from salmon to other small fishes? I do not necessarily disagree but wonder where this conclusion came from. On page 9-5, several unsupported statements are made that are significant. First, the authors conclude that because a structure is difficult for an applicant to design and locate, this constitutes a moderate risk of take. I fail to understand the logic for this at all. Second, the statement is made in the next Paragraph that any juvenile chinook rearing within one acre of a dock is considered "taken". Where did this come from? 3 Marine overwater structures are almost always constructed over the intertidal and shallow subtidal. Due to the migratory dependence of several salmonid speicies on shallow nearshore habitats, rarely can such structures be "located to avoid adverse impacts to juvenile salmonid migration routes." The authors determine on page 9-5 that "it is difficult for an applicant for an HPA to design and locate a structure to avoid such impacts (shade) and therefore there is a moderate potential risk for take of the potentially covered species." Conclusions are inconsistent. If the impact is difficult to avoid, one would conclude that there is *high* potential risk. 4 Is the assumption "However, available data on light sensitivity suggest that those impacts may reasonably be extrapolated to other small fishes, particularly nearshore marine species." really appropriate given what we know about many of these species? 6 I disagree with the conclusion that shade from overwater structures has a "moderate potential risk for take" if it is assumed (and stated) that impacts are unavoidable. The logic does not support the

		conclusion, which seems arbitrary.
	9.2 eelgrass and macroalgae	1 Is this the same as "Littoral vegetation"? See previous comments on accuracy and precision in the definition and use of terms. 1st paragraph, 4th sentence – This implies that structures will be authorized regardless of impacts to, or the sensitivity of, habitat. If this is true, please address why Washington Fish and Wildlife does not apply siting considerations and how that meshes with the agency's requirements to avoid impacts to vegetative habitats. 2nd paragraph – To date there are no "proven" methodologies for replacing eelgrass and kelp. In addition, there are significant challenges to developing these methods as regulatory monitoring requirements rarely extend beyond 2 or 3 years. 3 Because there are far more potentially covered species (and habitats to protect) than there are listed species for which there is a record of past Biological Opinions, it is probably not relevant to state that the services have "generally not regarded impacts to macroalgae as amounting to incidental take." Because the geometry of eelgrass beds is somewhat dynamic, it should be pointed out that even where a structure is constructed in such a way as to completely avoid any shading of current eelgrass beds, there remains the potential for the structure to preclude recruitment in future years. 4 Good 'call' on absence of attention to kelp as vulnerable habitat that is not effectively embodied or implemented in regulation. 6 The statement: "compensatory mitigation has been required" is misleading and not always true. Full compensatory mitigation is rarely required/achieved and where required, is poorly monitored to determine success. Based on my experience, there is always a net loss. It is erroneous to state that macroalgae critical to potentially listed species are kelps that chiefly occur in areas of rocky substrate (true), often in deep water and will not be permanently impacted by overwater

		structures. Macroalgae also occurs in shallow water and is impacted by overwater structures and associated activities.
	9.3 Freshwater aquatic vegetation	
	9.4 Riparian and shoreline vegetation	6 The statement: "the ambiguous language and the lack of binding provisions regarding replacement of ecological function render the WAC provisions inadequate in that they do not provide assurance that loss of riparian and shoreline vegetation is effectively minimized, let alone compensated" is the most straightforward, honest, and accurate statement I've seen in this document. There are numerous inadequacies and risks associated with the WAC, in terms of interpretation and implementation, and these need to be honestly and openly stated throughout the document, and should be highlighted in the executive summary, conclusions, and recommendations.
	9.5 Noise	3 The "cease" provision in the WACs is also problematic in that an individual may not immediately die or appear stressed – even a few minutes time is sufficient for an individual that has suffered a lethal injury to swim or drift beyond the notice of construction workers. Concur with the "high risk" conclusion. As discussed in a note above, should also include analysis of impact from vibrations on incubating eggs. 5 All aquatic organisms are at risk from these effects (see comments on Table 10). ▪ Second sentence is unclear. Is this is reference to hearing sensitivities, or general susceptibility to underwater sound disturbance/injury? ▪ The science is not clear on the susceptibility of swim-bladder fishes vs. non-swimbladder fishes. That may be true in terms of certain types of barotrauma, but there are a host of other potential impacts to consider. Risk of injury appears related to the effect of rapid pressure changes on gas-filled spaces in the

		bodies of exposed organisms (Turnpenny et al. 1994). Biologically, key variables that factor into the degree to which an animal is affected include size, anatomical variation, and location in the water column (Gisiner et al. 1998). Any gas-filled structure within an animal is particularly susceptible to the effects of underwater sound (Gisiner et al. 1998). Those gas-filled voids could include the bowel, nasal passages, lungs, etc. In regard to observing fish kills and fish in distress, the majority of fish killed as a result of barotrauma sink to the bottom and are not detected (Teleki and Chamberlain 1978) . Additionally, injured fish may appear perfectly normal for hours, and even days after exposure (Abbott et al. 2002).
	9.6 Water quality	3 For DO, as discussed above, analysis should consider potential impact of the removal of old overwater structure as mitigation. The removal of pilings also has potential to resuspend anoxic sediments. As noted above, consider copper leachate from boat hulls. Indirect water quality impacts from normal operation of overwater structures and also from small or large, incidental spills should be considered in the risk assessment. 6 Bioaccumulation also poses some risk (which argues against dilution – a long-standing, yet poor argument for allowing contaminant inputs) and should be discussed. Consumption of contaminated prey should be added to the list at the bottom of p.9-8.
	9.7 Channel hydraulics	1 9.7.4, 3rd paragraph – The statement that the vague language of the rules allows minimization of potential take is misleading. While it is possible to use the rule in such a manner, it is just as likely that the vagueness results in inconsistency between regions in how and even whether biological effects are addressed in the permits. ▪ 9.7.5, 1st paragraph – While it is true that

		"…significant amounts of deposition… are not likely to occur from the installation of an overwater structure…", the text minimizes the potential for take resulting from "localized" changes in deposition. 2 Since when is channel embedding a major issue for OWS in either FW or SW? 6 9.7.1: There is no discussion or rationale for making the "low risk" determination for marine settings and I believe this statement is erroneous. It is also confusing to see this mentioned here, where in other sections pertaining to channel hydraulics, marine settings are not covered. Does "Channel Hydraulics" apply to marine systems or not? This is very confusing. 9.7.2: The use of the term "Habitat Destruction" is somewhat inconsistent with the more common term "habitat modification". The way the term is described in the text is also confusing and defines destruction as temporary or permanent. It seems that destruction applies to permanent loss, whereas a temporary loss would be a modification. However, a modification can also be permanent and a partial loss of ecological functions. 9.7.4., p. 9-13, last sentence in the last paragraph: "…vague language in the WAC will minimize potential risk of take…" This sentence doesn't make sense and seems to contradict itself. It seems that vague language increases the risk, due to uncertainty and lack of coverage in the details of protection. 9.7.5, last sentence, first paragraph. Suggest replacing the term "minimize" with reduce. The term minimize suggests greatly reduced, whereas reduced offers no particular degree of reduction, which is a more realistic assumption. Also, this section offers no marine examples and it is unclear if this assessment applies to marine systems (again, inconsistent and confusing).
	9.8 Littoral drift	1 Again, littoral refers to lacustrine and marine shorelines – the discussion here overlooks all reference to sediment transport in lakes. The citations WDNR 2006a and 2006b are incorrect. Washington DNR created a single document addressing 6 groups of species (herptofauna, birds,

		fish, invertebrates, marine mammals and plants) and 86 individual species in 2005. The correct reference is: Washington Department of Natural Resources. 2005. Covered Species Technical Paper. Aquatic Resources Program. Olympia, WA. Please correct throughout this and all future documents. 6 Suggested edit: Add the following to the end of the first sentence of the last paragraph: "…may change beach substrate characteristics, sediment deposition"and patterns of littoral drift. Why is there no comment/assessment on level of impact as in the other sections? Inconsistent.
	9.9 Substrate modifications	1 The discussion here overlooks all reference to sediment transport in lakes. 2 Another instance of a conclusion I cannot derive from material presented in Chapter 7 or 8. The stated conclusion is that the primary impact of placing structures is to create hard surfaces. Where does this statement come from (again, it is hard to disagree without knowing where it comes from)? What about modification of substrate resulting from changes in water movements littoral? 6 I believe that the statement about "increasing habitat diversity" is misleading and does not address the impacts of modifying substrate. This seems to suggest that modifying substrate is beneficial, but does not consider soft-bottom communities and the displacement of other organisms (such as forage fish spawning habitat). This section appears to be narrowly construed, incomplete, and does not consider the full suite of potential impacts associated with substrate modifications. What about disruption of ecological processes, structure, and functions? I do not agree with the statement: "The language in the WAC's will avoid impacts…." This is simply not true based on my experience and the lack of consideration of multiple, temporal, and cumulative impacts associated with substrate modifications.
	9.10 Channel dewatering	6 This section, as with many of the others, does not seem to account for temporal loss of habitat and productivity. Otherwise, it does a good job of identifying real world protection shortfalls in the WAC's. This is the kind of candor that is needed to

		understand risk (see similar comment under 9.4 above).
	9.11 Artificial light	
	9.12 Vessel activities	6 Recommend adding Water Quality impacts and Shading impacts to the bullet list. Also, in addition to noting that the WAC's do not provide any guidance on vessel operation and associated activities, this section should indicate that a variety of impacts will occur, which could increase risk of take.
	9.13 Risk evaluation	1 Similarly to the rest of the analysis, Table 12 overlooks risks in lacustrine systems. 6 I disagree with the last sentence in this paragraph and question the level of "professional experience" of the "analysis team" for coming up with such a statement. How many of the members of the "analysis team" have experience reviewing projects, issuing permits, and monitoring project sites for compliance and have actually seen how ineffective the regulations are at protecting natural resources? This indicates a lack of understanding and narrow assessment of potential impacts.
10 Data gaps		2 Again, this section lacks a systematic and rigorous approach to the subject. Clearly at any step in their conceptual model there can be data gaps. I believe a holistic discussion that makes this clear and tries to identify the major issues should be developed. This would include: - Ecology and biology of organisms. - Particular types of impacts on organism. - Cumulative impacts. - Mitigating factors. I am not clear as to the value of trying to develop an exhaustive list for each impact pathway is productive. It is too easy to fall into the trap that we do not know enough about anything. How does one decide that effects of noise on green sturgeon is as important to study as the response of bull trout to an overwater structure? That would require a short book. However, I think it might be useful for the authors to ask what information would benefit the Federal Services most and use that as the foundation

		for developing this data gap discussion. For example, listed species are probably the biggest driver in developing an HCP and so might warrant the most attention as far as identifying important data gaps.
	10.1 Shading	1 While construction may occur during “fish” windows, the primary impacts of shading are to vegetation and there are no established “windows” for work over and in vegetation. 6 The recognition/acknowledgement of potential impacts associated with vessels moored at overwater structures is important and should include more elaboration, particularly the extent of additional coverage and time (which is often substantially more than “various times of the year” – actually most of the time at commercial docks and marinas).
	10.2 Littoral vegetation	4 Suggest that sensitivity analysis of eelgrass assessment methodology also needs to be conducted, because scale of many assessment method do not meet questions posed here. The statement “foraging habitat may not be a limiting factor for juvenile salmon in Puget Sound (Haas et al. 2002)” should probably be qualified (see 8.2 above). 6 Recommend adding to the bullet list: Littoral vegetation includes backshore and salt marsh vegetation (As noted in the Bank Stabilization paper - Impacts need to be addressed here)
	10.3 Freshwater aquatic vegetation	1 While data gaps exist for the species addressed here, submerged/emergent vegetation in riverine, lacustrine and marine systems provides similar function both as a component of structural habitat and as refuge and foraging habitat for species. The text reinforces the artificial distinction made by the authors in separating littoral and freshwater vegetation and in overlooking lacustrine systems.
	10.4 Riparian and shoreline vegetation	4 Does this suggest that fuction of riparian and shoreline is well known for estuarine/marine ecosystems? Doubt that’s true. 6 The first sentence is not entirely true. There are a number of important ecological (and social)

		functions provided by riparian areas (see NRC 2002) Should also note prey production for salmonids (see Brennan et al 2004; Brennan and Culverwell 2004)
	10.5 Noise	1 Tables 13 – Similar tables should be developed for other mechanisms in the paper. 3 See comment and reference to technical report on noise/vibrations and egg mortality above. 5 This section could summarize the goals of the National Academy of Science's National Cooperative Highway Research Program study on the effect of pile driving on fish. This is a three year study being conducted by Art Popper and Tom Carlson, funded by the Federal Highway Administration. The study tiers off of the research recommendations in Hastings and Popper 2005. See link for more information: http://rip.trb.org/browse/dproject.asp?n=12206
	10.6 Water quality	1 This section needs to include a discussion f data gaps associated with stormwater inputs and sediment contamination. 6 Need to include more than suspended sediment and turbidity. What about chemical compounds released from vessels and associated activities?
	10.7 Channel hydraulics	1 As an analysis of take, this section should also either include a discussion of data gaps related to shoreline structures associated with overwater structures (fill, armoring, breakwaters), or refer to the appropriate whit paper. 6 Second sentence: "…water crossing effects on habitat features…" I believe this was cut and pasted from a different paper and needs to be corrected.
	10.8 Littoral drift	1 As an analysis of take, this section should also either include a discussion of data gaps related to shoreline structures associated with overwater structures (fill, armoring, breakwaters), or refer to the appropriate whit paper. 4 This is giving the extensive information gaps of impacts, especially cumulative, of littoral drift cells very little emphasis, yet this may be one of the more extensive impacts along the Puget Sound shoreline!

	10.9 Substrate modifications	1 As an analysis of take, this section should also either include a discussion of data gaps related to shoreline structures associated with overwater structures (fill, armoring, breakwaters), or refer to the appropriate whit paper.
	10.10 Channel dewatering	
	10.11 Artificial light	4 Need to include need for information on specific guidelines (e.g., light frequency, intensity, timing, etc.) that minimize impacts!
	10.12 Vessel activities	
11 Habitat protection, conservation, mitigation and management strategies		1 As an analysis of take, this section should also present strategies based on disallowing additional/new structures. It should also present strategies for addressing shoreline structures associated with overwater structures (fill, armoring, breakwaters). 2 Again, to reiterate, there was almost no attempt that I could detect to evaluate or assess any of the information/references as to the quality of the information. A brief discussion of the sequencing process to put this section into perspective would have been useful. This is one section where the presentation of material into the construction phase, the structure as built, its use, and finally compensatory mitigation were clearly separated. This is how permits would be written, for example, with mitigation for each of those phases. In addition, I think this is one section where the use of the 12 impact pathway framework is not useful and detracts from the document. In my opinion, a better organization would have been to use the approach from the first marine OWS document that management measures were divided into the things you could do such as the following: 1. Placement of structure- location on shoreline, relative to other OWS. 2. Landscape context. 3. Construction material- which would include decking and pilings. 4. Construction.

		5. Size, type, and shape of structure- include height over water, length, and so on. 6. Lighting. 7. Use. Size and number of boats. 8. Other. Seasonality of structure. 9. Mitigation. 10. Monitoring. Monitoring should be used as a tool for all impact pathways. Most of this section seems to be just laundry lists of ideas. While some of these ideas are good, others are less so- is a re-vegetation plan really a management measure. Further, on page 11-14, it seems to be implied that removing riparian vegetation is not OK when erosion potential is high but maybe ok in other places. There should also be some accompanying assessment of what the authors think will really work, what is less likely to work, and what is a reach. 3 It has become common to mitigate new overwater coverage through the removal of an existing structure. Often the existing structures are no longer in use due to their poor condition. Such structures should not be permitted to remain over state jurisdictional waters where they create ongoing, unmitigated impacts on listed species. HPAs should require that all such structures be removed at the end of their useful life.
	11.1 Shading	2 This is the first place I can recall seeing this USACE (2005) document referred to. I have not reviewed this document. But, it clearly contains some very specific information on mitigating impacts with grating, float dimensions, and so on. If these are to be relied on, I would have preferred to have had some more material from this document presented so it could be evaluated. There are likely going to be a number of site specific issues as to where the structure is located that may cause one to modify these values. What if one has to build a OWS- for example, a dock or float of some kind is necessary to access many islands in the SJIs?

		Occasionally some mitigation is suggested that is really more along the lines of a research project-e.g., pp11-15.
	11.2 Littoral vegetation	1 2nd paragraph – There is little to no long term data supporting the success of restoration and/or transplanting. If Washington Fish and Wildlife is suggesting that compensation is an appropriate alternative to the Hydraulic Code's requirement to avoid impacts to vegetation, the rule and guidance will need to require long term monitoring and maintenance commitments. 3rd paragraph – In addition to locating structures away from vegetation, Washington Fish and Wildlife should engage in a siting analysis for whether structures should be permitted at all and deny permits in areas that other entities have defined as important and/or critical habitat. 4th paragraph – Again, the author's offer compensation as an alternative to the Hydraulic Code's requirement to avoid impacts to vegetation and there is no consideration given to the long term effects associated with the presence of the structure. 6 Needs some discussion of backshore vegetation as well (see Bank Protection white paper).
	11.3 Freshwater aquatic vegetation	1 Again, the author's offer compensation as an alternative to the Hydraulic Code's requirement to avoid impacts to vegetation and there is no consideration given to the long term effects associated with the presence of the structure.
	11.4 Riparian and shoreline vegetation	1 2nd set of bullets – The statements here apply to all vegetation and should be incorporated throughout the preceding sections. 6 Preparing a revegetation plan (in and of itself) does not compensate for impacts, or temporal loss. This should be rewritten. Temporal loss is particularly important and needs to be discussed. Mature trees and their associated functions cannot be instantaneously replaced.
	11.5 Noise	5 Avoid stating that the Services assume a certain reduction with bubble curtains. This is a case-by-case assessment. In some cases project proponents commit to meeting a certain reduction in their project descriptions. Other times certain

		levels are required in Terms and Conditions. It is highly variable. Instead, discuss the range of effectiveness we have seen in Washington. Include recent monitoring done by Washington State Ferries at the Mukilteo Ferry Test Pile Project (also, Eagle Harbor and Anacortes). The Mukilteo Test Pile project also tested what is called a "TNAP" or Temporary Noise Reduction Pile (pile within a pile, with the void between filled with either air or foam). This is the first time rise time is mentioned. There needs to be a discussion in previous sections as to why this may be important. In the discussion of pile caps, not that not only did they reduce sound pressure levels, they also lengthened rise times which may be an important factor in reducing the chance of physical injury. It would be good to note that while use of any of these attenuation devices may not get a project below the levels expected to cause adverse effect, they can significantly reduce the area of effect and are thereby effective minimization measures.
	11.6 Water quality	1 Overlooks strategies that would apply to stormwater. Treated wood – The most effective strategy is "No treated wood".
	11.7 Channel hydraulics	1 1st paragraph, 2nd sentence – This is confusing – are the author trying to say that there are three primary factors for habitat impacts?
	11.8 Littoral drift	4 Focus on transport mechanism ignores one of the most important aspects of littoral drift cells that needs to be a focus of management and regulation, i.e., sediment DELIVERY processes by feeder bluffs, etc. Focus on transport zones may miss the most significant impact!
	11.9 Substrate modifications	1 Include strategies for lacustrine and riverine systems.
	11.10 Channel dewatering	

	11.11 Artificial light	
	11.12 Vessel activities	1 Include strategies for lacustrine and riverine systems.
12 References		1 The following references are incorrect: ▪ WDNR (Washington Department of Natural Resources). 2006a. Draft fish covered species paper. Olympia, WA. ▪ WDNR (Washington Department of Natural Resources). 2006b. Draft invertebrate covered species paper. Olympia, WA. Washington DNR created a single document addressing 6 groups of species (herptofauna, birds, fish, invertebrates, marine mammals and plants) and 86 individual species in 2005. The correct reference is: ▪ Washington Department of Natural Resources. 2005. Covered Species Technical Paper. Aquatic Resources Program. Olympia, WA. Please correct throughout this and all future documents. 2 I was greatly dismayed by how the White Paper uses references. In particular, it is unacceptable in my opinion to use "cited by…" to the extent that was done. I have never seen this done to the extent done here. In a document this size, I would find one or two instances of this acceptable. One thing this pattern of citations implies is that the authors of the White Paper never actually looked at the original references. They absolutely should have looked at and reviewed any reference they cite. It is inappropriate to refer to a reference that is cited by someone else that is not going to be available. Several "publications" of mine were cited that I do not even have any more. It is irrelevant whether the "cited by" publications like Nightengale and Simenstad incorrectly used these, this White Paper should rely on references that can be acquired or obtained. Other problems with the references. 1. The references are very erratic with incomplete information presented for many references.

		2. There were a large number of references that I tried to obtain and could not. If references are used, one should able to get them. 3. And, there are some references that should be added. I recognize that some have become available in the last year but others seem to have been missed. 6 NRC. 2002. Riparian Areas: Functions and strategies for management. National Academy of Sciences, National Academy Press, Washington, DC. 428pp.
TABLES		
Table ES-1 Potential impacts of changes in channel hydraulics on potentially covered species		6 Why only a table for FW systems? Yet, suggests that there are no impacts to marine spp. As with other white papers, illustrates a FW bias and a relatively poor understanding of marine impacts.
Table 1 Potentially covered fish and wildlife species		
Table 2 Range of potentially covered species listed in Table 1		2 A useful table. 4 Table 2: Why would Pacific Herring not be included in ALL Tidal Reference Areas? It is erroneous to suggest that Pacific herring, particularly as larvae and juveniles, don't occur in South Puget Sound, Edmonds, Everett, etc. regions. 6 White sturgeon are found in all marine waters.
Table 3 Habitat requirements of potentially covered species		2 I did not find this table useful as it is so brief as to be largely irrelevant. A better approach might be to list references where habitat requirements are described and highlight those where little is known which would feed into data gaps. 4 Table 3: At least for the marine species, there are too many inaccuracies and inadequacies for many

		species to cite them in detail. But, in particular, the data available on nearshore habitat associations and linkages for the salmonids; in particular, many of the Puget Sound specific data/information has not been utilized; it seems to reflect that the authors really were not very familiar with the greater body of literature for at least the life history and ecology of estuarine/marine species. If this is to provide important indicators of habitat and other dependencies, someone who is more knowledgeable and paid needs to review/update this information! 6 See my comments on Bank Protection paper.
Table 4 Principal impact pathways evaluated		4 Table 4: as per earlier comment, aren't the pathways a mixture of "apples and oranges"? 6 Need to incorporate marine systems into this table. Seems to have a FW bias and lack of consideration of marine systems (e.g., only refers to "channel" with regard to riparian and shoreline vegetation).
Table 5 Hearing categories for potentially covered fish species		
Table 6 Effects thresholds for PAHs in surface water		
Table 7 US water quality criteria for the protection of aquatic life ("aquatic life criteria") for water soluble chemicals used in treating wood		
Table 8 Threshold effects concentrations (TECs) for freshwater sediment		

Table 9 Probable effects concentrations (PECs) for freshwater sediment		
Table 10 Summary of potential for incidental take of potentially covered species		2 It was not possible to determine how this table was populated. Was there systematic criteria that were applied? 4 There are too many questionable assignments in this table to call them out; some mechanisms needs to be implemented to edit and validate these. For instance, the Y associations between eelgrass/macroalgae, is very questionable for Pacific hake, lingcod, ALL the rockfish, etc. 5 I don't see that we have any evidence to indicate that any of the aquatic species in this table would not be adversely effected by noise (especially pile driving). In applying the precautionary principle, I'd list each as a "Y" for noise impacts, especially because the risk (if you were wrong in assuming no adverse effect) could include mortality. 6 If one considers food web linkages and habitat needed to support prey, I believe that most marine fishes should receive a "Y" for riparian and shoreline vegetation (consider support for forage fishes and other small prey fishes that depend on prey production, habitat quality – such as shade for smelt spawning areas – and other links to riparian functions, such as water quality, habitat structure, organic inputs, etc).
Table 11 Potential impacts of changes in channel hydraulics on potentially covered species		6 See comment for table ES-1

Table 12 Conclusions of the risk evaluation		2 This could be a potentially very useful table and I would encourage it to be further developed and fleshed out. In its present form, I cannot figure out how the different items presented in each impact category are derived. It requires some systematic approach such that a reader can understand where the statements under each risk category come from. For example, why is a structure where riparian vegetation is removed only of moderate risk? Why is a high risk something involving placing large amounts of non-conforming substrate- what does that mean? 4 Good table 5 Pile-driving sound levels are not *between* 180 dBpeak and 150 dBrms as these are different metrics. Should read “Pile-driving activities with sound levels above 180 dBpeak and/or above150 dBrms”. Change throughout table.
Table 13 research questions on the impact of pile diving on fishes		2 Good table although it is not clear how it was developed? Would it have been possible to develop something similar for other impact pathways?
FIGURES		
Figure 1 Conceptual framework for assessment		4 Fig. 1: Although this is a popular figure, it really does pose some confusion because of its linear organization. Habitat structure, for instance, can just as easily provide ecological function as habitat processes, and habitat processes and ecological function may have feedback to habitat structure. Instead of just adopting information outright, the authors might think about how THEY see the scientific knowledge expressed, in this case in a non-linear organization with considerably more feedback?
Figure 2 Juvenile salmon behavior patterns related to light intensity		2 Given that this is in the first OWS White Paper, is it really necessary to provide it again.

APPENDICES		
Appendix A Standard HPA provisions		
Appendix B Maps: TRAs and WRIAs		
GENERAL QUESTIONS		
1. List any additional sources of information you have not already identified that should have been reviewed and incorporated into the analysis. Are there any sources that were used that you feel should not have been? Why?	2 Fresh, K. L., T. W.-Echeverria, S. W.-Echeverria, and B. W. Williams. 2006. Using light permeable grating to mitigate impacts of residential floats on eelgrass Zostera marina L. in Puget Sound, Washington. Ecological Engineering 28:354-362. Dauble, D. D., T. L. Page and R. W. Hanf, Jr. 1989. Spatial distribution of juvenile salmonids in the Handford Reach, Columbia River. U. S. National Marine Fisheries Service Fishery Bulletin 87:775-790. Garland, R. D., K. F. Tiffan, D. W. Rondorf and L. O. Clark. 2002. Comparison of subyearling fall Chinook salmon's use of riprap revetments and unaltered habitats in Lake Wallula of the Columbia River. North American Journal of Fisheries Management 22:1283-1289. Koehler, M. E. 2002. Diet and prey resources of juvenile Chinook salmon (Oncorhynchus tshawytscha) rearing in the littoral zone of an urban lake. Master's thesis. University of Washington, Seattle. Sergeant, C. J. 2004. Effects of bottom slope, substrate, cover, predators and ontogeny on lentic habitat preference by juvenile Chinook salmon (Oncorhynchus tshawytscha) in experimental arenas. Master's thesis. University of Washington, Seattle. Sergeant, C. J., and D. A. Beauchamp. 2006. Effects of physical habitat and ontogeny on lentic habitat preferences of juvenile Chinook salmon. Transactions of the American Fisheries Society 135:1191-1204. Tabor, R. A., G. S. Brown, and V. T. Luiting. 2004. The effect of light intensity on sockeye salmon fry migratory behavior and	

	predation by cottids in the Cedar River, Washington. North American Journal of Fisheries Management 24:128-145. Fritts, A. L. and T. N. Pearsons. 2004. Smallmouth bass predation on hatchery and wild salmonids in the Yakima River, Washington. Transactions of the American Fisheries Society 133:880-895. Fritts, A. L. and T. N. Pearsons. 2006. Effects of predation by nonnative smallmouth bass on native salmonid prey: the role of predator and prey size. Transactions of the American Fisheries Society 135:853-860. Phillip, D. P. and M. S. Ridgway (eds). 2002. Black bass: ecology, conservation, and management. American Fisheries Society Symposium 31. Koehler, M. E., K. L. Fresh, D. A. Beauchamp, J. R. Cordell, and C. A. Simenstad. 2006. Diet and consumption of juvenile Chinook salmon in littoral habitats of Lake Washington. Transactions of the American Fisheries Society 135:1580-1591. Naughton, G. P., D. H. Bennett, and K. B. Newman. 2004. Predation on juvenile salmonids by smallmouth bass in the Lower Granite Reservoir system, Snake River. North American Journal of Fisheries Management 24:534-544. The PSNERP program is in the process of publishing short monographs on a number of the species/issues being considered here such as salmon, herring, smelt, beaches and bluffs, and riparian forests. The website where these documents can be located is: http://pugetsoundnearshore.org/publications.htm#reports Fresh, K.L. 1997. The role of competition and predation in the decline of Pacific salmon and steelhead, pp. 245-276. In: D.J. Stouder, P. Bisson, and R. Naiman (eds.) Pacific Salmon and their Ecosystems. Status and Future Options. Chapman and Hall. Fresh, K.L., R.D. Cardwell, and R.R. Koons. 1981. Food habits of Pacific salmon, baitfish, and their potential competitors and predators in the marine waters of Washington, August 1978 to September 1979. Wash. Dept. of Fisheries, Progress Report. No. 145. 58 pp.

	Gregory, R. S. 1993. The effect of turbidity on the predator avoidance behavior of juvenile Chinook salmon (*Oncorhynchus tshawytscha*). Canadian Journal of Fisheries and Aquatic Sciences 50:241-246. Gregory, R. S. and C. Levings. 1998. Turbidity reduces predation on migrating juvenile Pacific salmon. Transactions of the American Fisheries Society 127:275-285. Simenstad, C.A. 2000. Commencement Bay aquatic ecosystem assessment. Ecosystem-scale restoration for juvenile salmon recovery. University of Washington, School of Fisheries, Sof-UW-2003. 25pp. Beamer, E., A. McBride, C. Greene, R. Henderson, G. Hood, K. Wolf, K. Larsen, C. Rice, and K. L. Fresh. 2005. Delta and Nearshore Restoration for the Recovery of Wild Skagit River Chinook Salmon: Linking Estuary Restoration to Wild Chinook Salmon Populations. Supplement to Skagit Chinook Recovery Plan, Skagit River System Cooperative, La Conner, Washington. Toft, J.D., J. R. Cordell, C. A. Simenstad, and L. A. Stamatiou. 2007. Fish distribution, abundance, and behavior along city shoreline types in Puget Sound. North American Journal of Fisheries Management 27:465-480. 4 There are MANY gray literature sources that were missed/ignored, but there are several that are important to Section 7.8: a. **Finlayson, D.P.** , 2006, The Geomorphology of Puget Sound Beaches (9.5 Mb PDF), Dissertation . School of Oceanography, University of Washington, Seattle, WA: 216 p. b. **Finlayson, D.P.**, and Shipman, H., 2003, Puget Sound Drift Cells: the importance of waves and wave climate (263 Kb PDF), Puget Sound Notes: Olympia, WA, p. 1-4. c. Finlayson, D. 2006. The geomorphology of Puget Sound beaches. Puget Sound Nearshore Partnership Report No. 2006-02. Published by Washington Sea Grant Program, University of Washington, Seattle, Washington. Available at http://pugetsoundnearshore.org Also, for Section 7.11: d. Nightingale, B., T. Longcore, and C. A. Simenstad.

	2006. Artificial night lighting and fishes. Pages 257–276 in C. Rich and T. Longcore (eds.). *Ecological consequences of artificial night lighting*. Island Press, Washington, D.C. See for synthetic description of juvenile salmon utilization and "dependence" on Puget Sound shorelines: Fresh, K.L. 2006. Juvenile Pacific Salmon in the Nearshore Ecosystems of Washington State. Puget Sound Nearshore Partnership Report No. 2006-06. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington. Available at: http://www.pugetsoundnearshore.org 5 A discussion of the result of caged fish studies done by Bud Abbott for Caltrans should be included. His studies were (as he readily admits) flawed, however there is still information to be gained from them. Importantly, they demonstrate that energy accumulates over multiple pile driving strikes. This is demonstrated by the fact that fish that received exposure to multiple strikes had extreme internal injuries (in some cases their internal organs were homogenized). Popper and Hastings 2005 excludes Abbott's work on the premise that it was not peer reviewed. However, Popper and Hastings 2005 relies heavily on Yelverton's work which was also not peer reviewed. Abbott's work also demonstrates that fish with serious internal injuries may not appear harmed to observers (Abbott et al. 2002). You might want to add a note about pile installation adjacent to waterbodies. It is often assumed that installation of piles "in the dry" will result in minimal, or undetectable, SPLs in the water. Monitoring data from impact installation indicates that SPLs in the adjacent waterbody can be significantly elevated (Battelle Marine Sciences Laboratory 2004; Reyff 2006). Hydroacoustic monitoring during impact installation of 48-inch steel piles that were 5 m from a river in California detected SPLs as high as 201 dB_{peak} and 188 dB_{rms} at 10 meters from the pile (Reyff 2006). It is possible that as the sound pressure travels through the substrate its waveform is altered, resulting in longer (i.e. less damaging) rise times, but this has not been adequately investigated. Also, during monitoring of vibratory installation of piles adjacent to a river Reyff (2006) noted that there was clearly noticeable vibration in the river.

2. In general, what aspects of the paper do you feel are particularly flawed? Why? How could they be improved?	2 See the general comments at the end of this review sheet. 3 Incorporate more analysis of cumulative and indirect effects and the impacts of long-term maintenance activities. 4 The authors appeared to draw on secondary or tertiary sources, and thus often ended up presenting an interpretation of the primary data that was less than accurate. The primary sources for key results that are described in detail should be consulted for accuracy. Some of the assumptions of species associations and dependence may be 'precautionary' but not really based on adequate knowledge of species life histories and ecology. Information, particularly recommendations, for topics such as littoral drift are grossly inadequate. 6 Many sections are very confusing because I could not distinguish what applies specifically to marine vs freshwater environs. Several sections draw conclusions w/either weak or no discussion/rationale for conclusions. In many cases, conclusions are oversimplified and do not account for the real effects on the ground or for the variability/diversity of site specific conditions and project impacts. Overall, this analysis does not account for the full suite of impacts associated with overwater structures. By looking at each individual potential impact it misses site/project specific cumulative impacts as well as larger scale cumulative impacts. In most cases, the use of the term "minimizes" should be changed to "reduces", which more accurately reflects the unknown amount of lessening the impact. It would be helpful and informative to summarize all parts of the WAC's that do not provide any guidance or requirements to avoid or minimize impacts (table?). Also needed is an assessment of the deficiencies in implementation and lack of ability to achieve "no net loss" (this is policy, right?) within each project, or cumulatively. The 12 impact pathways should consider both construction AND operation of overwater structures, including maintenance and associated activities and associated land use/development.

	This is a major deficiency in this paper. I would recommend a section on how uncertainty is addressed and whether or not the Precautionary Principle applies.
3. In general, what aspects of the paper are particularly well done and successfully convey the information	3 This was a comprehensive and very well done paper. The summaries of direct impacts are very well presented and should be useful in the HCP process. 4 Certain topics, like water quality, channel hydraulics, noice, etc. are very effectively treated.
4. Please provide any additional comments.	**General Comments:** 1 The authors have generally done a good job of assembling the pertinent information addressing effects associated with overwater structures, however there are several issues and gaps that should be addressed in future versions and/or uses of this work: While the regulatory extent of the HPA is limited to the protection of fish and shellfish during "…work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state.", the analysis of take in the HCP planning context <u>must</u> include a discussion of the effects that may result from the action regardless of the control the entity may legally exercise over the effect. entities ability to control the effect . As a result the omission of a discussion addressing impacts associated with shoreline armoring, stormwater, and long term operational impacts is a critical flaw both for this document and the HCP planning process generally. In instances where Washington Fish and Wildlife has developed separate white papers addressing these impacts, future iterations of this work should either include the text from those papers or refer to the papers. For those impacts or activities not addressed in any existing white paper or those under development, the discussion should be added to reflect the entirety of effects associated with the activity. Throughout the paper, effects are discussed without an acknowledgement of the potential long term impacts of the permit – a failure both of this paper and of the HPA permitting process in general. While take may be the result of an individual action or construction of a structure, it is more frequently the result of the long term presence of the structure and the cumulative biological effects of multiple permitted structures. Addressing these operational and cumulative

	impacts is critical to the success of the analysis, any future HCP and Washington Fish and Wildlife's requirement to protect fish and shellfish. This paper is unevenly written and frequently fails to link the strings of declarative sentences describing existing research and mechanisms with biological effects. This could easily be resolved by utilizing a technical writer with expertise in aquatic ecosystems for future work products. While it is true that the existing body of research primarily addresses salmonids, very little effort has been made to extrapolate the information to other potentially covered species and their habitats or even salmonids that exhibit riverine and lacustrine life histories. Without the extrapolation, it would appear that there is generally no benefit accrued to non-salmonids by inclusion in this planning effort. The document is inconsistent in what is portrayed as a mechanism (e.g., shading vs ambient light), and continually blurs the line between mechanisms (shading, noise, vessel activity) and biological effects/impacts (direct disturbance, modified species behavior, reduction of submerged/emergent vegetation, reduction/modification of benthic communities). As the consistent definition and use of terms is critical to the success of HCP planning, this should be standardized between white papers and in all future uses of the papers. There is an artificial distinction made between the biological significance of, and impacts to, freshwater and marine submerged/emergent vegetation and sediment transport as a result of overwater structures. While it is certainly true that there are some differences in processes (e.g., wind driven currents, tidal currents, stream flows) and types of vegetation, the analysis would greatly benefit by combining the discussion of vegetative and hydrologic impacts. Specific impacts (e.g., disruption of drift cells) should be addressed within this larger ecological context for all future iterations and uses of this document. Although littoral defines both lacustrine and marine shorelines, this paper almost entirely overlooks mechanisms and impacts associated with lakes. As the Hydraulic Code specifies the protection of fish and shellfish in "state waters and offshore waters (RCW 77.04.012), this is a critical flaw and should be corrected in all future iterations and uses of this and all other HCP related documents. To a large extent, the HPA permitting process concentrates on effects related to the construction of a single structure/facility

	and overlooks both the on-going and long term operational impacts associated with the existence of the structure, and the effects of siting multiple structures in a specific embayment/body of water. In essence, this results in a total abdication of the agency's responsibility to protect the continued well being of fish and shellfish. This oversight should be addressed both as a part of the HCP planning process, as well as in all future rule revisions and permit writing guidance. While this document frequently refers to mitigation, the context would indicate that what is actually being addressed is compensation for a biological impact. As mitigation is properly the sequence of avoidance, minimization and finally compensation for impacts this is incorrect and should be corrected throughout this and all other HCP planning documents. In addition, the perception that effects can be compensated for has led to the regulatory community replacing existing, functioning habitat with a new type of habitat; decreased habitat function as a result of the newness of the created habitat; with little to no commitment to ensuring the long term success of the replacement. 2 The following are my comments on the OWS White Paper. In preparing this review, I also re-read the original White Papers. I would like to note that because there were a significant number of large-scale issues (e.g., organization), I was unable to focus on the level of detail review and comment asked for in the template below. In general, I found that this document is limited in its utility as a supporting document of the development of an HCP and provides only limited understanding and evaluation of the major issues surrounding overwater structures. In my opinion, probably the major problem with this document is the breadth and extent of material it tries to cover. The subject matter it tries to cover is simply too large and too diverse which then greatly diminishes the quality and usefulness of the document. This in part reflects the fact the document tries to deal with over 50 species of concern and the potential impact and mitigation issues with each. Further, I do not understand why freshwater, marine, treated wood and bridges are all lumped together. In the past, the separation of marine and freshwater OWS worked well and the foundation was there to just extend these documents. Further, treated wood was its own document and now is part of this one. I also believe that bridges should have been split out into a separate

	document. The following is a summary of the major problems that were consistent across the whole document: 1. The material from the original white papers is used inconsistently. 2. Much of the WP lacks analysis as well as summaries or conclusions. 3. There is not a consistent presentation of material. 4. While I understand the desire for a consistent organization (the 12 impact pathways), there were several places where this did not seem to work very well and detracted from the document (especially the last section). 5. The factors that can affect the impact of an OWS (e.g., size of OWS, depth), are mostly not considered throughout the document. 6. There was limited effort that I found to evaluate any of the information/references as to the quality of the information. All information seemed to be pretty much treated the same regardless of whether it was peer reviewed publication or very gray literature. 7. There were many references that I could not find when I tried. This could be because the authors did not present all the relevant material in the citation or because it is too "gray". 8. A major problem is that the impacts relative to construction, the as built structures, and use of the structures are not distinct and are generally blended together. In some places they are not really differentiated. This is especially a problem in the management section where construction mitigation and mitigation for impacts of the structure are often not distinguished. 9. I do not understand, and disagree with, the emphasis throughout the document on freshwater channel, habitat, riparian, processes. Many pages in this document are written on Channel Hydraulics (and I include Dewatering). While there may be some limited instances of these issues occurring, they are not in my opinion a major issue in OWS and do not warrant such an extensive amount of text. 10. In my opinion, the impacts of OWS on growth and survival of organisms should be 5 It is important that there is consistency amongst the various white papers in how the pile driving analysis is discussed. ▪ Seems the paper should include a discussion of vibratory pile driving as well.

	▪ Ensure consistency in citing underwater sound metrics. Peak vs. rms vs. SEL should always be identified. ▪ Describe difference in reference pressure underwater vs. in air since most people are used to evaluating dB levels in-air. The reference scale for underwater sound is 1 micro-pascal (□ Pa) and is expressed as “dB re: 1 □ Pa”. This is in contrast to the reference pressure for in-air sound of 20 □ Pa which is based on a human hearing threshold. Consider discussing the effect of transmission loss and how it is related to determining an area of effect.

5 Abbott, R. R., E. Bing-Sawyer, and R. Blizard. 2002. Administrative Draft - Assessment of Pile Driving Impacts on the Sacramento blackfish (*Orthodon microlepidotus*). Caltrans, Oakland, California.

Abbott, R. R., J. A. Reyff, and G. Marty. 2005. Monitoring the Effects of Conventional Pile Driving on Three Species of Fish.

Battelle Marine Sciences Laboratory. 2004. Hydroacoustic Monitoring During Beach Pile Driving at Hood Canal Bridge on June 14th, 2004. Battelle Marine Sciences Laboratory, Sequim, Washington.

Caltrans. 2001. Fisheries Impact Assessment. Caltrans.

Gisiner, R. C., and coauthors. 1998. Workshop on the Effects of Anthropogenic Noise in the Marine Environment. R. C. Gisiner, editor Effects of Anthropogenic Noise in the Marine Environment. Marine Mammal Science Program, Office of Naval Research.

Hastings, M. C., and A. N. Popper. 2005. Effects of Sound on Fish. CalTrans.

Laughlin, J. 2005. Underwater Sound Levels Associated with Restoration of the Friday Harbor Ferry Terminal. WSDOT, Seattle, WA.

Laughlin, J. 2006. Underwater Sound Levels Associated with Pile Driving at the Cape Disappointment Boat Launch Facility, Wave Barrier Project (Revised). Washington State Parks.

Reyff, J. A. 2006b. Russian River Replacement Bridge at Geyserville: Underwater Sound Measurement Data for Driving Permanent 48-inch CISS Piles. Illingworth and Rodkin, Inc., Petaluma, CA.

Teleki, G. C., and A. J. Chamberlain. 1978. Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie. Journal of the Fisheries Research Board of Canada 35:1191-1198.

Turnpenny, A., and J. Nedwell. 1994. The Effects on Marine Fish, Diving Mammals and Birds of Underwater Sound Generated by Seismic Surveys. Fawley Aquatic Research Laboratories Limited, Marine and Freshwater Biology Unit, Southampton, Hampshire, UK.

Turnpenny, A., K. P. Thatcher, R. Wood, and J. Nedwell. 1994. The Effects on Fish and other Marine Animals of High-level Underwater Sound.

Yelverton, J. T., and D. R. Richmond. 1981. Underwater explosion damage risk criteria for fish, birds, and mammals. Proceedings of the 102nd Meeting of the Acoustical Society of America, editor 102nd Meeting of the Acoustical Society of America,

Miami Beach, Florida.
Yelverton, J. T., D. R. Richmond, R. E. Fletcher, and R. K. Jones. 1973. Safe Distance from Underwater Explosions for Mammals and Birds. Lovelace Foundation for Medical Education and Research, Albuquerque, NM.
Yelverton, J. T., D. R. Richmond, W. Hicks, K. Saunders, and R. E. Fletcher. 1975. The Relationship Between Fish Size and Their Response to Underwater Blast. Defense Nuclear Agency, Albuquerque, NM.

APPENDIX D		
Reviewers' Comments on Bank Protection/Stabilization White Paper		
PEER REVIEW COORDINATOR NOTE: Seven individuals reviewed and comment on this white paper. Each was assigned a number, 1 through 7. Each individual's comments are identified by that number at the start of his/her comments for a particular cell in the comments column. The comments are from that reviewer until the start of a paragraph begins with the number of another reviewer.		
SECTION	SUB-SECTION	REVIEWER'S COMMENTS
Title		1 I recommend dropping the word "stabilization" from the title, since banks are part of fluid systems and armoring does not "stabilize" them, but rather is a method used to prevent erosion. For example, most shoreline bluffs will continue to erode (from the influences of many other factors, such as wind, water, gravity, etc.) and using the term stabilization creates a misunderstanding of the influences and processes at work.
Executive summary		1 In the first paragraph, WDFW's objective is stated as avoiding, minimizing, or compensating for incidental take. Shouldn't the objective be to avoid take (i.e., no net loss)? P.ES-5 Riparian Vegetation: removal of veg. has many impacts and it could be argued that water quality and temperature are Not the "most important of these impacts". See riparian and general comments.
	Habitat Accessibility	2 Could be described more clearly. For example: Habitat Accessibility is influenced by physical variables including geography (e.g. height of a waterfall), flow and temperature. It is different for different species and life stages of each subject species depending on their physiological abilities like their ability to jump falls.
	Riparian Vegetation	2 "Changes to water quality, and particularly temperature are the most important of these impacts." This is a subjective, too generalized, and unsubstantiated statement. Against this speaks that allochthonous input (drift insects) is an important food source for juvenile salmonids.

	Overview – objectives 2. Habitat Protection, conservation, Mitigation and Management Strategies (p. ES-8)	3 Add "existence over time" to construction and observation…This is an important point in sections 8 and 9. Here in the Executive summary would be a good place to establish the timeframe for a future cumulative impacts analysis and potential risk of take. 50 years? I'm not sure I would characterize all conservation measures as "design elements". Avoidance and minimization procedures are most effective when considered in site selection and evaluation, prior to any site-specific design. 6 A significant data gap not addressed in the executive summary is an analysis of the adequacy of the implementation of the current program. I will discuss this in more detail in the data gaps section of the paper. 7 Because of "apples and oranges" aspect of listed 'mechanisms' of impact (e.g., the mechanisms is not usually defined), it might be better to call this the 'categories' of impact.
1 Introduction		6 The Corps should be added as one of the agencies that must provide approvals for work done under this program.
2 Objectives		6 It seems to me one of the objectives of this paper should be to evaluate the effectiveness of the current HPA program related to bank protection since the recommendations appear to make technical modifications but not structural changes to the existing program. Many of the tools listed as necessary to minimize risk to take currently exist. An assessment of how they are being utilized is necessary to determine if take is being avoided under current operating procedures, or whether the tools or procedure currently employed need to be modified.
3 Methodology		1 How many Habitat Biologists (past and present) were interviewed to perform this evaluation? A "literature review" misses much of the practical experience and observations that could reveal many of

		the major weaknesses in the interpretation, implementation, and protective ability of the Hydraulics Code. 7 There is no indication in method #2 that any literature, gray or otherwise, was searched/reviewed about mitigation and other procedures (including regulatory and policy) to decrease impacts and take from bank protection.
4. Activity description		1 I will assume that other "armoring" practices, such as jetties, will be covered under a separate white paper. General Comment: Most of the focus in this section seems to be on FW systems, where most of these principles and practices apply to marine systems as well – with some distinct differences. 7 Just dawned on me: Who and where are the integrated impact of complexes of different structures addressed, e.g., where an overwater structure is combined with a bulkhead and a breakwater?
	4.1 Statutes and rules regulating bank protection structures	1 The statement that "construction of bulkheads is prohibited…" needs to be qualified. The reality is that bulkheads (SFR's or not) are rarely denied. This needs to be explicitly stated. Bulkheads always result in a permanent modification or loss of habitat. 3 What constitutes "in eelgrass" areas related to construction of non-residential bulkheads? Are we to believe the department denies HPAs for bulkheads on all beaches with eelgrass for non-residential upland land uses? Is this prohibition limited to bulkheads that would impact eelgrass by their very footprint or would it include bulkheads that have an indirect effect on an eelgrass bed offshore of where the armoring is placed? 6 It is my understanding that WDFW does not issue HPA's for projects on non-Federal lands if they are being conducted by the Corps of Engineers. A citation to the statute that provides for this exemption would be helpful, or at least a discussion of the jurisdictional authorities of the agency. 7 Shouldn't regulatory specifications such as associated with "…. certain wood preservatives and

		rock sizes…” that are banned unless otherwise authorized, be described in more detail, or these regulations included in full in appendices, and referenced here?
	4.2 Environmental setting of bank protection structures	3 Table 2 – What would be more useful is a breakout of bank protection HPAs issued by residential vs. non-residential. This would allow a clearer calculation of projected potential cumulative impact if WAC 220-110-280 is truly enforced as part of the HCP. The rate of issuance of HPA's broken out in this way would also align better with other sources of information such as SMA environment designations that would suggest what types of development would be allowed by the local governments. 4 Text indicates that distribution of bank protection projects is “even” between marine and freshwater habitats. This does not coincide with information in Table 2 (e.g. 7904 freshwater/4544 marine) 5 1st para of this section suggests freshwater and marine projects evenly distributed, but Table 2 indicates almost twice as many fresh as salt. 6 Table 2 is unclear in that it appears that there is an almost 2:1 ratio of freshwater to marine water projects. 7 A list of the specific data that are included in the HPMS would be helpful here.
	4.3 Bank protection techniques	1 4.3.1.1: Choice of material often has less to do with the project site and habitat, but rather the landowner's or contractor's preference. 4.3.1.2: Most of the items listed as “revetments” are usually vertical, or near-vertical and do little to “absorb” wave energy. 4.3.2.1: Logs and rootwads do provide bank protection on shorelines and do “exceed the lower limit of vegetation on the bank”. Need to be clear when you are referring to FW vs Marine Systems. 4.3.2.2: Maintenance is mentioned for beach nourishment, but is lacking for other techniques.

		Bulkheads don't last forever and require periodic repair, maintenance, or replacement. 4.3.2.3: What about surface drainage? 4.3.2.4: Riparian plantings "may be added to bank protection projects…" They may also be used as an alternative to conventional armoring in some cases (and should be considered as an alternative for improving slope stability/erosion). 4.3.3: The last sentence in this paragraph is somewhat misleading and overstated. Sounds like "sugar coating". I believe it would be more accurate to state that virtually all of these modifications result in some disruption of natural processes, structure, and functions. Some may be used to make improvements to an altered system, but rarely does one "bank protection" project (even when being identified as restoration) restore larger scale processes. 2 "soft approaches are used where shear forces are relatively low" This is a simplified statement that unfortunately does not account for the tremendous shear stress vegetation, like class A vegetation (USDOT, FHA. 1988. Design of Roadside Channels with flexible Lining. Hydraulic Engineering Circular NO 18. FHWA-IP-90-017) can withstand. Also, the statement does not account for the well thought out process of selecting the strembank stabilization technique that fits the objectives best formalized in Cramer et al. (2003). As described in Cramer et al. (2003), the selection of an approach does not only depend on the applicable shear forces, but also on other considerations including the acceptable risk. 3 4.3.2.4 Biotechnical Bank Protection – Several biotechnical and Integrated approaches (4.3.3) used on Puget Sound marine shorelines have been evaluated by Gerstel and Brown, 2006 available from www.psp.wa.gov/ 4 It is not clear what the difference is between Live Fascines and Live Pole Drains. The term "tree kickers" should be defined.

		Section 4.3.2.5 describes the effectiveness (or limitations) of bank reshaping as a protection technique. The other techniques should also include information on the limitations in similar suit. 5 Beach Nourishment. Might also refer to descriptions in Zelo et al (2000), and Shipman (2001). 7 If this simple classification of bank protection techniques is to be used to organize information on impacts, might consider distinguishing within 4.3.1.1. Vertical Retaining Walls whether the material is semi-porous (e.g., vertical rock boulder wall) or contiguous (e.g., vertical sheet pile, poured concrete). Similar to above, would it be worthwhile to distinguish when sloping rock revetments are semi-porous or contiguous? 4.3.1.4 Levees implies that flood protection is the major or only reason they are constructed, while they were constructed for (agriculture) development of tidal wetlands, and are still maintained to sustain that. Does 4.3.2.3 Subsurface Drainage Systems deserve its own category, given that it usually is just a component of these other approaches, and isn't really a bank protection structure itself?
5 Potentially covered species habitat use		1 Table 3: WRIA is an acronym for Watershed Resource Inventory Area, not Water Resource Inventory Area. White sturgeon occur in all marine areas, along with many estuaries, bays, and rivers/streams throughout the state. I believe the areas listed is an inaccurate representation of their distribution. Table 4: Need to check on spawning elevations for sand lance and include elevations for surf smelt. Why no description of nearshore timing and feeding for juvenile and adult salmonids (see Brennan et al 2004, Fresh et al 2006, and others). Too FW centric.

		6 Table 3: Brett Barkdull reports (pers comm.) the presence of white sturgeon in the lower regions of all Puget Sound streams. 7 See Table 3 comment. If juvenile salmonids are at all included in this assessment, there is no real rationale for excluding some Tidal Reference Areas for some (sockeye, pink) and citing "all" for others. Wydoski and Whitney (2003) is an exceedingly poor source for juvenile fish distributions in estuarine/marine waters, while there are considerably better sources (albeit many gray literature) for more comprehensive information. In addition, eulachon occur in TRA9, at a minimum, longfin smelt and Dolly Varden are probably in all TRA, etc. This is not parallel to all the various rockfish species, that probably do not occur in all TRA, but their distributions are not known enough to discern the TRA. Someone hasn't done their homework.
6 Conceptual framework for assessing impacts		1 P. 6-1 "(e.g., shading or cover)" are not habitat processes Table 5. What about changes in beach morphology, sediment input, composition, transport…? What about related impacts? (e.g., armoring often enables upland development in closer proximity to the water, loss of backshore/backshore vegetation, creates barrier to connections between aquatic and terrestrial systems – disruption of ectone processes, structure, functions). 3 Consult Puget Sound Nearshore Partnership for additional development Conceptual Model Narrative document for ideas on better capturing the temporal component of disrupted processes over time from the existence of a process-constraining structure. More on that issue under section 8. 4 This framework is one that was developed to under stand natural processes. It is not one that is used to determine effects to ESA listed species. That method evaluates effects after minimization measures have been applied. The appropriate method should be used or the framework needs to be adjusted.

		5 The terms “impact mechanism” and “impact pathway” would benefit from clearer explanation/examples. 6 The issue of hydrology in terms of forcing fish to downstream locations during flooding as a result of bank protection activities should be evaluated. 7 (see comment in Overwater Structures review) Is a mechanism/pathway missing here, or should a category be renamed? That is, as in changes in channel morphology, there are instances where estuarine/marine beach profiles are changed due to modified wave induced sediment erosion; could change “Channel Processes and Morphology” to “Channel/Beach Processes and Morphology”?
7 Direct and indirect impacts		1 Description of benefits is misleading. Maybe if restoration is a primary goal, but rarely, if ever does bank protection provide benefits in the marine environment. 2 The impacts described are a worst-case scenario. That is necessary for later in the process developing further avoidance and minimization measures as well as take estimates. However, in some sections the impacts described do not seem to take the existing BMPs into consideration and thus describe an impact scenario worst than the reality with BMPs should be; e.g. “unless the discharge at the outlet results in scouring of substrate material or erosion of streambanks”. 4 7.1.2.1.4 discusses impacts of sediment based on a draft USFWS guidance document, which was not available for the paper, yet supposed contents were included. If a document is not available then it should NOT be used in this white paper – it is then hearsay, and cannot be read or evaluated by anyone. Recent BOs received by WSDOT from USFWS assume that turbidity will be kept within the mixing zone. The 3.3 miles down stream was not used.

		Suggest looking at 2006-2007 documents, as ESA is an ever-changing field. The impacts discussion mixes temporary impacts (those that occur during construction) and permanent impacts (those that occur after the structure is in place. It would be easier to assess impacts if they were separated out into those two categories. 7 Best to explain the distinction between Direct and Indirect impacts here. "essential life-history traits" seems inappropriate; do they mean "sensitive life history stages"? Life history traits wouldn't be impacted per se, except on an evolutionary scale. The history of exposure or adaptation to a natural suspended sediment regime might also be a factor in impacts to suspended solids? "loss of favorable depths, velocities, and floodplain habitats" is an odd mixture of habitat attributes and one specific habitat?
	7.1 Construction activities	1 P. 7-4 Reference to Grette (1985) study of salmon migrations in the marine environment ascending a fish ladder – in the marine environment???? Check this. Change all "instream" to in water. Also applies to marine waters. 2 Determining an impact threshold for salmonids is important. Unfortunately, the White Paper picked a Biological Opinion for which a key supporting document, *USFWS. 2005. Sediment Biological Review* was not available for public use. Thus, the train of logic in the White Paper, why which calculation was made, is hard to follow and incomplete. A central piece of information is missing: What level of impact the Services determined to constitute and adverse effect. This information, what level of impact constitutes a take, is available in NMFS 2004/01878 Appendix C and NMFS 2004/01876: For the purpose of this take estimate, NMFS and the LCFEG have determined

		which severity level constitutes take. "Take" is defined by the ESA to mean Aharass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect@ (section 3(18)). NMFS= regulations further define "harm" as Aan act, which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering@ (November 8, 1999, 64 FR 60730). These final regulations on harm provide examples of actions that may constitute take. Example nine applies for purposes of this analysis: Conducting ... earth-moving or other operations which result in substantially increased sediment input into streams (November 8, 1999, 64 FR 60730). If the actions under consideration result in a substantial increase in sediment input is difficult to decide. All lethal effects (severity level nine to fourteen) clearly constitute take. Behavioral effects (level one to three) are on the other end of the scale. They neither kill nor harm fish. Harm does occur somewhere in the range of the sublethal effects (severity level four to eight). Newcombe and MacDonald (1991) define sublethal effects as "effects that injure the tissues or physiology of the organism, but are not severe enough to cause death". A severity level of four equates to a short-term (less than two hours) reduction in feeding rate. The authors explain that Athey reflect less a change in fish behavior than reduced availability of food and reduced visual hunting range.@ This is a measurable adverse effect that does not amount to the level of harm. Reducing feeding rate for less than two hours does not injure a juvenile by significantly impairing feeding or rearing. The same can be argued for a severity level of five, minor physiological stress. A severity level of five is associated with an increase in concentration of 90 mg/l to 660 mg/l for one hour and 33 mg/l to 90 mg/l for seven hours (see Appendix A for table). A severity level of five equates to an increase in the rate of coughing, reduction to cessation of feeding, and increased respiration. However, the habitat degradation at this level is negligible and the adverse

		effect to the juvenile salmonid rather small. Thus, an impact of the severity level five does not meet the regulatory standard of significantly impairing rearing. However, at a level of six, moderate physiological stress, we cautiously assume injury to a juvenile by significantly impaired rearing. A severity level of six equates to an increase in sediment concentration of above 660 mg/l for one hour. At a severity level of six, studies show a large increase in the rate of coughing and an increase in blood glucose levels (Servizi and Martens 1992). Thus, for this analysis NMFS and the LCFEG determined that increased sedimentation that results in a response of severity level six or higher will equate to take. 3 7.1.1.1.3 – Consult Partridge, 1979 for general descriptions of fish schooling behavior effects and habituation to noise as well as other reports on effects of fish behavior from seismic literature to expand on this section. Schooling behavior may be critical to survival in some species, especially forage fish. 4 P.7-5. Sentence beginning with “Anderson (1990) reported larger schools…” is not clear. Section 7.1.2.1.2: The section does not provide discussion on the sub-lethal effects of suspended solid concentrations. For example, the section does not describe how feeding rates or physiological responses are inhibited by suspended solids or what results these reductions would have on species life stages. Section 7.1.2.1.4: The reference document used to provide much of the impact analysis or calculation of impact thresholds was indicated as not useable, although it was used. This does not seem appropriate. Also, these methods are currently under review and considered excessive for project monitoring requirements in comparison to other current water quality monitoring standards. Bottom page 7-12: Context of project results should be provided for the extreme turbidity example used. It is not common for elevated turbidity level to extend to distances of 4300 feet. What other factors contributed to those results (i.e. coffer dam break, accidental

		discharge, some other discharge, etc.)? Top of page 7-13: It is unclear which project is under discussion as an example (i.e. Stillaguamish project or high turbidity project or are they the same). Top of page 7-15: The majority of construction manuals require that energy dissipaters are used for outlets (bypasses, stormwater, culverts, etc.) to reduce the potential for scour or excess turbidity. This should be indicated. 5 What about: compaction of substrate by equipment burial by stockpiling of materials disturbance of bed (holes, ruts, etc) by equipment or barges removal or destruction of aquatic or riparian vegetation 6 An additional impact of the loss of riparian vegetation associated with the need to stage equipment during bank protection activities was not mentioned. Frequently, riparian vegetation is lost when roads are constructed to access work sites. With regard to suspended solids, work done by Cedarholm in the 1980's showed Olympic Peninsula steelhead had variable resistance to suspended solids based on season. Higher incidence of impacts during the winter, when adapted to high turbidity during the winter high flows and lower resistance in the summer. I can't seem to locate a citation, but I know the article exists. Another theoretical impact is that with an extended sediment plume, fish will tend to avoid the plume, thereby increasing the density in other areas. Where rearing habitat is limited (for example, coho habitat in the Skagit) this can have adverse success on survival . 7.1.3.1.2 This section discounts the potential adverse impacts from relocating fish from dewatered reaches. As above, the act of relocating fish to areas that already may have high densities of fish will increase competitive pressure for food and locations advantageous to minimize expenditure of energy.

		7 A table summarizing the noise attributes (e.g., noise/pressure levels, pulse frequency, species and life history stage, mortality rate, injury, etc.) associated with various literature documented effects of fish and invertebrates (and habitats?) might be very helpful in synthesizing this impact 7.1.2.2. Impacts to Invertebrates: It should probably be mentioned that sedimentation effects on (benthic) invertebrates probably depend on the rate of sediment deposition, e.g., benthic invertebrates are moderately adapted to sediment movement and deposition at the benthic boundary layer, but no so to catastrophic sedimentation?
	7.2 Channel processes and morphology	1 What about beach and bluff, tidal flat and salt marsh processes and morphology? A recurring problem with this document is that it shows a bias for FW systems and virtually ignores marine systems. 2 7.2.1 describes several negative effects from bank stabilization that, with proper planning, are mostly avoidable; for example "Similarly, areas upstream of bank protection structures may also encounter sediment deposition if associated channel narrowing backs up water to some extent. Such sediment deposition could contribute to upstream river instability, which could threaten land, including the parcels with bank protection." The analysis process described in Cramer et al. (2003) should be used for every bank protection project to reveal these reach and other problems. Recognizing failure mechanism and analyzing reach and site conditions will then allow for selecting solutions that avoid and/or minimize upstream and downstream negative effects. To minimize negative impacts on channel processes and morphology, using the analysis and assessment outlined in Cramer et al. (2003) needs to become more of a reality for bank stabilization projects in WA. 3 Reduced habitat complexity, substrate coarsening, decreased channel migration, reduced LWD, reduced grave (and sand) recruitment and disrupted flow through hyporheic (beach seeps) alterations also occur on marine and estuarine shorelines. So, channel

		processes should probably be replaced by "bank" or "shoreline" processes to be more inclusive for the heading. Text within this section appropriately treats these mechanisms. 4 Levees are structures for flood control and although they may impact the flows of a river system during a storm event, the correlation to bank stabilization is unclear. If the reference to shortening of the river is in reference to not allowing the river system to shift, then this needs to be stated. Reference to the lack of LWM material recruitment due to a bank stabilization project assumes that bank contains trees, which is not always the case. 6 7.2.1 should mention the work of Beamer and Henderson (1998) documenting the reduction in density of various species of salmonids when comparing use in areas of hardened banks vs. those naturally vegetated. 7 See elsewhere, but this would appear to be the appropriate location of information on geomorphological change on estuarine/marine shorelines as a function of bank protection, but this section appears to be dominantly oriented toward riverine situations. If it fits better under 7.3 Substrate Modifications, then Morphology should be added to that category.
	7.3 Substrate modifications	1 Don't forget, as armoring deteriorates, it ends up on the beach/in the water and there is currently no requirement to remove debris, unless a new or repair is proposed/permitted. Then there <u>may be</u> a requirement to "clean up" the beach. 7.3.1.1: Some rockfishes do occur along the shoreline and associate with kelp, eelgrass, rocky substrate, and other structures, including bank protection and jetties. In the discussion of prey (i.e., surf smelt and sand lance) you forget to discuss other prey production (e.g., insects, amphipods, etc) lost as a result of lost backshore and riparian vegetation, wood and beach wrack. Also need to mention loss of refugia, where juvenile

		salmonids “stack up” against bulkheads due to the loss of shallow water habitat (see Toft et al 2004). Potential increased risk of predation? I have observed fish being driven up against hard structures by piscivorous fishes. 7.3.1.2: The first paragraph refers primarily to FW systems. Need to be clear about differencesThe Ahn and Choi reference does not seem to be applicable to WA State (study was done in Korea) and should be removed because it suggests a positive/beneficial outcome for inverts. Better to refer to Sobocinski (2003) and/or Sobocinski et al (2004) for effects on inverts. in Puget Sound. 7.3.2: What about marine shorelines??? Scour is typically increased at ends of structures and at base. 7.3.2.1: What about impacts to forage fishes in the marine environment? Prey production? Again, FW bias – very confusing and poorly organized/presented. 7.3.4: ~2500 miles of shoreline in PS Most beaches are not cobble, but rather mixed sand and gravel. For most beaches in Puget Sound, rivers provide a mere fraction of the sediment that forms and maintains our beaches. 7.3.4.2: Lincoln Park is probably a better example of sediment loss resulting from a bulkhead. It should at least be mentioned. 7.3.4.4: Regarding impacts to backshore/riparian vegetation and prey links to salmonids, see Sobocinski 2003, Sobocinski et al 2004, Brennan et al 2004, Brennan and Culverwell 2004, Brennan 2007. 4 Page 7-30: The term “scour” is usually referred to flow driven *vertical* excavation . The sentence as written infers that horizontal and lateral are different. 5 Notes that substrate modification does not apply to beach nourishment (p. 7-29), but it may be valuable to also discuss the placement of small gravel and sand in conjunction with other projects (i.e. habitat mix, fish mix, etc…), since it is a widespread practice and one generally implemented to improve habitat or mitigate impacts. The section on Altered Littoral Drift (7.3.4) would seem to fit better in Section 7.2 (Channel processes

		and morphology). Alterations to littoral drift (marine environments) can affect substrate, but also influence a wide range of other processes and habitat characteristics. Page 7-37. Para beginning "Revetments …" While it is true that revetments may dissipate wave energy better than vertical structures, they are usually constructed of riprap (with attendant substrate modification problems) and occupy a much larger footprint on the beach/shoreline than vertical structures. 7 7.3.3.: There is a lot of narrative that talks about fine sediment, coarse sediment, etc. with no values to explain precisely what sediment structure they're really talking about! Wouldn't these be important design/assessment criteria? Among the "Substrate modifications can have the following primary impacts on habitats of potentially covered species:" why wouldn't modification of substrate characteristics (size, sorting, etc.) be included? Relative to comment above, you already talk about it in the last paragraph of 7.3.1. In 7.3.2 Increased Scout of Substrate, doesn't "Changes in velocities and substrate sizes may accompany increased scour." sound a bit obtuse? Isn't scour <u>always</u> involve with a change (increase) in velocities? 7.3.2.2.: So, mussels are the only invertebrates of interest in this case???? 7.3.3.1.: Two question about the statement: "In addition to effects on the larval stage of salmon, embedding also reduces prey for foraging juveniles by promoting a shift from epibenthic to benthic infaunal macroinvertebrates, which are not easily preyed upon by young salmonids (Bash et al. 2001; Suttle et al. 2004). " (1) doesn't this belong in the next section? (2) This is a good case where it's uncertain whether this refers to freshwater or estuarine/marine circumstances,

		but it is important to know, i.e.., it probably applies to the former but wouldn't necessarily apply to the latter situation. 7.3.4.: See various Finlayson publications for excellent (new) information on Puget Sound beaches.
	7.4 Habitat accessibility	4 Section 7.44: Discussion of impacts to fish does not include temporary impacts from dewatering or diversions on migrating or traveling fish. This would also be an impact.
	7.5 Aquatic vegetation	1 In the discussion of vegetation, you should include backshore vegetation (i.e., salt tolerant dune and strand communities). In other words, not just intertidal, but supratidal and wetland plants. – I see this mentioned in the last paragraph. Since bank protection projects are often/usually placed below OHWL, backshore vegetation is lost. An important point to make about OHWL is that it is not an exact science, and the determination is often quite liberal. 7.5.1.1 The reference to Chinook feeding on a polychaete worm is a bit misleading. Seasonally, they fed on this worm, likely when they had emerged into the water column for spawning. It is also important to mention the large amount of terrestrial insects found in Chinook diets (50% by numeric count in both years), suggesting a strong link to terrestrial and backshore vegetation. Last paragraph in this section – include adult rockfishes associated with vertical structure, not just juveniles. 7.5.2: All true for marine as well…. Where's the marine evaluation????? 4 Section 7.5.1.1: What types of impacts could be expected to marine vegetation down drift of sediment pulses during construction? How would species in these areas be impacted? Marine vegetation is a significant rearing/nursery habitat for many fish. The section does not seem to fully cover these impacts. 5 7.5.1 Marine Aquatic Vegetation. The relationship between bank protection measures on marine shorelines and aquatic vegetation is important, but poorly documented. The emphasis in this section is

		on the value of aquatic vegetation to fish, not the effect of bank protection structures on aquatic vegetation, which is more to the point. I would suggest more reference to Thom et al, 1994, and in particular, to work based on beach work at Lincoln Park in Seattle. 7 Need to include the green algae (Chlorophyta), that also do not necessarily require hard substrate (e.g., *Ulva*, etc.) The statement “Blackmon et al.’s (2006) synopsis of research on the use of seagrass and kelp habitats by fish, it was noted that forage fish and juvenile Pacific salmon species preferentially use eelgrass over other habitats.“ may not be substantiated by the peer-reviewed scientific literature. To my knowledge, there is little/no basis for the statement “preferentially”.
	7.6 Riparian vegetation	1 7.6.1 is all in reference to FW systems. This does a poor job of covering important marine functions. See Brennan and Culverwell (2004). 7.6.4: What about marine shorelines? Armoring and associated activities do alter groundwater patterns that play an important role in habitat quality, especially for species that are sensitive to shifts in temperature and moisture. 7.6.6: Add: “Reductions in contaminants running off the land” as a bullit – this is well documented in both FW and marine settings, although there hasn’t been much work done on WA state shorelines. In the second to last paragraph of this section, you should add that organic debris (i.e., beach wrack) would be less abundant at armored sites due to the loss of upland source and increased energy of armored beaches. 7.6.7: For marine references/information, refer to Sobocinski (2003), Sobocinski et al (2004), Brennan et al (2004), Brennan and Culverwell (2004). 7 Section 7.6.7: Hard to imagine, but they actually failed to cite Sobocinski (2003).

	7.7 Water quality	1 What about marine??????????? In the last paragraph, you refer to the impacts of the structures………it is not just the structures, but the associated activities and alterations that are influenced by armoring as well. 3 7.7.1 – The document already lists Pentilla's egg mortality reference for importance of shade on saltwater beaches so this subsection needs to be titled simply "Water Temperature" and reference back to subsection 7.6.1 or remove this subsection altogether as superfluous to subsection 7.6.1. 7.7.4 – PSNERP conceptual model and the regional nearshore Chinook recovery chapter (extension from referenced Fresh and Averill, 2005) – suggest that bulkheading along marine shorelines can also disrupt the natural flow of freshwater from bluffs into beach seeps fragmenting the continuous reduced salinity corridor characteristics exhibited in many Puget Sound marine shorelines. Add lack of empirical studies on this phenomenon to data gaps in section 10.2. 4 Section 7.7.3: Discusses adverse impact due to uncured concrete coming in contact with water. Neither WDFW, nor Ecology, allows this. Concrete must cure for seven days prior to being in contact with waters of the state. It seems this discussion is irrelevant. 5 This section does not address turbidity and suspended solids, indicating it is already addressed in the chapter on Construction Impacts (7.1). Although turbidity is clearly associated with construction disturbance, I am surprised that more cannot be said of non-construction impacts from bank stabilization efforts on both freshwater and marine shorelines. The section on pH impacts – related to concrete curing – would seem to be in large part tied to construction practices.

8 Cumulative impacts		1 Needs more background on the State and Federal requirements/responsibilities for performing cumulative impact evaluations (and protection). Give CFR's and RCW's relevant to this. 2 The definition of what cumulative impacts for the purpose of this paper are is not clear. It does not explain that the cumulative effects considered are the effects of the subject compound action, of many bank stabilization projects per year over several years. Different from the 50 CFR 402.02 definition this section does not look at "future state or private activities", but solely at the interactive and synergistic effects of the individual actions making up the entire action. 3 While an emerging science, there are potential methods to at least semi-quantify likely impacts from shoreline armoring as suggested in my comment on section 4.2. County by county growth projections, build-out scenarios and likely shoreline development patterns may be reasonably forecast using CTED and county data, HPA database documentation, etc. This may require that the HPA database be upgraded to record shoreline length and parcel # for geospatially explicit impacts assessment. While this functionality may not currently exist, I think it will be necessary to adaptively manage HCP implementation. In addition to Table 7, 3 additional considerations should be included in a cumulative effects analysis. 1. Differential effects of bank protection on marine or lake shores where armoring is placed at or below the ordinary high water mark. Doug George from USGS in Menlo Park has conceptual and some empirical evidence from higher energy shorelines on how standing waves can form that accelerate the sediment transport disruption processes. 2. Projected sea level rise scenarios for Washington's marine shorelines and tidal river segments are likely to place more bank protection structures within and below the ordinary high water mark within the 50 year HCP analysis timeframe, regardless of the elevation at which they were built. 3. Responses of humans to perceived risk from sea level rise, associated erosion and even bank stability on streams affected by projected increased

		winter rainfall intensity scenarios from global climate change will need to be considered. 4 It seems that there are studies on the cumulative or compounding effects of riparian armoring. For example, some information on cumulative impacts can be gleaned from the numerous reports on stream urbanization from UW research. There are also studies from 2001 on cumulative impacts of bank stability on the Missouri River that may provide some analysis. 5 The list of three reasons why bank protection activities might have significant cumulative impacts on page 8-1 could be strengthened, in part by linking more directly to the categories and examples of impacts in Table 7. 7 Although thresholds are mentioned at the end of the Cumulative Impacts sections, there really is no description of how they characterize cumulative impacts, and in particular, how cumulative impacts are not simply additive…..but usually very non-linear, with inherent thresholds, saturation levels, etc. Good synthesis of cumulative effects; MUCH better than equivalent section in overwater structures white paper. Table 7 is very helpful but it might be even more so if the cumulative impact type is designated for each of the subtopics/pathways below.
	8.1 Construction activities	2 "The threshold for watershed and population size and the number of activities that must occur within a particular watershed to have a measurable cumulative impact are not established in the literature." However, literature laying the groundwork for establishing WS specific take thresholds is available. McElhany et al. (2000) introduces the viable salmonid population (VSP) concept, identifies VSP attributes, and provides guidance for determining the conservation status of populations and larger-scale groupings of Pacific salmonids. The paper outlines concepts intended to serve as the basis for a general approach to performing salmonid conservation assessments. McElhany et al.

		(2000) defines a viable salmonid population as an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time frame. For the HCP it would be useful to estimate the construction impacts on at least abundance and spatial diversity by watershed and set upper limits for take/impacts. In previous Opinions NMFS (e.g. 2004-01878) has established construction impacts on abundance that were below a not explicitly calculated jeopardy threshold. In that Opinion NMFS estimated construction impacts and put them in relation to the abundance of the WS and ESU.
	8.2 Channel processes and morphology	5 This may be the most significant category of cumulative impact as a result of the complex geomorphic linkages between bank stabilization and downstream and downdrift channel and shoreline processes, yet it is limited to a single, very general, paragraph. In the riverine environment, work by Montgomery, Buffington, and others, addresses sources of cumulative impacts in geomorphic systems. Macdonald et al, 1994, provides some additional insight into the cumulative impacts of bank protection on marine shorelines.
	8.3 Substrate modifications	
	8.4 Habitat accessibility	
	8.5 Aquatic vegetation	
	8.6 Riparian vegetation	1 Very weak! There is a strong potential for significant impacts and long-term effects that result from displacement (e.g., structures, impervious surfaces), and the time required to reach a fully functioning, mature canopy and understory (if allowed to occur) (e.g., loss of wildlife habitat, reduced water quality, loss of LWD and organic debris recruitment, loss of salmon prey, change in temperature regime – microclimate, potential for increased sedimentation, etc).
	8.7 Water quality	

9 Potential risk of take		1 Table 8: Again, apparent FW bias. Table includes channel processes, but nothing on beach/littoral processes. This is a major flaw. Why would you consider riparian veg. to be important for white sturgeon, but not green sturgeon? For surf smelt, N for aquatic vegetation?? What about prey production and refuge? Need a column for marine processes, even if it is for sediments. This would include introduction of large cobble/rock/boulder that would receive a Y for lingcod, rockfishes, and most other marine fishes (habitat structure, macroalgal establishment, food web links, etc). For rockfishes, I disagree that riparian vegetation has no potential for take. There are definitely food web likages (prey production, forage fishes, juvenile salmonids, and other prey, habitat structure – large rocks/boulders, large wood) for many of these species. P.9-7: The first paragraph is misleading. When and where do federal agencies quantify the extent of anticipated take for shoreline armoring projects. None exists if there is no federal nexus (most bulkheads) and HPA's do not require consultation, nor does WDFW, or anybody else attempt to quantify the amount of impacted habitat or anticipated take. I also disagree that "characterizing a project's take (can or should be) based on project size". Scale is a major issue and it is really the cumulative impact that is the killer. Second paragraph: Impacts associated with construction of bank protection are NOT "generally short term". Loss of vegetation, compaction of soils, materials left on the beach, etc., are not short-term impacts. 4th paragraph: I disagree with the statement: "A project's size and location certainly dictate the potential for and magnitude of take." Some areas are certainly more sensitive than others, and larger projects are likely to create larger impacts, but there

		needs to be a larger scale measure for evaluating the contributions of smaller projects as well (cumulative impact threshold). P.9-8: It is interesting to note that there is neither a technique for evaluating cumulative effects nor the outcome. This needs to be emphasized as a major flaw and risk. Many shoreline inventories have been conducted and could/have been used to evaluate cumulative effects, yet this does not seem to influence setting thresholds. Stating that integrating soft and hard elements would result in an intermediate risk is an oversimplification and ignores site/area specific sensitivities. 2nd to last paragraph on this page: This is a very important point, but leaves the reader hanging. It should also state that because of these associated impacts, the hydraulic code authority does extend above OHWL if activities will impact fish life (although it is rarely interpreted/implemented this way). P.9-9: The reference to Zelo et al. (2000) and description of their findings is incomplete. Should add: However, these alternatives were not considered beneficial, but may be considered as the less impacting alternative. Table 9: I disagree with the evaluation regarding construction-related activities, suspended solids. Under construction-related activities, chemical contamination, it should be noted that debris or material from armoring projects often does end up on the beach (or other water bodies) as they deteriorate and there is no monitoring or requirement to clean them up later. Bank protection projects rarely, if ever, achieve no net loss. There is no method or expectation for evaluating what portion of a bank protection project is “necessary” for marine projects as well.

		Repair or replacement infrequently reduces encroachment and sometimes results in more loss of intertidal habitat. Marine bulkheads are rarely located at or above OHWL. Also, by default, even SFR's should be required to use the least impacting type of structure (as in 220-110-280). Under "Substrate Modifications": provisions DO NOT provide enough specificity, or requirements to provide adequate protection. For saltwater, placement of gravel on a beach is NOT adequate mitigation. It is short-term mitigation that is typically driven off due to the increased wave energy where bulkheads occur. Timing restrictions are also inadequate – very short term and do not account for lasting effects of bank protection. Under Habitat Accessibility: provisions DO NOT provide protection and do not minimize risk of take. Riparian Vegetation: Requirements for revegetation do not account for temporal effects and loss of riparian functions. This includes reductions in water quality impacts. 2 The Whitepaper reads: "No explicit take thresholds (such as shoreline length) were identified during a review of bank protection-related biological opinions prepared by NOAA Fisheries and USFWS in recent years." The 2006 USFWS Restoration Programmatic Opinion (1-3-05-FWF-0167) does not consult strictly on streambank stabilization works. However, regardless of the type of work, it establishes upper limits in shoreline length for allowable construction impacts by major river systems. This is a good concept for a programmatic consultation or for any consultation that evaluates construction impacts from multiple projects over several years and could be adapted for the pending HCP. 6 Risk of take was divided into two categories, construction of the project and the existence of the project itself. A third category should be examined,

		project maintenance. Many projects, once constructed, require ongoing maintenance (tree removal, repair) that have adverse impacts to listed species. I disagree with the statement that "In terms of the risk of take associated with different types of bank protection techniques, bank protection projects that incorporate natural features and/or allow for partial function of channel-forming and channel-maintaining processes would have a lower risk of take than techniques that stop the functions In this way, soft armoring techniques have a lower risk of take than hard armoring techniques. In situations where some hard armoring techniques are necessary to adequately protect a bank, then integrated techniques that incorporate hard and soft elements would produce an intermediate risk of take. (p 9.8) As described in previous parts of this paper, bank stabilization by their very nature impede natural functions necessary to sustain salmon populations. Therefore, virtually all bank protection projects take fish, there really is no element of risk here. What is true is that the magnitude of the take will vary based on the technique employed, but some level of take will occur. I believe this is a fundamental flaw in the approach being taken in this paper to determine adequacy of current techniques. By saying that one class of activities has a lower risk of take than another does not address the cumulative take that does occur even under "low risk" scenarios. It should also be pointed out that the ISPG has not, to my knowledge, ever been peer reviewed by individuals from the university or Tribal communities. Further, while it provides an opportunity to evaluate impacts on a reach level basis, it provides for a number of alternative approaches for bank protection based on site characteristics, but there can be significant differences in the level of take depending on which approach is taken by the biologist, and since these are merely guidelines, there is no directed outcome that is determined by utilizing the ISPG. Since bank protection, even utilizing ISPG, results in impacts to natural riverine process, mitigation for the activities associated with ISPG should become part of

		the protocols. 7 The statement "An understanding of the conditions and processes throughout a larger reach of the water body is necessary…" hidden in this section is an important one, that perhaps should be raised earlier (at least in Cumulative Impacts) as a dedicated discussion about the role/importance of landscape setting (e.g., littoral drift cells in estuarine/marine settings). The statement "bank protection projects have the potential to generate significant risks of take when the cumulative impacts of multiple projects are considered." is an extremely important one, that I'm not sure was well represented/highlighted in the Executive Summary? This point should not be lost in all the other detail!
	9.1 Evaluation of risk of take under existing statutes	6 There should also be an evaluation of the existing policy guidelines that are part of the HPA program to determine its adequacy. Four examples come to mind. First, denial of an HPA requires approval at the Deputy Director level. It is extremely rare that denials occur, and impacts are avoided. The outcome is therefore the inappropriate use of the ISPG. Second, it is our understanding that HPA's are not written for projects constructed by the Corps of Engineers, even if on private or State lands. This appears to increase the risk of take as part of the State's HPA program. Finally, there is no requirement for additional mitigation when the ISPG is used, even if there are adverse habitat impacts. Finally, there is no requirement to demonstrate the when mitigation measures are employed that they are commensurate with the impact.
	9.2 Evaluation of relative risk of take associated with bank protection structures	1 Question: Was the "project team" composed of individuals that are intimately familiar with bank protection projects? Unless there are habitat biologists with years of experience on this team, many of the implementation issues are going to be missed and the evaluation will be weak The number of flaws in this table are too numerous to list and it is difficult to track the rationale for how each category was selected. Much of the information/content of this table is oversimplified,

		overly general, or doesn't recognize variations in location, type of project, temporal loss, and associated impacts or weakness in proposed mitigation. 3 It is completely inappropriate to describe risk solely at the project scale. As the white paper already acknowledges that these activities disrupt natural processes, the spatial and temporal scale of those process that are interrupted are beyond project scale. It may be important to discuss certain concepts as thresholds qualitatively. It's generally understood that armoring across an entire littoral drift cell could irreparably damage sediment transport processes leading to beach steepening and coarsening and loss of depositional features downdrift such as sand spits, barrier lagoons and barrier estuaries which support many of the covered species. Empirical case studies on this phenomenon are crucial to establishing those thresholds even semi-quantitatively. See suggested mitigation strategy on my subsection 11.2 comment. 6 A statement that claims that "activities in the low risk category appear to be well-suited for programmatic approval" ignores cumulative impact effects, and ignores the fact that while there may be a low level of take, take may very well be occurring, and on a programmatic level the impacts can be significant. Vertical retaining walls: I believe there could be a significant take associated with rock retaining walls that precludes the use of floodplain terraces during high water events because of the placement of the wall Log Rootwad Toes: Merely incorporating wood into a bank protection project does not avoid take. If this toe prevents side channel formation, access to sidechannels, or disruption the natural stream process that create new habitat, then this process may result in a significant amount of take. Because bank protection is comprised of root wads does not make this a low risk to take, it only makes it less bad than other techniques. This concern is applicable to all instances in the document that asserts that the use of wood or log structures will result in a low risk of take. This must be evaluated in the special context in which it is

		being employed.
10 Data gaps		This section should also discuss as a data gap the lack of empirical information to determine the effectiveness of the current implementation of the HPA program as it related to bank stabilization projects. For example, how well does the program work under emergency conditions, has there been enforcement of permit conditions, has mitigation been commensurate with impacts, has the ISPG been adhered to, and if so, has it been effective is meeting the no-net loss standards of the HPA program, what type of bank protection permits have been denied, and for what reasons. Absent an analysis of the effectiveness of the implementation of the current program, it will be impossible to determine if the addition of new bank protection measures will be compliant with ESA. An additional data gap is an assessment of whether mitigation measures are commensurate with the impacts associated with permitted activities. Is the no-net loss standard being met? 7 VERY SPECIFIC recommendations are needed here; this really doesn't provide any rationale or argument for further studies that will prompt a manager to read further.
	10.1 Direct impacts of the covered activities to potentially covered species	1 While I agree that there is a need for more information on the physical and biological impacts, I believe we already know the answer, based on current knowledge and models. In addition, it may be more important to look at the impacts to a suite of elements, rather than simply looking at one element (e.g., LWD, sediment composition) if we really want to understand how much of an impact a single, or multiple structures have. Given that much of our shorelines are already modified by shoreline armoring, and there are other factors that may influence results (e.g., working from a modified baseline), it may be difficult to get accurate results. It would be helpful if we could find large areas of undisturbed shoreline (or rivers) that could be used as references – this will be important for understanding many of the other study results.

		6 One impact not addressed is the downstream displacement of juvenile salmonids during high water events as a result of decrease in low velocity areas resulting from simplification of streambanks, or from an increase in depth and velocity as a result of bank armoring. Fish displaced to salt water prematurely, or into areas that currently sustain high densities of fish will be put at risk of increased mortality. A second data gap is an evaluation of the loss of recruitment of large wood as a result bank protection maintenance, and the increased export of wood out of the river system as a result of the cumulative effects of bank protection. The lower Skagit River is a good example of a river system where there is little opportunity for wood to become entrained within streambanks, and little opportunity for the recruitment of wood from riparian areas. Analyses should be conducted to determine the frequency and consequences of the issuance of emergency permits. Analyses should be conducted to determine the frequency and consequences of determining that intolerable consequences or extreme site condition determinations are made to provide for installation of new rip rap.
	10.2 Indirect impacts of the covered activities to potentially covered species	3 See comment on 7.7 See comments in 10.1
	10.3 Cumulative effects of the covered activities to potentially covered species	1 Ditto to direct impacts, especially for understanding larger scale impacts. 3 See comment on 9.2 5 Possibly add new bullet: Improved understanding of relationship in marine systems between reduced sediment availability and downdrift response of beach elevation and substrate See comments in 10.1

	10.4 Conservation measures, best management practices, and mitigation	1 Add: Evaluation of existing mitigation measures in achieving "no net loss". Also need to track and evaluate impacts at multiple scales, not just watershed scale (may loose the signal, or be working at too large a scale to provide adequate protection where important, smaller scale habitats occur).
	10.5 Management recommendations	
11 Habitat protection, conservation, mitigation, and management strategies		4 The use of the term 'mitigations' is not appropriate when discussing ESA requirements pertaining to 'take' 6 Table 11 does not provide a pathway for avoidance of impacts, and the document does not provide specificity regarding when the Department should avoid impacts. Further, while the BMP's identified in Table 11 may, in many instances reduce impacts, there hasn't been documentation provided to demonstrate that impacts are minimized. Absent an analysis of the current implementation of the program, it is unclear as to how it has been determined that impacts have been minimized. A good example is in the riparian protection description, when in each instance there is a loss of vegetation, and these particular losses are not mitigated. Language that states that it is important to "leave as many existing trees and vegetation in place as possible" provides for a significant range of interpretation. 7 Conservation, etc. measures are not just design (structural) elements; in fact, in some respects, they are the last recourse. Regulation, enforcement, education, BMPs, etc. should all be considered part of the toolbox.
	11.1 Avoidance and minimization techniques	1 Table 11: For Construction Activities and Riparian Vegetation: Develop, or better yet, maintain adequate vegetation buffers (Brennan and Culverwell 2004; Brennan 2007) also add these citations to conservation measures and BMP's for riparian vegetation. Add: Low Impact Development Techniques (See LID

		Manual, (Hinman 2006?) 4 The term conservation measures indicate that a method for restoring or preserving a population will occur rather than minimizing the impact of an action. 5 Distinction between Conservation Measures and BMPs is not clear. 6 See comments for section 9 regarding ISPG. Further, it appears that there is an assumption that following the ISPG results in no-net loss, and additional mitigation is not necessary. Because ISPG provides for the choice of multiple options, this is not necessarily the case. Mitigation should be built into the ISPG process.
	11.2 Mitigation strategies	1 Where has it been shown that beach nourishment has a long-term positive impact, other than where such application was an "improvement" of degraded conditions, or was the less-impacting technique? This document appears to be promoting beach nourishment without adequate documentation or evaluation of its impacts, or a clear rationale for when, where, and how it might be appropriately applied. Table 12: Soft-shore armoring or bioengineered solutions, spawning gravel supplementation or beach nourishment are NOT compensatory mitigation. Replacing lost riparian or aquatic vegetation is NOT compensatory mitigation. Need to account for disturbance and temporal losses. All of the items listed are reduction or minimization and do not fully compensate for adverse impacts. 3 Effectiveness of site-based mitigation strategies has been called into question in recent years, specifically in the wetlands regulatory arena (see Mockler/King County and Ecology reports). Generally, these functional failures are due to lack of mitigation actions appropriate to the scale of the process interruption. WDFW and the federal services should not expect to be able to mitigate for cumulative effects solely through tweaking design BMPs and site-specific

		mitigation conditions, especially the ongoing temporal effects of an ever-expanding base of permitted process-disrupting structures. Consider an acknowledgement of each HPA's cumulative and unavoidable impacts and require a Resource Impact Fee to capitalize a programmatic restoration fund. This fund can then be used by the department to mitigate cumulative impacts at the appropriate scale of the disrupted processes through strategic land acquisitions and process-based restoration projects. 4 Mitigation is an inappropriate term for dealing with Habitat Conservation Plan under ESA. 6 This section needs significant work. If in fact following the ISPG results in the loss of habitat, than strategies and protocols should be establish that (1) could require that mitigation be done (2) direct staff as to how and where and what types of mitigation is appropriate (3) mechanisms to insure that mitigation actually occurs (4) establishes how mitigation will occur for projects that take place under emergency conditions and (5) require some documentation to insure that mitigation is commensurate with the impacts and based on proven habitat protection/restoration techniques. 7 Section 11.2: Remember that the first definition of mitigation is "avoidance." Should probably call this "Compensatory Mitigation Strategies"?
	11.3 Management strategies	1 11.3.1: Allowing private companies to inspect and approve projects would be very costly and does not assure that they have the experience or knowledge to evaluate projects. There is also the risk of "buying an opinion", which is an existing problem in some cases. Beach nourishment is NOT something that should be promoted or allowed without proper evaluation of impacts. I find it disturbing that this paper seems to be promoting this practice without identifying some of the inherent problems with such practices. Eliminate the last bullet. Programmatic coverage, especially that based on project size, does nothing to protect natural resources or covered species. It only makes the process easier for the project proponent and

		the permitting agency. Additional staff, with the expertise and experience should be hired by WDFW and retained as long as possible. The WDFW should also receive adequate funding to perform necessary site/project reviews, monitoring and enforcement. Regulations should be strengthened to eliminate loopholes/weaknesses and to assure that full compensatory mitigation are mandatory. 11.3.3 Suggestion: In addition to recommending gathering more information, how about evaluating existing data and/or establishing a moratorium until the level of impacts/thresholds can be determined? As it stands, my impression is that this will only "monitor the decline/degradation" and puts off much needed actions to protect what is left and prevent additional damage. 11.3.4 Education should include policy-makers and mid-upper level managers. 2 The Regulatory Recommendations seem useful. Addition: Many small and residential projects do not meet the no-net-loss standard and often do not offer much opportunity for mitigation. Check into developing Conservation Banks for these small impacts. All the Education Recommendations are very good. Hopefully some will turn into reality. 4 11.3.1 Regulatory Recommendations: Care needs to be taken when 'requiring' certain actions across the board as a regulatory requirement under a WAC. This approach may remove any flexibility based on the size, scope, location, and impact of a specific project or activity (especially for small scale projects) and lead to unreasonable and unrealistic requirements put on some projects. Inspections and sign off can only be to insure the conditioned work activities is being performed per the plans submitted for the permit. Any delays caused by

		waiting for an inspection or sign off could result in the project extending beyond the in-water work window. It may be unrealistic (or over restrictive) to establish a fish work window that covers all requirements for all species that may be at a site during construction. 5 No reference to Integrated Streambank Protection Guidelines (ISPG). No mention of benefit of reach-scale analyses or evaluation of site context prior to identification of project design or appropriate mitigation. 6 It is also my understanding that in many instances that reach level analysis is often not done due to the lack of date, or done by staff without appropriate expertise. One strategy might be to require documentation on the HPA of reach level analysis prior to the selection of bank protection measures. Other regulatory measures that should be evaluated are: (1) have the HPA authority extend beyond OHWM for bank protection projects (2) Change the emergency procedures element of the HPA program so that entities do not take advantage of emergencies to undertake work that should have been done via the normal permit process. (3) Establish a requirement that mitigation for emergency work must be determined and implemented within a specific time frame following an emergency or work done during the emergency will be removed (4) Require coordination with Tribal and other interested governmental entities in the issuance of bank protection HPA's (5) Incorporate within the HPA program standards for mitigation associated with bank protection projects. For example, tree replacement ratios for replanting on or off-site for the removal of mature vegetation. (6) The HPA program has as its sole criteria for the protection of fish life, yet biologists are frequently put in the position of choosing between protecting fish life or private or public property. Standards should be established that provide for less subjectivity in determining to what extent fish will be compromised

		in order to protect private interests. The ISPG recommends that new riprap installations should be built " only where bank failure would have intolerable consequences or where site conditions are extreme". How is the biologist to determine what is intolerable or extreme, and how is this valued against the statutory requirement of the act, that requires fish life to be protected. Clearly the proliferation of rip rap projects indicate that intolerable consequences occur quite frequently. Enforcement Regulations: I assume a more robust discussion associated with this section was inadvertently left out of the document. Clearly a discussion regarding the adequacy and efficacy of current HPA enforcement measures associated with bank protection projects is warranted, as well as a discussion as to additional financial needs and regulations necessary to insure an effective enforcement component for this portion of the code. 7 Would it be worthwhile, perhaps under Section 11.3.3., to recommend agency/state collaboration with research to address basic science gaps, e.g., through either direct collaboration between agency and academic scientists, or direct contracting/granting mechanisms, or through provision of matching of Federal funds?
12 References		
TABLES		
Table 1 Potentially covered fish and wildlife species		4 Green Sturgeon are federally Threatened. 7 Check for correct (up-to-date) Latin binomials; some may be out of date, e.g., Pacific/Olympia oyster, *Ostrea lurida* = *Ostreola conchaphila*; Pacific herring, *Clupea harengus pallasi* = North Pacific herring, *Clupea pallasi pallasi*; etc. See FishBase, http://www.fishbase.org/search.php

Table 2 Count of HPAs between 1986 and 2006 that included bank protection as a project type		4 Description in text on number of projects per environment does not coincide with table numbers.
Table 3 Range of potentially covered species		4 Clarify what “Columbia and Snake Rivers” means; are WRIA’s that include those rivers included in the range or just the portions of those rivers that occur within the WRIA’s listed are included. For example, are kokanee in Lake Roosevelt included under sockeye because it is the Columbia River. 7 See comment for Table 1. Table 2: Why would Pacific Herring not be included in ALL Tidal Reference Areas? It is erroneous to suggest that Pacific herring, particularly as larvae and juveniles, don’t occur in South Puget Sound, Edmonds, Everett, etc. regions. This table needs to be thoroughly reviewed and revised.
Table 4 Habitat requirements of potentially covered species		7 Table 3: At least for the marine species, there are too many inaccuracies and inadequacies for many species to cite them in detail. But, in particular, the data available on nearshore habitat associations and linkages for the salmonids; many of the Puget Sound specific data/information has not been utilized; it seems to reflect that the authors really were not very familiar with the greater body of literature for at least the life history and ecology of estuarine/marine species. If this is to provide important indicators of habitat and other dependencies, someone who is more knowledgeable and paid needs to review/update this information!
Table 5 Principal impact mechanisms evaluated		7 This table might be more appropriately labeled as “Category” in the left column and “Mechanism” in the right column?

Table 6 Estimates of thermal conditions known to impact salmonids		
Table 7 Types and examples of cumulative impacts		
Table 8 Summary of potential for incidental take of potentially covered species		7 Potential take assessments appear to be generally well attributed among species. There are perhaps a few questionable ranks, such as N for lingcod habitat accessibility, but not too many that are intuitively contrary to the present literature and knowledge.
Table 9 Evaluation of existing WAC and RCW provisions and risk of take		2 I agree with the deficiencies in the current WACs pointed out. Dealing with those deficiencies should help minimize take and impacts to critical habitat. Additional deficiencies: All bank stabilizations should have to go though an analysis process and selection of least impacting treatment process as outlined in Cramer et al. (2003). Currently, there is still too much rock and concrete used where less impacting methods would suffice. The "no-net-loss" provision does not translate into reality. Some serious thought and innovative approaches (conservation banking?) are necessary to improve in this area. Some evaluations point out too little specificity in the WAC; e.g. Channel Processes. However, with each project having different site specific conditions not everything can be solved with more specific WACs. A better or at least companion way should be to allow the HPA biologist sufficient time to address a project. Currently, the administration of the HPA program does not only suffer from outdated WACs, but from a too high caseload for most HPA biologists.

		4 Construction-Related Activities: It may be unreasonable to identify timing restrictions that will work for all potential species. 7 Great table!
Table 10 Evaluation of relative risk of take associated with bank protection structures		5 Beach Nourishment. Table addresses turbidity and aquatic vegetation concerns. It does not address aspects related to forage fish spawning beaches. It also fails to address short term versus long term impacts -- nourishment may adversely impact certain habitats in the short-term in some settings, yet provide net benefits in the long term. Also under beach nourishment: Implication that OHWM and MHHW are interchangeable. On marine shorelines, MHHW often lies 10-20 feet waterward and 1-3 feet lower than OHWM. 7 Equally good table!
Table 11 Conservation measures and BMPs		2 It would be helpful to indicate where these measures come from (commonly used HPA conditions?). 4 Construction Activities: NOAA and USFWS do have qualifications for personnel who are conducting electrofishing activities. Those assisting "the qualified personnel" should not be required to have specialized training, but should be under the direct supervision of the person that does. Impact hammers may be necessary to 'proof' piles. Channel Processes: For short duration dewatering activities, it is unreasonable design the dewatering system for a one-year flow event. This type of condition needs to be site and construction duration specific. Consideration should be given to whether the dewatering process has a greater impact on the species than performing the work in the wet. Aquatic Vegetation: Has it been proven that

		monitoring a site for ten years increases the survival of plant material and vegetative coverage? If so, provide reference that supports this concept. What information would the monitoring process be gathering and how would that information be used by WDFW? The use of stem counts for establishing "the success" of a planting is not a viable option after the first year or two. The monitoring process and development of reports can be very time consuming and costly so there needs to be a clear correlation between the monitoring requirement and the desired outcome of the plantings. Riparian Vegetation: Requiring monitoring of up to ten years for riparian revegetation seems excessive and outside the scope of current monitoring requirements, which are three years. Please cite resources that indicate the benefit or need for this requirement. The exclusion of non-native plants from a revegetation site is unrealistic. There are many indigenous plants that provide the same functions as native plants. Also, for the purpose of erosion control, native grasses are not desirable due to the long duration required for most of them take to germinate and establish a substantial mass to stabilize soils. Requiring the removal of non-native plants may require an excessive use of chemical applications in order to meet this requirement. Saving vegetation and LWM material removed from a site for future use is problematic. If saving material is requested by WDFW, then they must accept ownership and responsibility for the material upon removal. 4 Construction Activities. Second bullet addresses upland drainage issues, which I do not believe have been addressed previously in document. In addition, it is not clear whether this is a construction impact or an ongoing practice associated with upland development. 7 Is habitat accessibility only applicable to freshwater systems?

Table 12 Bank protection-specific mitigation measures		4 The use of the term ‘mitigation’ when discussing ‘take’ under ESA is inappropriate. The White Paper should be addressing conservation measures. Substrate Modifications: Requiring periodic supplementation of spawning gravel or beach nourishment material is unrealistic and would require additional permitting from other agencies (including the Corps of Engineers). Habitat Accessibility: Off-site construction of a side channel would be considered an excessive requirement and outside of the scope and funding of most projects. This may be appropriate in the case that a bank protection project would result in jeopardy of a species unless side channels were constructed. Where bank stabilization is performed to protect an existing structure, it is unlikely that the system would be developing a viable side channel for rearing and spawning habitat. Mitigative measures need to be based on existing conditions, functions, and impacts. Aquatic and Riparian Vegetation: The phrase “re-establish riparian buffer along bank shoreline” needs to be clarified. If no existing native woody plant material is impacted, would additional plantings be required? The revegetation requirements should be proportional to the plant material impacted. Retaining removed vegetation and LWM for other restoration projects can be cost prohibitive, depending on the time until its reuse and the distance from the site for the proposed project. Once the material is removed, it becomes WDFW’s material to distribute to restorations projects, as they feel appropriate. WDFW should consider developing its own holding areas for these types of materials so restoration groups can utilize as needed. 5 Channel Processes and Morphology. The basis for including energy dissipation structures, as mitigation is not established. “Further erosion” is not what needs to be mitigated.

		Substrate Modifications. The use of beach nourishment as mitigation is also discussed in Shipman, 2001.
FIGURES		
Figure 1 Conceptual framework for assessment		7 Fig. 1: Although this is a popular figure and is not incorrect *per se*, it really does pose some confusion because of its linear organization. Rivers and estuarine/marine nearshore ecosystems, like most ecosystems, do not function is simple linear fashion. Habitat structure, for instance, can just as easily provide ecological function as habitat processes, and habitat processes and ecological function may have feedback to habitat structure. Instead of just adopting information outright, the authors might think about how THEY see the scientific knowledge expressed, in this case in a non-linear organization with considerably more feedback?
APPENDICES		
Appendix A Maps: TRAs and WRIAs		
Appendix B Data compilation of the effects of turbidity and suspended sediment on salmonids by lifestage		
Appendix C Data compilation of the dose response effects of suspended sediments		

GENERAL QUESTIONS	
1. List any additional sources of information you have not already identified that should have been reviewed and incorporated into the analysis. Are there any sources that were used that you feel should not have been? Why?	4 There may be additional impact analysis resources that can be compiled from research on urban streams that could be used to provide additional information on anticipated impacts from projects. 6 A Critique of the States Hydraulic Code by Hollowed, J and Larry Wasserman, Center for Natural Resource Policy, 1999. (WDFW has been provided a copy of this report) 7 There are MANY gray literature sources that were missed/ignored, but there are several that are important to Section 7.8:Finlayson, D.P. , 2006, The Geomorphology of Puget Sound Beaches (9.5 Mb PDF), Dissertation . School of Oceanography, University of Washington, Seattle, WA: 216 p. Finlayson, D.P., and Shipman, H., 2003, Puget Sound Drift Cells: the importance of waves and wave climate (263 Kb PDF), Puget Sound Notes: Olympia, WA, p. 1-4. Finlayson, D. 2006. The geomorphology of Puget Sound beaches. Puget Sound Nearshore Partnership Report No. 2006-02. Published by Washington Sea Grant Program, University of Washington, Seattle, Washington. Available at *http://pugetsoundnearshore.org* See for synthetic description of juvenile salmon utilization and "dependence" on Puget Sound shorelines: Fresh, K.L. 2006. Juvenile Pacific Salmon in the Nearshore Ecosystems of Washington State. Puget Sound Nearshore Partnership Report No. 2006-06. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington. Available at: http://www.pugetsoundnearshore.org A MAJOR work on bank protection is the MS thesis by Sobocinski: Sobocinski, K. L. 2003. The impact of shoreline armoring on supratidal beach fauna of central Puget Sound. MS thesis, School Aquat. Fish. Sci., Univ. Washington, Seattle, WA. 83 pp.

2. In general, what aspects of the paper do you feel are particularly flawed? Why? How could they be improved?	5 Changes to channel processes and morphology were recognized as an important mechanism by which bank protection to lead to adverse habitat impacts, but the discussion might have been improved with more geomorphological discussion and references. This is difficult in a fundamentally biological document, but this connection is important in evaluating indirect and cumulative impacts. 6 This paper does not really look at the magnitude of take associated with the proposed management strategies. Rather, it assumes that low risks of take are an appropriate approach to its HPA program. It ignores the cumulative or site-specific effects of low risk approaches by comparing them to intermediate and high-risk approaches. The Department should provide for an assessment as to why a proliferation of low risk take actions will result in the protection and recovery of listed species. Further, it relies too heavily on the ISPG process as the mechanism to minimize take without an analysis of its effectiveness if implemented correctly, or an analysis of whether it is being implemented correctly. Also, there is no quantitative or special analysis of bank protection projects to determine if the program as described will be effective, particularly in light of the difficulty in denying projects or dealing with emergency activities. There should be a basin-by-basin, or region-by-region analysis of the current effectiveness of the program. I also believe that a survey should be conducted with area habitat biologists to consider their evaluation of the current effectiveness of the program and what could/should be improved, or what may be working. It should also recommend outright prohibitions of certain activities that have significant fisheries consequences. Since there is no real mechanism provided to assess cumulative effects, no standards by which field staff can determine how to deny a project, the process as described ultimately results in a continuation of incremental losses of salmon habitat. As mentioned in Section 11.3, determinations by biologists that intolerable conditions exist is a common determination, but an empirical analysis under which these determinations are made would be useful to evaluate the reason for the proliferation of new rip rap projects. 7 One comment is more about the absence of something, rather than problems with something that's problematic with the existing paper: there is a significant lack of context to the way that Puget Sound basin rivers and shorelines function in the

	absence of bank protection and the ecosystem processes and functions/goods/services that benefit human society. I would think that an important contribution to understanding the impact of bank protection would be an explanation of what is at risk in terms of natural processes that are inhibited by bank protection in various ways. For instance, I've seen very few explanations or references to feeder bluff supply of sediments that sustain beaches within littoral drift cells. Not exactly a fundamental flaw, but the dominant use of other synthetic white papers, i.e., gray literature, instead of the primary literature is somewhat disturbing…it is yet one more step further into potential misinterpretation. In fact, the real problem is that the reader doesn't really know what the validity and level of peer-review supports a particular interpretation without knowing and being able to reference the primary literature source. The general lack of much peer-reviewed literature should be discouraging from a number of points, only one of which is the poor referencing to the original sources of these interpretations.
3. In general, what aspects of the paper are particularly well done and successfully convey the information	6 The analysis regarding the impacts of bank protection activities on habitat and biota was well done, with adequate citations. 7 One of the better aspects of this white paper is the consistent synthesis of threshold effects, which may provide some of the more important information to HCP planning.

4. Please provide any additional comments.	1 Overall, there appeared to be a strong bias toward FW systems and exclusion of adequate evaluation of impacts for marine projects. The document often mixed FW and marine evaluations, or simply stated FW assessments, which could be applied to marine systems, but was not explicitly stated. Much of the paper needs to be reformatted and rewritten to clearly identify what applies to FW or marine systems. Associated impacts are not well covered, yet these are often some of the greatest impacts, or are the cause of bank protection projects (e.g., building in harm's way). This applies to repair and maintenance, illegal/unpermitted activities, inadequate enforcement, poor mitigation, and politics. Also, the piecemeal and disconnected manner in which permits are authorized (and disconnect between local jurisdictions and State authorities) all account for poor protection standards and increased risk to listed or potentially listed species. Spatial, temporal, and cumulative impacts are either not addressed, or are poorly covered (or minimized – to site and/or instantaneous impacts only). 4 WDFW needs to insure that any additional legal requirements or conditional requirements are consistent with the other state and federal agencies that also have jurisdiction over bank protection work. WSDOT has concerns about the use of 'mitigative measures' under a HCP that are more restrictive than the conservations measure established by the Services when impacting ESA listed species. Any additional requirements or conditions developed from this white paper need to take into account the size, scope, location, duration and impact of the actual project. Generic conditions or requirements may be unrealistic for small-scale projects or ones located in highly disturbed areas. Although the white papers (Bank Protection and Water Crossings) are covering different topics, some of the processes/impacts are the same but they are addressed differently and sub-grouped differently. The list of potential impacts should be identified for all the white paper topics; they all should use the exact same terminology.

	5 The report is organized around impact mechanisms, rather than around geomorphic settings. I recognize the challenge in structuring a complex report of this type where there are concerns about different impacts to different species in different places, but I believe breaking the report down by setting (river, lake, marine) might make it both easier to review and to apply. 7 It probably depends a lot on what one expects from a Executive Summary, but in this (and the Overwater Structures) whitepaper, I found the information so over-generalized that it really doesn't say much at all. For example, the "…are identified.." content of the first sentence under Data Gap is illustrative of rather valueless narrative. I thought executive summaries were supposed to be condensed versions of the most significant findings, substantiated with specific facts and examples, relative comparisons of impacts, recommendations, etc. Simple diagrams or photographs of the different bank protection techniques (and integrated versions) would be somewhat helpful? Don't know if it's appropriate to compare the two white papers I've reviewed, but (this) the Bank Protection White Paper is much more completely and expertly written than the Overwater Structures White Paper, particularly from the standpoint of explaining the processes and interactions that link the associated activities with impacts on organisms and their habitats. This paper could serve as a 'model' for further revision of the more deficient papers. Although it might add some artificiality and yet another layer of headings, it might help the organization to have subheadings for riverine and estuarine/marine settings, as is done in Section 7.5. It is often difficult to figure out whether the narrative is talking about one or the other?

APPENDIX E		
Reviewers' Comments on Water Crossings White Paper		
PEER REVIEW COORDINATOR NOTE: Five individuals reviewed and comment on this white paper. Each was assigned a number, 1 through 5. Each individual's comments are identified by that number at the start of his/her comments for a particular cell in the reviewers comments column. The comments are from that reviewer until the start of a paragraph begins with the number of another reviewer.		
SECTION	**SUB-SECTION**	**REVIEWER'S COMMENTS**
Executive summary		1 Paper is void of any mention of critical habitat, which is a major component of most ESA analysis.
	Table ES-1	2 Overall the review is well written and most of the freshwater topics are covered in depth. Although, I feel the authors did a good job reviewing the potential impacts of water crossings on freshwater aquatic systems, the review would be strengthened by a broader discussion of potential impacts on marine and estuarine systems. In particular, bridges along shorelines in Washington state often span the openings of large and small pocket estuaries. In many cases artificial rip-rap fill has been added to narrow the bridge span and movement of rip-rap and accumulation of material beneath the bridge can form an intertidal dam, restricting drainage of tidal channels during low-tide and causing artificial pooling of stagnant water upstream of the bridge. The pooled water can accumulate sediments, become anoxic, and/or can increase in temperature during the summer or decrease in salinity during rainfall events causing thermal or other physiological stress to migratory species entrapped during ebb tides. The authors should discuss the potential impacts of restricted tidal-hydrology on species and habitats. I am also unclear as to why avian and marine mammal species were not included in these assessments, and more discussion of the impact of water-crossings on non-salmonid marine and estuarine species should also be included.
	Water quality	I disagree strongly with the statement "In contrast, incidental take risk associated with dissolved oxygen impacts is probably quite low", in fact unanticipated changes to water circulation can often result in low oxygen conditions.

		4 It is stated that WDFW's objective is to avoid, minimize, or compensate for incidental take. It is not feasible to compensate (mitigate) for take of ESA listed species. The Executive Summary refers to impacts associated with the construction and operation of water crossings. There was little to no information in the document pertaining to the operation or maintenance activities associated with such structures. ES1 Risk of Take and Potential Minimization Measures Compensation for the incidental take of species is not possible A take is a take, you can only avoid or minimize incidental take. TABLE ES1- This section is not clear as to what kind of impacts (Direct, indirect or cumulative) **Embedding is not** due to reduced sediment transport capacity and is a direct result of bank erosion Deposition is due to reduced sediment transport Deposition and Embedment are two completely separate things. **Scour is not** due to locally increased transport capacity. Local scour is due to increased turbulence due to an obstruction to the flow. **Deposition** downstream of scour areas – Temporary impact of short duration and small in size. **Rapid channel change** via migration or channel avulsion due to accidental flow obstruction, particularly flow blockage, from an artificial structure such as an ELJ. New bridges and culverts are required by law to be designed to pass Q_{100} flows plus debris. **Loss of riparian vegetation** due to bank erosion would be a secondary impact not directly caused by a water crossing but by some other force acting upon a water crossing site.

1 Introduction		"*An HCP must outline conservation measures for avoiding, minimizing, and mitigating, to the maximum extent practicable, the impacts of the permitted take on the potentially covered species*." Comment: should read, "potentially covered species and their habitat.
	Table 1	2 Marine mammals (e.g., Orca) and sea and shore bird species of concern are missing from the table (and the white paper evaluation?) but may be affected directly or indirectly from water crossing structures. 3 Intro is repetitive and overly lengthy. 4 Southern DPS of green sturgeon has a status of FT in WA state (Columbia R., Grays Harbor, and Willapa Bay) Section 11 – "Strategies and management recommendations to offset potential impacts" is not consistent with the title or context of the actual Section 11 "Habitat Protections, Conservation, Mitigation, and Management Strategies".`
2 Objectives		4 It is not feasible to mitigate the risk of incidental take of potentially covered species. The use of the term "mitigating" is inappropriate when discussing take under ESA.. Compensation for the incidental take of species is not possible. You can only avoid or minimize incidental take.
3 Methodology		
4. Activity description		4 The Corps of Engineers has issued the new Nationwide Permits for 2007. Bridges and culverts should be defined using the definitions from 23USC144. **DEFINITIONS** (23 USC 144 and 23 CFR 650.305) **Bridge**: A structure including supports erected over a depression or an obstruction, such as water, highway, or

		railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet (6.1 meters) between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. **Culvert**: A structure designed hydraulically to take advantage of submergence to increase hydraulic capacity. Culverts, as distinguished from bridge type structures, are usually covered with embankment and are composed of structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert. Culverts that meet the NBIS definition of a bridge are considered bridges from a legal standpoint and thus are subject to all requirements of the NBIS.
5 Species and habitat use	Table 1 and in text Table 1 and 2	2 I was under the impression that WRIAs contained a nearshore component (where WRIAs meet the sound, straits and coast) in which case many of the marine species listed would be found within WRIAs that border marine bodies of water. Shark species, in particular 6 and 7 gill sharks utilize intertidal areas to some degree – on the coast in Willapa bay G. Williams (NWMSC) and others have found that 7 gill sharks use tidal channels during ebb tides to forage. These shark species, along with bird and marine mammal species should be included in this assessment.
6 Conceptual framework for assessing impacts	General	2 The discussion of impacts should explicitly identify the very different impacts of hydrological alterations on FW streams versus impacts on estuarine lagoons (where the mouth is often constricted by dikes, bridges, and other structures). This should include discussion of upstream (or back lagoon) versus down stream (or estuarine mouth, marine convergent zone) impacts. 4 This frame work is not the same that is applied under a section 7 consultation. Under a consultation effects to the species are not considered until after the minimization measures are applied. What is missing from this analysis

		is how impacts can be minimized or reduced to the species. Authors do not show any direct correlation between the listed impacts and how a water crossing is supposed to cause the potential impact or even if the impact is even possible.
7 Direct and indirect impacts		
	7.1 Channel dewatering	3 2nd para. Should qualify substrate and cover type that either enhances or diminishes effectiveness of dewatering. LWD and snags may reduce efficiency of seining. 7.1.1 pg. 7-2 No mention is given to how to hold and transport fish to safe release points following the initial capture effort. This aspect is often overlooked but warrants critical review. Often fish are stored in 5-gallon buckets which heat up rapidly. If sampling is to occur guidelines should be required for water temperature, DO, anesthetizing, time and fish density limits in transport containers etc. Personnel qualifications should require a fish biologist present for such procedures.7.1.5, pg. 7-5; recolonization has been studied extensively in marine shorelines but if similar science is available for freshwater lotic environments it should be cited here. 7.1.6, regional adaptations to turbidity are common. Puyallup/White River turbidities often exceed 500 NTU's in the summer so consideration of local conditions is needed. 4 7.1.1 Page 7-3. !st ph. 1st sentence. Electrofishing can kill (immediate or delayed) even if properly conducted. Would add "especially if improperly conducted" a remove" if improperly conducted." Last sentence, same ph, would add that injured fish may have reduced fitness. 7.1.2 There is no reference to fish screen RCWs (RCW 77.55.320 Diversion of water—Screen, bypass required, 77.55.40 Fish guards required on diversion devices), and 77.55.070 Director may modify inadequate fishways and fish guards) for bypasses or dewatering pumps. Dewatering can also be required for work in marine or estuarine environments. This is not addressed in the

		document.
	7.2 Channel hydraulics	2 This section is limited to discussion of alterations to freshwater streams. The authors need to add a significant discussion of the widespread documented impacts of bridges, dikes, and other water passage structures on estuarine areas that drain at low tide. The mouths of these systems are often narrowed (with rip rap fill) to create a smaller span for bridges, or in some cases are completely filled and a tide gate or culvert is installed to allow some exchange of marine and fresh water. These physical alterations of flow significantly impact estuarine systems, often resulting in scour at the constricted opening and sediment accumulation in the estuary, reduction in estuarine depth, loss of tidal tributaries, warming of estuarine water, and changes to DO and PH of estuarine water. In some cases pooling occurs behind the constriction and this has collateral effects that vary by season (dependent on rainfall, air temperature, and mixing with the estuarine area). Artificial pooling (both FW and marine) as well as changes in flow rates, and constriction of channel openings can also impact predation rates (through artificial aggregative effects). Some discussion of the impacts of water flow alterations and channel morphology (of freshwater and tidal channels) on predator-prey interactions should be discussed. Largely absent from the current discussion of the impacts on freshwater streams and rivers is a review of impacts of structures on saltwater intrusion into estuarine areas (e.g., drowned river mouths) during tidal floods into lower river and stream reaches. The authors state “Water crossing structures have primarily temporary effects on regime channel hydraulics, and the channel equilibrates to local scour or deposition without significant substrate composition changes.” I strongly disagree. My personal observation has been that in-channel structures associated with bridges can restrict the movement of fine sediment seaward thus increasing downstream (nearshore) scour – tideflats downstream of such structures are thus composed primarily of sand and coarser sorted sediments (versus fine silt sediments). This shift in sediment is extremely important for benthic

		organisms and we often see a shift in benthic invertebrate species resulting from changes to sediment composition. In some cases corollary changes to channel width that are associated with bridge and other water-passage structures increase tidal velocity in the channels and can cause permanent alterations to channel morphology. I encourage the authors to review the existing literature on the impacts of culverts and brides on tidal channels at estuarine mouths. 3 Pg. 7-8, increased roughness usually is achieved with a commensurate increase in water surface elevation. Water surface will often dictate engineering solutions. 7-11, the statement that step-pool habitat is the principle spawning habitat for resident salmonids is unsupported and contrary to my experience. 4 Page 7-13 4th bullet: Reword for clarity. 7.2.1 For many rivers and streams, a single representative discharge may be used to determine a ~~stable~~ channel geometry. Channel-forming (dominant) discharge does not guarantee that the channel form will be stable. 7.2.2 Remove all discussions of LWD from this section. LWD has no direct correlation to water crossings. 5 7.2.1 provides one reference (Barks and Funkhouser 2002) indicating that relocation of in/near channel structures landward (e.g. piers and abutments) increases scour and channel destabilization, which can be mitigated by ripraping the area. Use of this reference presents a skewed argument that riprap solves a velocity problem when in-fact the bridge created the problem. The existing roughness conditions throughout the reach (hopefully from natural features) should be the baseline. Any mitigation should be from such natural features and not from the use of riprap. We are seeing more and more bridge replacements where the existing channel encroaching structure is being replaced with a much longer structure, but riprap is being proposed for bankline placement between and for some distance up-and down-stream, often out into the streambed creating a “nick point” for head- and down-cutting. The habitat benefits

		from removing the channel encroaching structure are negated by adverse bankline/riparian and channel hydraulics habitat effects.
	7.3 Littoral drift	2 The authors state "Much of this shoreline consists of poorly consolidated bluffs of glacial sediments faced with cobble beaches in the upper intertidal zone and sandy sediments in the lower intertidal and subtidal areas." However, rocky intertidal areas also compose a large portion of Puget sound shorelines. Additionally, estuarine mouths have fine sediments in the upper intertidal and are not characterized by the above statement. Bank erosion is a large source of littoral sediments but estuaries (especially historically) are also major sources of littoral sediments in Puget Sound. The impact of water-crossings on estuarine sediment supplies (derived from erosion in upland freshwater streams) should be discussed. Rice et al. 2006 (impacts of armoring on forage fish eggs) should follow the statement: "Alteration of sediment transport patterns can present potential barriers to the natural processes that build spits and beaches and provide substrates required for plant propagation, fish and shellfish settlement and rearing, and forage fish spawning (Parametrix and Battelle 1996; Penttila 2000; Thom et al. 1994, all in Nightingale and Simenstad 2001b; Thom et al. 1998; Thom and Shreffler 1996). 4 Authors confuse water crossings with shoreline structures and their resulting impacts. Authors do not show any direct correlation between the listed impacts and how a water crossing is supposed to cause the potential impact or even if the impact is even possible.
	7.4 Substrate modifications	2 There is good discussion of the impacts of structures as substrate in this section. The impact of culverts is also discussed. I'm not sure if this is the correct section for discussion of elevated culverts that restrict fish passage but they should be discussed as well. The impact of tide-gates should also be discussed. 4 Discussions of docks belong in the over water structures white paper not the water crossing white paper.

		Discussions on culvert impacts are attributed to only one type of culvert that is not embedded per current design standards.
	7.5 Water quality 7.5.1.3 7.5.3	2 References are needed through the paragraph that starts with "The behavioral effects of suspended sediments on salmonids". In particular citations are needed for the following statements "Salmonids appear to avoid areas of increased turbidity in laboratory and field studies. Laboratory studies have shown alterations in social interactions and territoriality in response to increases in turbidity."… "Some laboratory studies have shown a negative impact of increased turbidity on foraging, possibly due to reduced visibility, while other studies have shown a positive effect of increased turbidity on foraging, possibly due to reduced risk of predation." Suspended sediments may also impact eelgrass growth - some statement of impact should be included. I disagree that low DO associated with water-crossings will pose minimal risk to fish. If pooled water is low in DO then fish trapped during lowtide in pools of water behind water-crossing structures (e.g., rip-rap dams that commonly occur below bridges that are inundated only at + 2-3 foot tides) could experience protracted periods of stress. The authors also need to include a statement about the impact of increases in water temperatures (and other water quality parameters such as pH, salinity, etc.) that occur in stagnant water trapped behind partial dams, culverts, tide-gates, and other restrictive structures often associated with water-crossings. 3 Reduced DO levels and altered pH conditions are also unsupported in this chapter but likely apply more to marine waters and not lotic environments. 4 This section does not distinguish between water quality impacts that occur during the placement of the in-water structure and the impacts that occur during its operation. Sediment impacts are greatest during construction. Impacts cited in references 7.5.1 are for structures other than water crossings and may or may not have the same impacts.

		Conclusion in 7.5.1.3 is not supported by previous statements “. In most cases, the magnitude, frequency, and duration of sediment pulses are expected to be similar to naturally occurring conditions during natural fluctuations in flow conditions, and few salmonids are predicted to be present during in-water work windows; therefore, NMFS concluded that potential increases in turbidity would have negligible impacts on salmonids and their habitats (NMFS 2006a; NMFS 2006f; NMFS 2006h; NMFS 2006i; NMFS 2006j; NMFS 2006k; NMFS 2006m; NMFS 2006n).” Discussions of impacts in 7.5.1.1 are cumulative not direct or indirect. 5 Statements in 7.5.6 that stormwater impacts are mitigated by Ecology regulations under the CWA and that compliance with Ecology and WSDOT stormwater guidance will not result in incidental take of listed species are not accurate. Neither state WQ standards nor the presumptive approach of such compliance predicated upon the use of certain BMPs in guidance documents are protective of listed fish. For example, NMFS has identified incidental take from the effects of stormwater in recent biological opinions (e.g. SR 167 Extension, soon to be available on the NMFS website). The biological effects thresholds of 2.3 µg/L dissolved copper (Baldwin et al. 2003) and 5.6 µg/L dissolved Zn (Sprague 1968), used in these analyzes as the basis for incidental take, are well below state WQ standards. In future ESA section 7 consultations, NMFS will utilize a dissolved copper effects threshold of 2.0 µg/L(Hecht et al. 2007; Sandahl et al. 2007).
	7.6 Eelgrass and macroalgae	4 It would seem that substrate alteration, such as dredging activities for a marina or maintaining open channels could also affect eelgrass. Impacts discussed in 7.6.1 are for over water structures and not water crossings. Bridges in the marine environment must be high off the water for navigation and do not have the same shadow effect.
	7.7 Freshwater aquatic vegetation	4 Much of this discussion has no direct correlation to water crossings.

	7.8 Riparian and shoreline vegetation	3 Must include a chapter (possibly in this section) on the relationship between vegetated levees and dykes since so many stream miles in WA are affected by the vegetation management programs on flood works. 4 Authors do not show any references in 7.8.1 relating to a level of vegetation loss that has a measurable impact on water temperature. Impacts that are not quantifiable or measurable are insignificant. Authors fail to show a direct correlation between water crossings and the perceived impacts discussed in 7.8.2. Authors do not show any references in 7.8.3 relating to a level of vegetation input loss that has a measurable impact on anything. Impacts that are not quantifiable or measurable are insignificant. 7.8.4 The impairment of hyporheic function attributable to water crossings is mostly theoretical. Impacts that are not quantifiable or measurable are insignificant. 7.8.5 LWD positioning and influencing pool formation has absolutely no direct correlation to water crossings. 5 This section identifies removal of riparian vegetation in the construction of water crossings but does not mention the often greater adverse effects from the up-and down-stream placement of riprap (see comments on 7.2). In some cases vegetation is planted in the interstices of the riprap, but there will be temporal and may be permanent effects depending on the species of vegetation planted.
	7.9 Noise	2 Is there any evidence of behavioral response to noise associated with car traffic across bridges? 4 7.9 Increased boating traffic has no direct correlation to water crossings. 7.9.1 “Not enough is known to provide discrete injury thresholds for different fish species, and even less is known regarding behavioral thresholds” 7.9.1.1 “Data on the effects of sound on developing eggs and larvae are limited” 5 7.9.1.1 Recent biological opinions (e.g. SR 167 Extension, soon to be available on the NMFS website) have indicated that egg masses in gravid adult female salmon may be at particular risk from high SPLs. These risks could include mortality of individual eggs, tearing of

		the mesenteries securing the eggs in the ovary resulting in the eggs being extruded prior to spawning, or developmental abnormalities which could decrease survival rate. Limited research indicates that post-fertilized eggs are sensitive to mechanical shock, such as pile driving (Jensen 1997; Jensen 2003).
	7.10 Artificial light	5 Authors do not show any direct correlation between typical lighting used on bridges and the lighting discussed in the referenced research papers. (Navigation light on bridge –vs- flood light on dock). This is comparing apples to oranges.
	7.11 Shading	5 This section has not looked at any of WSDOT research on fish movement and predation under docks. One example study is "Impacts of Ferry Terminals on Juvenile Salmon Migrating Along Puget Sound Shorelines. Phase II: Field Studies at Port Townsend Ferry Terminal "the author can contact WSDOT research office to obtain these publications. 7.11.1 Authors do not show any direct correlation between shading from bridges high over the water and the shading from piers (low to the water) discussed in the referenced research. papers 7.11.2 See 7.11.1 7.11.3 See 7.11.1 7.11.3.1 See 7.11.1 7.11.4 See 7.11.1
	7.12 Vessel activities	4 Impacts discussed are either temporary or not likely to occur.
8 Cumulative impacts of water crossings		4 It is unclear if this is for an individual event like a single channel dewatering or for the cumulative effects of multiple channel dewaterings. That should be made clear up front by defining what is meant by cumulative effects. This statement: Such accidents can be predicted only in a statistical sense, but the impacts could still occur and therefore could affect populations of potentially covered species. This impact would be considered by the federal agencies in their decision to issue an Incidental Take Permit. Is not necessarily a true statement. All projects have minimization measures which normally include BMPs for spill control and containment. Agencies consult on the expected project, not the unpredictable or unexpected action.

		Cumulative effects are those effects of <u>future</u> State or private activities, not involving Federal activities, that are **reasonably certain to occur** within the action area of the Federal action subject to consultation. 50CFR402.02.
	8.1 Channel dewatering	2 Although there may not be specific references for the impacts of channel dewatering on fish, there are a number of studies on the impacts of handling and other stress associated with fish by-pass systems and transport downstream of dams in the Columbia River on the survival of salmon in that system. 3 The relationship between dewatering and Salmonid (as well as other fish species) recruitment to dewatered areas warrants review. Specifically, cyclical dewatering events that result in fish stranding, desiccation and death. Rock chutes and sediment delivery systems that are periodically closed for maintenance can recruit fish to vacant habitat only to be dewatered again. The closest comment I see that captures this issue is on page 8-4 under "excessive flow variation". 4 Effects discussed are direct or indirect not cumulative.
	8.2 Channel hydraulics	4 Catastrophic failure of water crossings during natural disasters is not a cumulative effect. Remove this discussion.
	8.3 Littoral drift	
	8.4 Substrate modifications	
	8.5 Water quality	3 Bridge maintenance activities can produce pollutants that may end up in a stream. Similarly, stormwater runoff from bridges is often allowed to exit through the deck directly into waters below. Bridge decks should be required to direct run-off in to bioswales or catchment areas that provide some measure of treatment and storage. 4 It is well known that PAHs and metals are significant components of urban stormwater. This statement should be rewritten or a citation provided. Turbidity from water crossings is temporary and not cumulative.

	8.6 Eelgrass and macroalgae	
	8.7 Freshwater aquatic vegetation	4 Much of this discussion has no direct correlation to water crossings.
	8.8 Riparian and shoreline vegetation	4 Authors do not show any references relating to a level of vegetation loss that has a measurable impact on water temperature. Impacts that are not quantifiable or measurable are insignificant. Authors fail to show a direct correlation between water crossings and the perceived impacts. Authors do not show any references relating to a level of vegetation input loss that has a measurable impact on anything. Impacts that are not quantifiable or measurable are insignificant.
	8.9 Noise	4 Most of the discussion in this section is independent of water crossings or is temporary not cumulative.
	8.10 Artificial light	4 "possible to speculate" is not reasonably certain to occur.
	8.11 Shading	
	8.12 Vessel activities	4 Vessel activities are independent of water crossings and should be left out this section.
9 Potential risk of take		
	9.1 Channel dewatering	3 No mention is given to how to hold and transport fish to safe release points following the initial capture effort. This aspect is often overlooked but warrants critical review. Often fish are stored in 5-gallon buckets which heat up rapidly. If sampling is to occur guidelines should be required for water temperature, DO, anesthetizing, time and fish density limits in transport containers etc. Personnel qualifications should require a fish biologist present for such procedures. 5 Channel dewatering is overused. For example, direct take associated with in-water work immediately adjacent to the bankline can be avoided by simply sand-bagging against the in-water structure. Incidental take can be minimized by dewatering only a portion of the channel in lieu of the entire channel.

	9.2 Channel hydraulics	2 See comments above – a potential impact that should be added is impact of pooling (or slackwater) on estuarine species (loss of full tidal exchange). 3 Should mention the long term habitat lost associated with projects such as channel rip-rap for property/bridge/levee protection. This work results in long term riparian impacts, channel simplification, reduced cover and perhaps a change in habitat suitability. 4 "However, the use of qualifying language diminishes the effectiveness of such provisions in avoiding incidental take." This is an incorrect use of the term incidental take. It should read in avoiding impacts. Table 11 **Embedding is not** due to reduced sediment transport capacity and is a direct result of bank erosion Deposition is due to reduced sediment transport Deposition and Embedment are two completely separate things. **Scour is not** due to locally increased transport capacity. Local scour is due to increased turbulence due to an obstruction to the flow. **Deposition** downstream of scour areas – Temporary impact of short duration and small in size. **Rapid channel change** via migration or channel avulsion due to accidental flow obstruction, particularly flow blockage, from an artificial structure such as an ELJ. New bridges and culverts are required by law to be designed to pass Q_{100} flows plus debris. **Loss of riparian vegetation** due to bank erosion would be a secondary impact not directly caused by a water crossing but by some other force acting upon a water crossing site. 9.2.2 The discussion is about habitat alteration, not habitat loss. 9.2.3 Embedding sufficient enough to cause the impacts discussed in this section require large amounts of fine material. Amounts much greater than anything generated

		from a water crossing. 9.2.4 Scour from portions of water crossings in the wetted perimeter is local and direct not cumulative. Most of the discussion in this section is on bed scour which is not caused by water crossings. 9.2.5 Deposition of fines sufficient enough to cause the impacts discussed in this section require large amounts of fine material. Amounts much greater than anything generated from a water crossing. 9.2.6 Risk of take from extreme natural events does not belong in this paper. 5 The adverse effects from the placement of riprap, identified above in 7.5.1, designed in part to mitigate scour can in fact promote scour and incidental take of in-stream and riparian habitat. Take can be avoided by locating bridge abutments outside the floodplain and extending them below the depth of scour. Take can be minimized by using buried groins immediately adjacent to abutments in lieu of carpeting the bank with riprap.
	9.3 Littoral drift	4 Authors have not identified if water crossings affect littoral drift
	9.4 Substrate modifications	2 The authors discuss the positive impact of artificial hard substrates for marine organisms that are frequently found in structured or architecturally complex habitats (those with high rigosity). The authors should also discuss the impacts on resident soft-bottom species and migratory species (such as crab and flatfish) that forage in mud and sand flats at high-tide. Conversion of soft-bottom habitats to highly structured habitats (e.g., through rip-rap revetments, pilings, etc.) alters the ecological state of the area and has cascading impacts on the species assemblages that are found in the affected area. Introducing structural complexity to soft-bottom areas benefits some species (mentioned by the authors) at the cost of displacing others. A discussion of the negative impacts of substrate modifications on species should also be included. 4 The authors statement "There is a moderate to high risk of take of fish associated with substrate modifications in freshwater environments" does not agree with the sited literature.

	9.5 Water quality	5 As the above-referenced dissolved metals biological effects threshold concentrations are very low, take from the effects from stormwater quality can be expected from most projects where there is a significant amount of pollution generating impervious surface (PGIS). Incidental take can only be avoided when there is no net increase in pollutant loading and the effluent concentrations are at or below the thresholds. Minimization measures include retrofitting most if not all existing PGIS in addition to treating all new PGIS, significant use of infiltration BMPs to minimize the pollutant load and minimize the discharge such that pollutant concentrations are diluted within a few feet of the outfall, and/or large receiving waterbody volume and/or high flows.
	9.6 Eelgrass and macroalgae	4 "Based on the regulatory background, the federal agencies are almost certain to evaluate eelgrass loss as resulting in incidental take of potentially covered species that use eelgrass. Those species include anadromous salmonids, anadromous and marine forage fishes, and certain larval pelagic fishes." This statement is confusing. Federal agencies may consider impacts to eel grass as take, but currently there are no listed anadromous and marine forage fishes or larval pelagic fishes. Covering a species in a HCP does not make it a listed species. Impacts discussed are for over water structures and not water crossings. Bridges in the marine environment must be high off the water for navigation and do not have the same shadow effect.
	9.7 Freshwater aquatic vegetation	4 " Certain potentially covered species, including freshwater mollusks and an array of fishes, have a strong association with freshwater aquatic vegetation and would be at relatively high risk of incidental take from projects that remove or reduce such vegetation within their habitat. Sessile organisms and larval fishes would also be at high risk of mortality caused by vegetation-clearing operations." While the HCP may cover 54 species, many of which are not listed, using the term incidental take does not seem appropriate for non-listed species.
	9.8 Riparian and shoreline vegetation	

	9.9 Noise	
	9.10 Artificial light	4 Authors do not show any direct correlation between typical lighting used on bridges and the lighting discussed in the referenced research papers. (Navigation light on bridge –vs- flood light on dock). This is comparing apples to oranges.
	9.11 Shading	4 Authors do not show any direct correlation between shading from bridges high over the water and the shading from piers (low to the water) discussed in the referenced research. Paper.
	9.12 Vessel activities	4 Vessel activities are independent of water crossings and should be left out this section.
	9.13 Conclusions of the risk evaluation	4 Table 12 maybe overly conservative.
10 Data gaps		4 A general data gap would be the distribution of the 54 species, their habitats, spawning and rearing habitat maps. The information that is available is often not specific or is available at a scale that makes it unusable for site specific analysis.
	10.1 Channel dewatering	3 Pump screen size, suggest state recommended guidelines for either approach velocity or head difference between inside and outside of screens. Also should add type of screen to be used ie. Polished stainless or smooth face pipe. Slot size to minimize impingement etc..
	10.2 Channel hydraulics	3 Eliminate first sentence, it doesn't add anything to the content and is somewhat contradictory to the last sentence which leaves many open doors.
	10.3 Littoral drift	
	10.4 Substrate modifications	
	10.5 Water quality	
	10.6 Eelgrass and macroalgae	
	10.7 Freshwater aquatic vegetation	
	10.8 Riparian and shoreline vegetation	

	10.9 Noise	
	10.10 Artificial light	
	10.11 Shading	
	10.12 Vessel activities	
11 Habitat protection, conservation, mitigation, and management strategies		1 Insufficient in scope: Where critical habitat (CH) is present, protection, mitigation, conservation, etc. should focus on Primary Constituent Elements (PCE's) of critical habitat. A permanent loss of any PCE's without compensation could result in Adverse Modification of CH, tantamount to Jeopardy under the ESA. 4 "These measures include one that was not specified in any of the documents reviewed for this white paper: modifying in-water work windows to be protective of spawning and incubation by any potentially covered species that could be present in the area affected by a proposed project." This strategy may be unattainable. One common issue that arises in an ESA consultation is the need to minimize impacts to numerous species and as a result, one or more species that is the least endangered is often selected to be the one that incidental take is issued for. Adding that level of additional aquatic species may result in additional incidental take on terrestrial species, some of which may not be able to handle the impact. This is an area that would be of great concern to WSDOT.
	11.1 Channel dewatering	3 Should specify seine mesh size according to species and age class present. Also specify mesh material to be used, dip netting protocol and sequence of equipment used to maximize effectiveness. Site specific constraints warrant review in selecting fish evacuation procedures and needed equipment. Also consideration should be given to establishing a well point or sump hole to draw fish into. We have used this approach on a number of occasions and it can be very effective depending upon site conditions. 4 Consider whether channel dewatering will increase the likelihood of impacts to the species present. Agree that the person directly supervising the fish capture and handling should be qualified, but if the requirement includes those assisting in the process, it may be to

		limiting. 5 Avoid unnecessary channel dewatering (e.g. when in-water structures to be isolated are located immediately adjacent to the wetted perimeter.) • Limit dewatered area to that which is necessary to isolate the in-water structures (e.g. dewater only a portion of the channel in lieu of the entire channel.) • Install work area isolation structures extending from the substrate to an elevation such that they will not be inundated at the maximum water level expected during in-water work. • Install individual pieces of multi-piece cofferdams in sequence to discourage fish from entering the project area and to allow fish that may become trapped to escape through the downstream opening. • Conduct cofferdam dewatering in two to three stages, pausing between stages to accommodate fish removal. Do not remove cofferdam materials until turbidity levels within the work area are the same as the river.
	11.2 Channel hydraulics	1 Clarify whether impacts to habitat are permanent or temporary. Creating a "ford" instead of a crossing structure may equal 'take'. 3 Page 11-4 discusses the issue of cumulative effects which is outside SEPA and certainly not a part of HPA review. However, it should be. One culvert on a stream might be insignificant but what about a dozen? Presently, no permit requirements involve review of this matter. 4 Requiring a risk take assessment for a HPA may be appropriate for lager scale projects, but is unrealistic for small, low impact HPA activities. Requiring a hydraulic model be performed for <u>any</u> structure placed below the OHWM may be appropriate for lager scale projects, but is unrealistic for small, low impact HPA activities. Also, modeling does not "ensure" the effects of the structure on the channel, it provides a reasonable assumption of what will happen (providing there is no change in the parameter used for modeling over the course of time). Designing structures to deal with "catastrophic" events is unrealistic.

		5 Locate bridge abutments outside the existing channel migration zone. • Avoid the use of in-water piers unless site and engineering design constraints necessitate their use. • Utilize drilled shafts for all abutment and piers; extend the shafts below the depth of scour to avoid scour protection. If scour protection is demonstrated to be necessary, it should be limited to buried groins immediately adjacent to abutments in lieu of carpeting the bank with riprap.
	11.3 Littoral drift	3 Pile support structures often provide the only mechanism of collecting and holding LWD in larger, levee confined rivers. Such structures may offer substantial habitat benefits in some cases.
	11.4 Substrate modifications	3 No mention is given to the effects on substrate by utilizing LWD in strategic locations. This can be a mitigating tool.
	11.5 Water quality	4 "Phase and stagger the installation of ACZA- and CCA Type C-treated structures by a few weeks or more, which may dramatically reduce the concentration of leached metals in surrounding water and the instantaneous extent of the area of impact." This suggest would be impossible and expensive. It would require equipment to sit idle at the job site. "Professional experience and information on urban stormwater pollutants presented by Menzie et al. (2002) and numerous others support this measure as reasonable." This white paper should focus on literature, and use appropriate citations. What professional experience supports this statement? Reference and use the requirements of *Best Management Practices for the Use of Treated Wood in Aquatic Environments* developed by the Western Wood Preservers Institute. 5 Treated Wood • A risk assessment should be undertaken for the use of treated wood for: ▪ Projects involving greater than 100 piling; ▪ Substantial projects having large treated wood surface areas such as bulkheads; ▪ Projects in industrial areas where there may be

		high background levels of metals or polycyclic aromatic hydrocarbons; or ▪ Projects in close proximity (<50 feet) to other projects involving more than 20 piling that are treated with a similar preservative. • Additional criteria should be applied for the use of specific types of treated wood. http://www.wwpinstitute.org/pdffiles/AquaticGuide.pdf • Any chemically treated wood material (pilings, decking, etc.,) must be coated with an impact-resistant, biologically inert substance. Stormwater Quality • Avoid incidental take of dissolved copper and zinc through no net increase in pollutant loading and effluent concentrations at or below the thresholds. • Minimize incidental take by: ▪ retrofitting most if not all existing PGIS in addition to treating all new PGIS; ▪ significant use of infiltration BMPs to minimize the pollutant load and minimize the discharge such that pollutant concentrations are diluted within a few feet of the outfall; and/or ▪ discharging into large receiving waterbody volumes and/or high flows. Treat all stormwater from water crossings to ensure that there is no direct discharge of untreated stormwater to receiving waters.
	11.6 Eelgrass and macroalgae	
	11.7 Freshwater aquatic vegetation	
	11.8 Riparian and shoreline vegetation	4 Revegetation monitoring reports do nothing to minimize or avoid take. Saving vegetation (specifically large trees and root wads) removed for the project for later use in restoration efforts does nothing to minimize or avoid take. The statement: • Save vegetation (specifically large trees and root wads) removed for the project for later use in restoration efforts (a condition of individual and programmatic Section 7 consultations that

		has been well received by the federal agencies). Even if the material is not specifically useful for the permitted action, a WDFW area habitat biologist will generally know of ongoing or pending restoration projects in need of LWD and root wads. can be problematic. Placing LWD upstream of bridges can cause major safety issues when it hangs up on a bridge. It can also be a storage problem, placement on lands adjacent to the water body can be problematic if the applicant does not own the lands. In other areas, the material can be stolen if it is good lumber (i.e. cedar trees). The issue of 'who is responsible for the LWM' once it is placed in an upland area for use by others needs to addressed. It is our understanding that any LWM or plant material removed and saved for future restoration projects will become the property/responsibility of WDFW. They will be responsible for moving the material from the job site and storing it for future use by restoration groups. Monitoring requirements may be appropriate for large scale revegetation projects, but does not make sense for small riparian area impacts. Stem counts at the end of three years may be problematic, depending on the density of the vegetation and the amount of volunteer species recruitment. Although the use of native vegetation may be preferred, it should be noted that in certain circumstances, non native plants perform better. This is typically where the area has previously been highly disturbed and no longer provides the conditions normally required by native vegetation. It should also be noted that native herbaceous species are slow to germinate and grow, therefore do not provide soil stabilization necessary to minimize erosion along the disturbed banks. It is not possible to ensure 100 percent survival of plant material for one year. I believe what you are after is any plants that die during the first year must be replaced. Also, even though the 80 percent survival rate at the end of three years is used by several agencies, it is not always realistic for restoration plantings depending on the site specific conditions.

		Consideration needs to be taken into account for plant loss associated with browsing, girdling, drought, freezing, insect infestation, and diseases. This is especially critical for any monitoring requirement beyond three years.
	11.9 Noise	4 It should be noted that the use of a wood pile cap may reduce the noise, but presents a safety hazard associated with the wood splintering upon impact. It is not a preferred method to reduce the noise. When using a vibratory hammer to install piling, proofing with an impact may still be required. 5 Bubble curtains shall confine the piling being driven inside a curtain of air bubbles, such that the air bubbles surround 100 percent of the piling perimeter for the full depth of the water column. The confinement shall extend from the substrate to a minimum of five feet above the maximum water level expected during piling installation. Bubble curtains may be unconfined if water velocities are < 1.15 mph, but must be confined if velocities are > 1.15 mph.
	11.10 Artificial light	4 Mitigation for the incidental take of species is not possible. You can only avoid or minimize incidental take.
	11.11 Shading	
	11.12 Vessel activities	
12 References		
TABLES		
Table ES1 Potential impacts of changes in channel hydraulics on potentially covered species		

Table 1 Potentially covered species		2 Shark species, in particular 6 and 7 gill sharks utilize intertidal areas to some degree – on the coast in Willapa bay G. Williams (NWMSC) and others have found that 7 gill sharks use tidal channels during ebb tides to forage. These shark species, along with bird and marine mammal species should be included in this assessment.
Table 2 Range of potentially covered species listed in Table 1		2 Shark species, in particular 6 and 7 gill sharks utilize intertidal areas to some degree – on the coast in Willapa bay G. Williams (NWMSC) and others have found that 7 gill sharks use tidal channels during ebb tides to forage. These shark species, along with bird and marine mammal species should be included in this assessment.
Table 3 Habitat requirements of potentially covered species		
Table 4 Principal impact pathways during construction and operation of water crossing structures		2 The discussion of impacts should explicitly identify the very different impacts of hydrological alterations on FW streams versus impacts on estuarine lagoons (where the mouth is often constricted by dikes, bridges, and other structures). This should include discussion of upstream (or back lagoon) versus down stream (or estuarine mouth, marine convergent zone) impacts.
Table 5 Effects thresholds for PAHs in surface water		

Table 6 US Water quality criteria for the protection of aquatic life ("aquatic life criteria") for water soluble chemicals used in treating wood		
Table 7 Threshold effects concentrations (TEC) for freshwater sediment		
Table 8 Probable effects concentrations (PEC) for freshwater sediment		
Table 9 Hearing categories for potentially covered fish species		
Table 10 Summary of potential for incidental take of potentially covered species		

Table 11 Potential impact of changes in channel hydraulics on potentially covered species		4 Section 11.2 **second paragraph:** use 'habitat alteration' instead of 'habitat loss' The area of habitat subject to embedding, scour, or deposition, cannot be determined via hydraulic modeling using a common sediment transport model. This requires very complex modeling using velocity vector analysis and digital terrain modeling at the least. **fifth paragraph:** take risk assessment would be required of WDFW and not the permittee. **sixth paragraph:** design requirements for bridges are spelled out in 23USC144 and are not in the jurisdiction of WDFW.
Table 12 Conclusions of the risk evaluation		
FIGURES		
Figure 1 Conceptual framework for assessment		
Figure 2 Juvenile salmonid behavior patterns related to light intensity		
APPENDICES		
Appendix A Standard HPA provisions		
Appendix B Maps: TRAs and WRIAs		

GENERAL QUESTIONS	
1. List any additional sources of information you have not already identified that should have been reviewed and incorporated into the analysis. Are there any sources that were used that you feel should not have been? Why?	2 All comments are covered above. 5 **LITERATURE CITED** Baldwin, D.H., J.F. Sandahl, J.S. Labenia, and N.L. Scholz. 2003. Sublethal effects of copper on coho salmon: impacts on nonoverlapping receptor pathways in the peripheral olfactory nervous system. Environmental Toxicology and Chemistry 22(10): 2266-2274. Hecht, S.A., D.H. Baldwin, C.A. Mebane, T. Hawkes, S.J. Gross, and N.L. Scholz. 2007. An overview of sensory effects on juvenile salmonids exposed to dissolved copper: Applying a benchmark concentration approach to evaluate sublethal neurobehavioral toxicity. National Marine Fisheries Service, (March 2007). Jensen, J.O.T. 1997. Mechanical Shock Sensitivity Units in Salmonid Eggs. Department of Fisheries and Oceans Canada, Pacific Biological Station, Aquaculture update 78, Nanaimo, British Columbia (September 15, 1997). 3 p. Jensen, J.O.T. 2003. New Mechanical Shock Sensitivity Units in Support of Criteria for Protection of Salmonid Eggs From Blasting or Seismic Disturbance. Department of Fisheries and Oceans Canada, Pacific Biological Station, Aquaculture update 90, Nanaimo, British Columbia (April 7, 2003). 18 p. Sandahl, J.F., D.H. Baldwin, J.J. Jenkins, and N.L. Scholz. 2007. A sensory system at the interface between urban stormwater runoff and salmon survival. Environmental Science and Technology 41(8): 2998-3004. Sprague, J.B. 1968. Avoidance reactions of rainbow trout to zinc sulphate solutions. Water Research 2: 367-372.

2. In general, what aspects of the paper do you feel are particularly flawed? Why? How could they be improved?	1 See above 2 The authors seem to have overlooked the impact of water-crossing structures on estuarine systems, in particular the impact of changes to tidal flushing and artificial pooling (behind structures). In general I felt that the impacts on estuarine and marine species and habitat (except for eelgrass and salmonid species) was weaker than the discussion of impact on freshwater species. There needs to be significantly more discussion of the impacts of water-crossings on marine habitats and species beyond salmon species (e.g., rock-fish). 4 It appears that this paper does not address the effects of operations or maintenance activities associated with Overwater Structures. Many of these activities require work below the OHWM and thus a HPA. The use of the term mitigation throughout the document is not appropriate when addressing ESA take.
3. In general, what aspects of the paper are particularly well done and successfully convey the information	2 The review of potential impacts on freshwater habitats is thoroughly discussed and well covered. The document is well written.

4. Please provide any additional comments.	4 Lamprey ammnocoetes are not mentioned when referencing species who live in the substrate and impacts to those species, It is important that no "future methods to minimize impacts to ESA species" are so restrictive as not to allow standard and usual projects to proceed. WDFW needs to insure that any additional legal requirements or conditional requirements are consistent with the other state and federal agencies that also have jurisdiction over bank protection work. WSDOT has concerns about the use of 'mitigative measures' under a HCP that are more restrictive than the conservations measure established by the Services when impacting ESA listed species. Any additional requirements or conditions developed from this white paper need to take into account the size, scope, location, duration and impact of the actual project. Generic conditions or requirements may be unrealistic for small scale projects or ones located in highly disturbed areas. Although the white papers (Bank Protection and Water Crossings) are covering different topics, some of the processes/impacts are the same but they are addressed differently and sub-grouped differently. The list of potential impacts should be identified for all the white paper topics; they all should use the exact same terminology.

APPENDIX F

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

2007 WHITE PAPER PEER REVIEW
SUMMARY OF POST REVIEW MEETINGS WITH REVIEWERS

September 17, 20, and 28, 2007

Duane Phinney
PH2 Consulting Services
Peer Review Coordinator

Post-review meetings for the peer reviews of the 2007 Washington Department of Fish and Wildlife white papers were held September 17 (Small-Scale Mineral Prospecting), September 20 (Overwater Structures and Non-Structural Piling—morning; Bank Protection/Stabilization—afternoon), and September 28 (Water Crossings). All meetings lasted about three hours and were held in Room 585 of the Natural Resources Building.

At each meeting it was clarified how the peer reviews of the white paper would be utilized in the overall Habitat Project Approval Habitat Conservation Plan effort. Marc Daily presented and discussed a schematic representation of the process for the last three meetings.

How the individual comments would be used was discussed as well. The comments of each individual will be presented as received. For each white paper, the names of the reviewers will be disclosed, but not linked to a specific set of comments.

General comments

There were several comments/criticisms on the white papers that were generally applicable to all four papers:

- There were numerous literature citation problems. Many citations went to a secondary rather than the primary sources—which apparently were not consulted by the authors, reviewers were unable to located and consult many documents—some because the citation was not accurately provided, gray literature was cited when refereed citations were available, gray literature generally seemed to be considered of the same quality as refereed literature, important information sources were not cited, documents such as HPAs were erroneously characterized as literature, and information in some references was erroneously characterized.

- Numerous authors were apparently involved in each white paper, and the papers generally suffered from a lack of appropriate editing to achieve consistency and cohesiveness.
- There was a general lack of consistency in approach within and between the different papers.
- Several terms were misused and/or used variously by different authors between, and even within, white papers: "mitigation," "compensation," "minimize", "reduce", "mitigation measures," "conservation measures," "BMPs," and others. Appropriate editing to address these and other consistency problems was not applied.
- Except for the Small-Scale Mineral Prospecting white paper, which only discussed freshwater areas, freshwater and marine or estuarine areas were not appropriately addressed. In many cases freshwater was discussed to the complete exclusion of the others; in same instances it was not possible to determine which area the discussion was in reference to; lakes were often totally excluded; and discussions of one area could have been extrapolated to others, but were not.
- The authors don't specifically define cumulative impacts, but imply that it is the impacts of construction and operation of overwater structures and non-structural piling over time or at multiple sites in a limited area. This would seem to suggest that the array of impacts of these structures and pilings at one site over time or at multiple sites in limited areas would be discussed. The discussion, however, is generally in terms of the cumulative impacts of each of the impact mechanisms. It would also be helpful and reasonable to have a discussion of the cumulative (synergistic) impacts of the full array of impacts at any one site as opposed to just the discussion of the individual impacts.
- It would seem necessary and appropriate under cumulative impacts to consider and discuss the combined effects of the array of impacts at one site, as well as at one site over time and multiple sites within an area.
- The white papers did a poor job of providing a clear link from the project type that is subject of the paper to impacts on potentially included species.
- The mitigation measures were not presented in any organized fashion. As summarized in section 11 they did not include all that were mentioned throughout the text; did not seem to flow from the discussions of impacts; and in some white papers were simply a "grab bag."
- The conceptual framework for impact assessment was not helpful.
- White papers would have benefited from a discussion of mitigation sequencing, with protection, conservation, mitigation, and management strategies organized in terms of that sequencing.
- Although not endorsed unanimously, many felt that, since much of the papers was based on professional judgment, identification of the individual authors and their qualifications would have been helpful.

Small-Scale Mineral Prospecting

Attending in person were:

- Dr. Thomas Seal, peer reviewer, Newmont Mining, Nevada
- Michal Rechner, peer reviewer, Washington Department of Natural Resources (DNR)
- Gayle Kreitman, National Oceanic and Atmospheric Administation, Fisheries Service (NOAA Fisheries)
- Tim Romanski, US Fish and Wildlife Service (USFWS)
- Duane Phinney, PH2 Consulting Services

Participating via telephone was:

- Bret Harvey, peer reviewer, US Forest Service, California

Reviewers Sheri Sears, Colville Confederated Tribes, and Aaron Prussian, US Forest Service, did not participate. Sheri Sears had planned to attend in person, but a wildfire on the Colville reservation required her attention. Aaron Prussian was scheduled to attend via telephone but was not available.

Areas of Disagreement

One general area of discussion related to comments repeated several times throughout the comments by one reviewer. These are paraphrased as:

- There should be no regulation without specific studies that prove a particular activity would result in a "take" under ESA.
- Inferences from studies not directly related to small-scale mineral prospecting are biased, inappropriate, and unprofessional
- The concept of using best available scientific information cannot be applied.
- Only studies of mining activities can be considered in determining rules to be applied. No inferences can be made from studies of other activities. For example, a study that showed walking on salmon redds killed incubating eggs or alevins was judged to not be applicable because the study was of wading anglers, not miners.
- Professional judgment or opinion cannot be used as a basis for regulation.

Other participants generally agreed that these points would be appropriate in a perfect world. However, given the state of the information on small-scale mineral prospecting; the fact that specific information for most potential impacts is unlikely to be forthcoming soon; and the magnitude of mining activity and potential for negative impact on fish, shellfish, and their habitats, they disagreed with this point of view as a present practical matter. Waiting until specific information is available to use as a basis for regulation could lead to damage of fish and shellfish resources. The dearth of information specific to small-scale mineral prospecting mandates that other applicable information be appropriately utilized, applied to small-scale mineral prospecting by the professional judgment of qualified individuals. Even though the white paper inaccurately portrayed one study of the effects of wading on trout redds as being directly related to mineral prospecting when it was not, others were not willing to make the leap that the paper was biased.

The same reviewer characterized the white paper as “more like a ‘white wash’ than a white paper, based on WDFW’s political interferences, influences and opinions” and “written to propound a predetermined conclusion supported by those that funded this work”. Again, others did not see evidence of this and did not share this view

The same reviewer also disagreed with the otherwise unanimous (based on in-person and white paper comments) opinion that some means must be devised to determine the geographic scope and extent of small-scale mineral prospecting in Washington. Without such information, other reviewers believed, determining the impacts and needed mitigation measures is problematic, if not impossible. Such information would also provide for more site-specific management. Regulations could be less stringent in lightly used areas. They also noted the need for compliance monitoring and effective enforcement.

Noting that the effects of water quality modifications are related to existing levels of contaminants and sediments, one reviewer recommended that highly contaminated areas be closed to all small-scale mining activity. Specifically mentioned were above Grand Coulee Dam on the main stem Columbia River and near the Hanford Reach. Another suggested that the department could work with prospectors such that their activity contributed to cleaning the sediments.

Areas of Agreement

There were several important areas of general agreement:

- The conceptual framework presented did not seem particularly relevant or useful and it was unclear how the rest of the paper followed from this.
- The authors did a generally adequate job of reviewing and presenting the literature on the effects of small-mineral prospecting on fish and shellfish.
- The authors did not adequately link the available science to potential impacts on potentially covered species, leading to appropriate mitigation measures. There were instances of citation of papers that did not provide direct evidence for a statement or the origin of the statement.
- There is a general lack of adequate studies of the effects of small-scale mineral prospecting on aquatic resources, especially non-salmonids.
- Site-specific analysis and regulation would be a definite advantage for resource management.

Overwater Structures and Non-Structural Pilings

Attending the meeting, all in person, were:

- Carol Cloen, reviewer, DNR
- Kurt Fresh, reviewer, NOAA Fisheries
- Tom Ostrom, reviewer, Suquamish Tribe
- Charles “Si” Simenstad, University of Washington (UW)
- Emily Teachout, USFWS
- Jim Brennan, reviewer, Washington Sea Grant (WSG)
- Gayle Kreitman, NOAA Fisheries
- Marc Daily, WDFW
- Duane Phinney, PH2 Consulting Services

Areas of Disagreement

There were no significant areas of disagreement.

Areas of Agreement

- Format problems, particularly various types of inconsistency, impaired the utility of the white paper. This may be attributable to the fact that there were multiple authors and not edited appropriately or adequately.
- The authors did not adequately deal with freshwater and marine issues. In many cases, the discussion was entirely, or nearly so, in terms of one or the other to the exclusion of the other. In some cases it was not clear which area the discussion was in reference to. In some instances, there was an artificial distinction made between the two areas. Lakes were virtually ignored. Impacts in saltwater were inappropriately extrapolated to freshwater.
- The focus was almost entirely on construction of a structure to the exclusion of impacts from operating, repairing, maintaining, and removing.
- The information of species and habitat use was inaccurate to the point of being of little or no use.
- The authors often times seemed to confuse mechanism, resultant biological effect, and ecosystem components.
- There were numerous literature citation problems. There was too much reliance on secondary sources (e.g. much material was taken directly from the previous WDFW white paper and inserted in the present without attribution). There was no attempt to evaluate the quality of the information—all seemed to be treated similarly. Statements that should have been supported by literature citation were not. Literature was cited as being studies in the Pacific Northwest that were not. Much important pertinent literature was not cited. Some documents cited could not be located.
- Indirect and cumulative impacts were sometimes confused.

- It was unstated and unclear what the authors were using as a definition of "cumulative effects." The discussions in the individual impact pathways sections were not clarifying.
- The potential risk of take (Section 9) discussion was deemed of little value. It was unclear to all how the individual cells in Table 10 were populated. The simple "Yes," "No," or "Unknown" classification was not helpful; quantification or some degree of qualification of risk would have been more meaningful.
- One reviewers suggested, and others agreed, that mitigation measures would have been more systematically and better presented had they been presented in the sequence that a project is developed and implemented, e.g. planning, siting, through construction, compensatory mitigation, operation, etc.
- Mitigation measure were not systematically evaluated and presented. They appeared to be merely a "grab bag."

Bank Protection/Stabilization

Attending the meeting, all in person, were:

- Jim Brennan, reviewer, WSG
- Stephanie Ehinger, reviewer, NOAA Fisheries
- Doug Myers, reviewer, Puget Sound Partnership
- Ken Schlatter, Washington Department of Transportation (DOT)
- Hugh Shipman, Washington Department of Ecology
- Gayle Kreitman, NOAA Fisheries
- Marc Daily, WDFW
- Duane Phinney, PH2 Consulting Services

Reviewers Larry Wasserman (Skagit System Cooperative) and Charles (Si) Simenstad (UW) were not able to attend.

Areas of Disagreement

There were few areas where all reviewers were not in agreement:

- One reviewer felt that monitoring riparian revegetation sites for 10 years was excessive; three years was deemed sufficient. This reviewer also disagreed that only native plants should be utilized for revegetation. In some instances non-native plants are more readily obtainable and will establish and begin erosion protection much faster. The others disagreed with these points.

Areas of Agreement

- The white paper was to consider both freshwater and marine areas. The authors did satisfactorily deal with the two. Discussions were largely in terms of fresh water, with marine areas ignored. There were instances where discussions for freshwater areas could have been extrapolated to marine, but were not. At times, it was unclear whether the discussion was in terms of freshwater, saltwater, or both.
- The information on distribution and habitat requirements of potentially covered species as summarized in tables 3 and 4 was fraught with errors. It was suggested that WDFW and DNR, because of their ongoing and overlapping Habitat Conservation Plan efforts, need to jointly put together this information such that both agencies can agree and utilize it.
- It was particularly felt that the authors were not knowledgeable about the subject of substrate modifications. Much pertinent literature was not cited. In other sections, as well, it was noted that some of the most important literatures sources were not used.
- Discussion was almost entirely in terms of construction impacts, with little attention to operating, maintaining, repairing and removing.
- Although the authors provided a definition of cumulative effects, it was so general as to not be very helpful in terms of how they applied it in this white paper. The discussion of cumulative effects for the various impact pathways was brief and general for some sections in relation to the importance of the category. The synthesis of cumulative effects in Section 8.0 was felt to be helpful
- Terms such as “mitigation” and “compensation” were inappropriately used and/or misused, and inconsistently used. A good graphic or discussion of mitigation sequencing would have been helpful.
- There were problems with literature citation noted. Gray literature was used when primary literature was available. There were many instances of a paper cited from a secondary source (e.g., Simenstad et al. 1982, in Gregory 1993). In many cases the original source was poorly referenced). Some literature was cited that was not available.
- Mitigation measures were not systematically formulated and presented.

Water Crossings

Attending the meeting, all in person, were

- Ken Schlatter, DOT
- Neil Rickard, NOAA Fisheries
- Gayle Kreitman, NOAA Fisheries
- Marc Daily, WDFW
- Duane Phinney, PH2 Consulting Services

Dr. Kirstin Holsman had planned to attend, but was ill. Scott Anderson and Russ Ladley were unavailable. The Peer Review Coordinator subsequently met with these two.

Areas of Disagreement

- One reviewer in written comments suggested that all discussion of LWD should be removed from the section on channel hydraulics, that it has no correlation to water crossings. Others disagreed. During the discussion, it was noted that the removal comment was in relation to contemporary water crossing structure requirements only and it was pertinent in the larger context of water crossing structures.
- There were several instances where one reviewer disagreed with impacts attributed, or implied, by the white paper authors to water crossing structures. Upon discussion it was found that the comment applied primarily to contemporary bridges with present requirements and not to older bridges or culverts.
- One reviewer felt that monitoring riparian revegetation sites for 10 years was excessive; three years was deemed sufficient. This reviewer also disagreed that only native plants should be utilized for revegetation. In some instances non-native plants are more readily obtainable and will establish and begin erosion protection much faster. The others disagreed with these points.

Areas of Agreement

- As with other papers, the authors did not provide working definition of cumulative impacts, and the section was not particularly useful.
- As with the other papers, certain terms, particularly “mitigation” “compensation” were misused and variably used throughout the paper.
- The white paper relied extensively on studies of overwater structures (and in some cases, shoreline structures) without sufficiently linking them to water crossings structures. In many cases, no attempt was made to do so.
- Much of the discussion in *7 DIRECT AND INDIRECT IMPACTS*, made little, or in many cases no, attempt to link the discussion to direct or indirect impacts of water crossing structures.
- The white paper did a poor job of progressing from *7 DIRECT AND INDIRECT IMPACTS*, *to 8 CUMULATIVE IMPACTS OF WATER CROSSING STRUCTURES*, to *9 POTENTIAL RISK OF TAKE*, to *10 DATA GAPS*, to *11 HABITAT PROTECTION, CONSERVATION, MITIGATION, AND MANAGEMENT STRATEGIES*.
- The focus was on salmonids with little reference to other potentially listed species. In large part this is because the literature primarily deals with salmonids.
- The white paper did not do a satisfactory job of addressing culverts and conduit crossings.
- The discussion was skewed toward freshwater, with lesser consideration of marine and estuarine areas.

- As with other white papers, this one focused on construction impacts with little or no consideration given to operation, maintenance, repair, or replacement.
- Reviewers disagreed with the statement in *7.2 Channel Hydraulics* to the effect that water crossing structures have primarily temporary effects on regime channel hydraulics, and the channel equilibrates to local scour or deposition without significant substrate composition changes.
- One reviewer, in comments on *7.5 Water Quality* noted that NOAA Fisheries had concluded that increases in turbidity during construction of water crossing structures would have minimal impact on salmonids. Upon discussion, all agreed that degree of impact would be site- and time-specific.
- This same reviewer stated in references to the discussion in *7.8.5 Habitat Conditions* of the importance of large woody debris that it has no direct correlation to water crossings. Although the white paper authors made no attempt to link the discussion to direct or indirect impacts from water crossing structures, it apparently was to be implied. Others disagreed, but upon discussion all agreed that the issue had to be put into context of the specific structure.
- This reviewer also stated in reference to *9.2.4 Scour* that bed scour is not cased by water crossings. Others disagreed, and this was another instance where the reviewer was referring to contemporary bridges with their present requirements.
- Reviewers agreed that the suggested mitigation measure of modifying in-water work windows to be protective of spawning and incubation of all potentially listed species that might occur in the area would eliminate any work window in most if not all areas, particularly in marine areas.

APPENDIX G

Lessons Learned From Peer Review of 2006 White Papers

Based on this year's experience, there are a number of improvements that could be made to the process for developing white papers and conducting the peer review that will make the white papers more valuable and the peer review process proceed more smoothly.

To improve the consistency and quality of the white papers:

1. WDFW should define key terms for the authors. A major problem with the white papers is that many terms were used variously within and between white papers. These include:
   - Mitigation
   - Conservation strategies, conservation measures, mitigation strategies, management strategies, protection strategies ("conservation strategies" was used in the title of Section 11 of each of the white papers, but never in the text of any of the white papers.)
   - Best Management Practices (BMPs)
2. HPA activities have the potential to impact fish and shellfish during construction, by virtue of their existence, through operation, maintenance, repair, and removal or replacement activities. Authors focused on construction, with somewhat less attention given "existence" aspects, far less given to operation, very little to maintenance, and virtually none to repair or removal. WDFW should prescribe precisely which of these aspects the white papers should cover and to what degree.
3. In section 7 of the papers, Direct and Indirect Effects, within and between papers, authors inconsistently discussed the effects of the activity covered in the white paper. In none of them was there consistently a clear path from the covered activity, to the covered activity triggered the specific impact mechanism (or pathway as they were sometimes called), to the effect on potentially covered fish and shellfish species. In each of the white papers, the direct and indirect effects were always described only for the individual impact mechanisms. There was never a discussion of how the individual mechanisms might work together synergistically. WDFW should clarify that this aspect must be discussed as well.
4. WDFW should define precisely how it wants authors to consider cumulative effects. Since there is no universally accepted definition or means of analysis, this is mandatory. No paper gave a precise working definition and the ways it was looked at varied within and between papers. Most of the discussion was in terms of how one of the individual impact mechanisms might work together with that same impact mechanism from other nearby projects of the same type, e.g., how overwater structure shading might impact fish and shellfish if there were multiple overwater structures in the same vicinity. Occasionally it would appear that the discussion was in terms of all of the impact mechanisms for the project type working together with all of the impact mechanism from multiple projects of the same type. Rarely, it would appear that the discussion was in broader

landscape terms of a watershed or some marine unit. Mostly it was not clear what context was being used.

5. As with section 7, the potential risk of take was discussed in terms of the individual impact mechanisms. The total risk of take of the particular covered activity was never considered. WDFW should clarify this aspect.
6. In Section 11 of the papers, Habitat Protection, Conservation, Mitigation and Management Strategies, there was no consistency to the presentations or cohesiveness. WDFW should consider instructing authors to present mitigation strategies organized in terms of strategies to consider for siting, design, construction, the continuing presence of the structure, operation, maintenance, repair, and removal.
7. In the discussion and evaluation of risk of take, the papers did not consistently consider the extent to which present Hydraulic Code WACs were applied. That is, in some cases the risk of take was considered assuming that all applicable WACs were applied. In other cases, a worst-case scenario was considered in that present WACs were not considered.

To improve the peer review, the peer review coordinator should:

1. Assure that reviewers understand and agree to commit the necessary time to fully participate in the established process. In this regard, realistic estimates of time should be provided potential reviewers at first contact. Reviewers should attend a pre-review meeting (preferably in person, but teleconference is satisfactory), devote sufficient time to conduct a thorough review, review the comments of other reviewers prior to the post-review meeting, attend the post-review meeting in person, and review and comment on the draft of the coordinator's final report for the appropriate paper(s).
2. Establish important dates as far ahead of time as possible and send reviewers timely reminders of upcoming dates.
3. Make sure each reviewer understands how the white papers and the peer reviews fit into and will be utilized in the overall HCP development process.
4. Make sure reviewers understand exactly what his/her review should entail and how reviewers' comments will be used. Clarify that the white papers will not be revised based on reviewers' comments, but that reviewers' comments, or a summary, may be attached in a preamble that will become an integral part of the paper.
5. Assuming white papers are distributed to reviewers as computer files, encourage reviewers to reference their comments to a section number, rather than a page number. Page numbers will vary depending on a number of factors.

APPENDIX H

Linkage of Recommendations in 2006 White Papers to Those in *"Identification of Discrepancies Between Existing Hydraulic Code Rules and Statutory Requirements, State and Agency Policies and Procedures, Other Administrative Guidance, and Technical Guidance Documents."*

In 2006, PH2Consulting Services was contracted by WDFW to examine the following as they relate to the Hydraulic Project Approval authority (RCW 77.55) and/or WDFW Hydraulic Project Approval administrative rules (Washington Administrative Code or WAC):

- Legislative changes to the Hydraulic Project Approval authority since 1994,
- Other legislative concerns related to the Hydraulic Project Approval authority,
- WACs of WDFW other than those related to HPAs,
- WACs of other state agencies that relate to the Hydraulic Project Approval authority,
- Governor's executive orders currently in effect,
- Other applicable state administrative guidance documents relative,
- WDFW formal policies,
- Fish and Wildlife Commission policies,
- Miscellaneous WDFW administrative guidance documents,
- Guidance and Informational documents on HPA technical issues,
- Formal Attorney General opinions, and
- Informal written Attorney General advice to WDFW.

The overall objective of this effort was to assess the present procedural/administrative portion of the WACs for consistency with the relevant legal and administrative directives and requirements, identify those specific WACs that may need to be amended to be consistent, and establish an explicit link between each such WAC and the specific legal or administrative change that necessitates the possible amendment.

PH2 also assessed the present technical portion of the WACs for consistency with the relevant legal requirements and administrative directives and requirements, identified those specific WACs that may need to be amended to be consistent, established an explicit link between each such WAC and the specific change that necessitates the possible amendment, and identified each WAC change requiring participation by HCP partners and the specific partners that might need to participate for each.

Results of the effort are reported in *"Identification of Discrepancies Between Existing Hydraulic Code Rules and Statutory Requirements, State and Agency Policies and Procedures, Other Administrative Guidance, and Technical Guidance Documents."*

The purpose of this report is to establish a linkage between the WAC amendments recommended in the 2006 report and the WAC amendments needed to implement the mitigation measures recommended in the four WDFW white papers prepared in 2006 and others identified during peer review.

The white papers referred to habitat protection, conservation, mitigation, and management strategies. They are collectively referred to as mitigation measures in this appendix.

Except for Small-Scale Mining and Mineral Prospecting, the white papers generally did not explicitly recommend measures. They listed measures WDFW "might want to consider" or actions that "could be taken," or something of the like. In other places they simply discussed measures that might reduce impact. The author considered all these to be measures that WDFW should consider.

Similarly, some reviewer suggestions for mitigation measures were not explicitly stated. The author tried to discern implied recommendations.

Numerous mitigation measures were suggested in more than one white paper or within one white paper to address multiple issues (e.g., spacing of pilings to reduce shading and to reduce impact on littoral drift). These were sometimes, but not always, cross referenced.

Appendix Table H-1. Mitigation Measures Recommended in Small-Scale Mineral Prospecting White Paper by Authors and in Reviewer's Comments.

Summary of Recommendation	White Paper Section or Peer Review Report Section for Reviewer Suggestions	WAC Number Recom-mendation is Related to	Peer Review Coordinator's Comment	Related section in *Identification of Discrepancies Between Existing Hydraulic Code Rules and Statutory Requirements, State and Agency Policies and Procedures, Other Administrative Guidance, and Technical Guidance Documents*
Measures recommended by authors				
1. Provide additional detail in Gold and Fish on potential spawning locations	Table 15	None	Management recommendation—does not require WAC amendment.	4.12, 6.30, 7.10, 7.13, 8.11, 9.5, 15.15
2. Provide information in Gold and Fish on known spawning areas and time of spawning or request annual spawning surveys	Table 15	None	Management recommendation—does not require WAC amendment	
3. Restrict mining to 300 ft upstream and 50 ft downstream of known spawning areas or shellfish beds	Table 15	201	Unnecessary for spawning areas if work windows are appropriately protective	
4. Preclude mining when eggs and alevins are susceptible to disturbance.	Table 15	206, 207, 208, 209	Evaluate and possibly amend existing work windows	
5. (a) Maintain specific stream and tributary work windows. (b) Routinely update statewide databases	Table 15	(a) 206, 207, 208, 209 (b) None	(a) Evaluate and possibly amend existing work windows (b) Management recommendation—does not require WAC amendment	
6. Restrict daily operations to daylight hours between 8:00 AM and 7:00 PM	Table 15	201(1)	Amend existing restriction	
7. Limit activities based on the size of a stream	Table 15		Need to determine streams sizes, provisions to be applied to, and in what manner; four sizes recommended	
8. Require 300 ft between suction dredging operations	Table 15	201(2)	Existing restriction is 200 ft. Adjust distance according to stream size	

9. Limit the number of permits granted per unit length or unit area of stream	Table 15	201	Use of unit area adjusts for stream size; allow no more than 10% impact. Probably not compatible with a pamphlet approval approach	
10. Request operators visually monitor the stream 300 feet downstream of dredging after first half hour. If noticeable turbidity observed, **must** cease or decrease in intensity until no turbidity observed	Table 15		**Requesting** monitoring and **requiring** operation to cease are not compatible. Would have to require monitoring	
11. Prohibit undermining, excavating, or removing stable woody debris or rocks that extend from the bank into channel	Table 15		There presently are restrictions on disturbing boulders, woody debris jams and large woody debris	
12. Prohibit removing, relocating, or disturbing stable instream woody debris greater than 4-in or boulders greater than 12-in diameter.	Table 15		There presently are restrictions on disturbing boulders, woody debris jams and large woody debris.	
13. Detailed requirements for refueling and storage of petroleum products.	Table 15	204(8)	One reviewer suggested using EPA refueling provisions.	
14. Require diversion screens are consistent with the latest NMFS criteria.	Table 15	204(6)	Restrictive criteria presently apply to diversion screens	
15. Quantify the number of permits granted under the Gold and Fish pamphlet procedures. Require miners to obtain a Gold and Fish pamphlet annually and document the number of pamphlets released	Table 15	201		
16. Require annual operational plan. **Request** annual post-mining summary of actual activities	Table 15		Would need to determine how to adjust voluntary data to reflect all prospecting	
17. Enforce Gold and Fish pamphlet rules	Table 15	None	Management recommendation—does not require WAC amendment	
18. Monitor operations and impacts	Table 15		Management recommendation—does not require WAC amendment	
Measures recommended by reviewers— see Appendix B				
19. Rewrite Gold and Fish pamphlet to high school vocabulary level	9.1, reviewer number 4 comment		Management recommendation—does not require WAC amendment	8.11, 9.5, 15.15
20. Require that equipment be certified	7.4 reviewer number 5 comment	201 new provision		

21. Prohibit mining in main Columbia River above Grand Coulee Dam and near the Hanford reach	7.4, reviewer no. 5 comment	Amend 207		

Appendix Table H-2. Mitigation Measures Recommended in Overwater Structures and Non-Structural Pilings White Paper by Authors and in Reviewer's Comments.

Summary of Recommendation	**White Paper Section or Peer Review Report Section for Reviewer Suggestions**	**WAC Number Recom-mendation is Related to**	**Peer Review Coordinator's Comment**	**Related section in *Identification of Discrepancies Between Existing Hydraulic Code Rules and Statutory Requirements, State and Agency Policies and Procedures, Other Administrative Guidance, and Technical Guidance Documents***
Measures recommended by authors				
1. Increase height of structures to allow light underneath	11.1, 11.2	060, 120, 271, 300	300(5) requires adequate light penetration	4.19, 5.2, 6.30 6.31, 7.3, 7.5, 7.13, 7.16, 7.17, 8.4, 8.5, 8.11, 9.1, 9.5, 9.6, 10.1, 11.1, 11.2, 15.15, 15.34, 15.39
2. Decrease width to reduce shade footprint	11.1, 11.2		300(5) requires adequate light penetration	
3. Align structures in north-south orientation	11.1, 11.2		Not practical in all locations. 300(5) requires adequate light penetration	
4.Use fewest possible piles	11.1, 11.2		300(5) requires adequate light penetration, but does not address number of piles	
5. Use grated surfaces or openings in the deck, not prisms	11.1, 11.2		300(5) requires adequate light penetration	
6. Design and construct for maximum light penetration	11.1, 11.2		300(5) requires adequate light penetration	
7. Experiment with ways to soften light-dark edges	11.1	None	Research recommendation—does not require WAC amendment	
8. Maintain light levels under structures greater than that required by salmonids	11.1	060, 120, 271, 300	Would be an objective in 1 through 6 above	
9. Continue research to improve understanding of effect of overwater structures on migrating juvenile salmonids	11.1	None	Research recommendation—does not require WAC amendment	
10. Investigate fish feeding behavior during temporary delays at structures	11.1	None	Research recommendation—does not require WAC amendment	
11. Allow no net increase of overwater cover in the Lake Washington system	11.1	060, 120, 271, 300		

12. In lakes, restrict piers to a 3.5-ft wide cantilevered, grated bridge to a small, narrow moorage structure that is high off the water with maximum light penetration	11.1			
13. Require removal of floats during off-season and upland storage	11.1, 11.2			
14. Study prisms and grating to determine efficacy in allowing light penetration under structures	11.1		Research recommendation—does not require WAC amendment	
15. Locate away from eelgrass	11.2		300(4) precludes shading of eelgrass.	
16. Minimize area of impact by using best available installation methods	11.2			
17. Space piling to reduce shading of eelgrass	11.2		300(4) precludes shading of eelgrass	
18. Encourage shared-use docks	11.2		Management recommendation—does not require WAC amendment	
19. Maintain minimum 1-ft clearance below boat propellers near eelgrass	11.2			
20. Use the functional approach to assessing impacts to freshwater aquatic vegetation	11.3	None	Management recommendation—does not require WAC amendment	
21. Require revegetation plan and monitor for 3 years	11.4	060, 120, 271, 300	Would need to determine required elements of plans	
22. Submit revegetation monitoring plans to WDFW	11.4		See no. 21 above	
23. Recommend that vegetation be saved for later restoration efforts	11.4	None	Management recommendation—does not require WAC amendment. WDFW could recommend, may be outside HPA authority to require	
24. Preclude disturbance of vegetation areas of high erosion	11.4	060, 120, 271, 300		
25. Require performance bonds for major disturbances of riparian vegetation	11.4		May require legislative change to HPA authority	
26. Work only within wetted channel for projects with extensive in-water work and high quality vegetation	11.4			
27. "Use the precautionary principle "Do no further harm"	11.4	None	Establishes a principle—does not require WAC change. Present WACs require no-net-loss of productive capacity of fish and shellfish habitat	

28. Conduct research and documentation to support policies and practices		None	Research recommendation—does not require WAC amendment	
29. Establish buffers and setbacks to protect marine riparian habitat	11.4	300	Could also be considered for freshwater	
30. Maintain and restore marine riparian vegetation for human health and safety	11.4		HPA authority can only be used to protect fish life	
31. Incorporate multiple functions into a management strategy	11.4	None	Management recommendation—does not require WAC amendment	
32. Time projects to occur when sensitive life stages are not likely to occur	11.5	060, 120, 271, 300	No present freshwater timing WAC, but timing is applied on ad hoc basis to HPAs. 271 covers saltwater work windows	
33. Though not explicit recommendations, section 11.5 discusses other potential mitigation measures	11.5		Could consider air bubble curtains, fabric barriers, pile caps, and coffer dams.	
34. Pre-project, characterize existing suspended sediment	11.6		Assumed to be a requirement of project proponent	
35. When evaluating cumulative impacts from turbidity, consider watershed condition. Establish allowable turbidity increases	11.6		Assumed to be a requirement of project proponent	
36. Set stockpiles back from bank and protect from erosion.	11.6			
37. Use materials other than treated wood	11.6		Inconsistent with 38, 39, 40, and 41 below	
38. Install treated wood when potentially covered species not present	11.6		Not needed if 37 is implemented	
39. Pre-soak treated wood	11.6		Not needed if 37 is implemented	
40. Phase and stagger installation of treated structures	11.6		Not needed if 37 is implemented	
41. Use water-repellant stain or paint on above water portions of treated wood structures	11.6		Not needed if 37 is implemented	
42. Find alternative to building a structure--to avoid channel hydraulics impacts	11.7			
43. Site outside active channel to avoid channel hydraulics impacts	11.7			
44. Minimize project footprint to avoid channel hydraulics impacts	11.7			
45. Design structures to have least possible effects on channel hydraulics	11.7			

46. Require hydraulic model for any project that will place fill within Ordinary High Water	11.7			
47. To reduce impact on littoral drift, maximize open space between pilings	11.8		Also, see item 4 above	
48. To reduce impact on littoral drift, minimize dimensions of floating structures perpendicular to shoreline	11.8		Also, see item 2 above	
49. To reduce impact on littoral drift, use floating breakwaters rather than grounded	11.8			
50. To reduce impact on littoral drift, do not allow floats to ground at low tide	11.8, 11.9			
51. Thoroughly study littoral drift cell and potential habitat affected	11.8	None	Research recommendation—does not require WAC amendment	
52. To reduce substrate modification, use fewer, widely-spaced pilings	11.9	060, 120, 271, 300	Also, see items 4 and 17 above	
53. Adopt guidelines for fish removal and exclusion from dewatered areas	11.10		Since dewatering is common to many project types, WDFW may want to consider a separate WAC section for provisions	
54. Develop (adopt) guidelines for channel dewatering and stream bypasses	11.10		Since dewatering is common to many project types, WDFW may want to consider a separate WAC section for provisions	
55. Define qualifications of those who may capture and handle fish in dewatered areas. Maintain list of qualified individuals	11.10	None	Management recommendation—does not require WAC amendment, but would have to provide in WAC that only qualified persons may capture and handle fish	
56. Initiate volitional fish removal activities before dewatering	11.10	060, 120, 271, 300	Would be considered in 53 and 54 above	
57. List of several measures recommended to minimize harmful effects of electrofishing	11.10		Would be included in suggested new section on dewatering and fish removal	
58. Allow no additional shoreline or pier lighting	11.11		Shoreline lighting may be outside HPA authority	
59. Reduce artificial lighting in the Cedar River to aid migrating sockeye salmon	11.11		Probably outside HPA authority. Could only address lighting for new HPA projects	
60. Require construction vessel operation plans for large projects	11.12		Would also have to define elements of plans and allowable operations	

61. Require facilities with substantial vessel traffic (e.g., ferries, recreational floats) to be over deep water	11.12			
62. Require propellers be cleaned before entering water, routine vessel maintenance, and spill prevention plan for construction vessels	11.12			
Measures recommended by reviewers—see Appendix C				
1. Preclude removal of riparian vegetation in all areas, not just those with high erosion	Executive Summary, reviewer number 6 comments	060, 120, 271, 300		9.5, 15.15
2. Require all structures be removed at end of useful life	11.0, reviewer number 3 comments			
3. Conduct site analysis and deny HPAs in important or critical areas	11.2, reviewer no. 3 comment		Recommendation for WDFW analysis. Areas to be protected defined in WAC	
4. Preclude use of treated wood	11.6, reviewer no. 1 comment			

Appendix Table H-3. Mitigation Measures Recommended in Bank Protection White Paper by Authors and Reviewers.

Summary of Recommendation	White Paper Section or Peer Review Report Section for Reviewer Suggestions	WAC Number Recom-mendation is Related to	Peer Review Coordinator's Comment	Related section in *Identification of Discrepancies Between Existing Hydraulic Code Rules and Statutory Requirements, State and Agency Policies and Procedures, Other Administrative Guidance, and Technical Guidance Documents*
Measures recommended by authors				
1. Require construction set-backs	Table 11, construction activities, conservation measures	050, 120, 223, 271, 280, 285		4.19, 5.2, 6.30 6.31, 7.3, 7.5, 7.13, 7.16, 7.17, 8.4, 8.5, 8.11, 9.1, 9.5, 9.6, 10.1, 11.1, 11.2, 15.34, 15.39
2. Contain and direct surface water				
3. Recommendations for dewatering same as number 53 to 56 in Appendix Table H-3			Since dewatering is common to many project types, WDFW may want to consider a separate WAC section for provisions	
4. Only allow activities when potentially covered species are not present	Table 11, construction activities, BMPs		No present freshwater WAC, but timing is applied on ad hoc basis to HPAs. 271 covers saltwater work windows	
5. Survey site prior to activity to endure no forage species present			Management recommendation—does not require WAC amendment	
6. Use temporary erosion control and soil trapping measures				
7. Use temporary bank protection techniques during construction				
8. Three suspended sediment measures--same as 34 to 36 in Appendix Table H-3				
9. Avoid use of impact hammer for pile driving		060, 300		
10. Use air bubble curtains and/or pile caps, or fabric barriers or coffer dams for pile driving				

1l. Require construction vessel propellers are washed, propeller scour is avoided, and a spill prevention plan is submitted		050, 120, 223, 271, 280, 285		
12. Adhere to Stream Habitat Restoration Guidelines (Saldi-caromile et al. 2004)	Table 11, channel processes, conservation measures			
13. Minimize structure footprint				
14. Site structure above OHWL and outside active channel			Structure above OHWL and outside active channel migration zone probably does not require a HPA	
15. Evaluate fluvial geomorphic processes and use natural processes in design				
16. Carefully develop and maintain upland infrastructure			Probably outside HPA authority	
17. Discourage backshore filling				
18. Plan for at least 1-yr flow event for dewatering	Table 11, channel processes, BMP			
19. Use measures that reduce substrate and wave impacts when using traditional armoring techniques	Table 11, substrate modifications, conservation measures			
20. Minimize area of large substrate placement				
21. Use suitably sized material				
22. Site above OWL and outside active channel			Structure above OHWL and outside active channel migration zone probably does not require a HPA	
23. Reduce slope and/or integrate vegetated or riprap bench area				
24. Schedule construction when project area is dry or substrate is frozen	Table 11. substrate modification. BMPs			
25. Locate as far outside floodplain as possible	Table 11, habitat accessibility, conservation measures		Structure outside floodplain probably does not require a HPA	
26. Locate structures away from aquatic vegetation	Table 11, aquatic vegetation, conservation measures			
27. Require post-project vegetation monitoring for up to 10 years				

28. Use land-based construction methods	Table 11, aquatic vegetation, BMPs			
29. Avoid barge grounding				
30. Avoid propeller scour				
31. Minimize disturbance of riparian vegetation, reseed early with native plants	Table 11, riparian vegetation, conservation measures			
32. Above OHWL, cover riprap with soil and revegetate				
33. Do not permit disturbance of riparian vegetation in high erosion areas				
34. Prepare revegetation plans for projects that disturb riparian vegetation, require monitoring for up to 10 years and submittal of reports				
35. WDFW should provide riparian revegetation guidance document			Management recommendation—does not require WAC amendment	
36. Suggest that vegetation be saved for restoration efforts associated with the project or elsewhere			Management recommendation—does not require WAC amendment. WDFW could suggest, may be outside HPA authority to require	
37. Construct access points with least possible impact, per Saldi-Caromile (2004)	Table 11, riparian vegetation, BMPs			
38. Clearly mark access route through riparian vegetation				
39. Use temporary mats across sensitive riparian areas				
40. Use tracked equipment in sensitive riparian areas				
41. Manage surface water--contain it and direct to base of bluff	Table 11, water quality, conservation measures			
42. Evaluate and design for surface and groundwater flow issues				
43. Avoid areas that affect flow connection between groundwater and surface water				
44. Use energy dissipation structures for wave or flow attenuation for compensatory mitigation	Table 12, channel processes and morphology mitigation			
45. Use soft shore armoring or bioengineering techniques for compensatory mitigation	Table 12, substrate modifications			
46. Use spawning gravel supplementation or beach nourishment for compensatory mitigation				

47. Off-site construction of side channels for compensatory mitigation	Table 12, habitat accessibility			
48. Replace lost aquatic and riparian vegetation for compensatory mitigation	Table 12, aquatic and riparian vegetation			
49. Apply natural regrowth or transplant methods for compensatory mitigation for eelgrass impacts				
50. Stormwater treatment or flow buffering for point sources for compensatory mitigation for water quality impacts	Table 12, water quality			
Measures recommended by reviewers—see Appendix D				
1. Allow use of non-native plants for revegetation	Table 11, reviewer no. 4 comments	050, 280, 285		

Appendix Table H-4. Mitigation Measures Recommended in Water Crossings White Paper by Authors and in Reviewer's Comments.

Summary of Recommendation	**White Paper Section or Peer Review Report Section for Reviewer Suggestions**	**WAC Number Recom-mendation is Related to**	**Peer Review Coordinator's Comment**	**Related section in *Identification of Discrepancies Between Existing Hydraulic Code Rules and Statutory Requirements, State and Agency Policies and Procedures, Other Administrative Guidance, and Technical Guidance Documents***
Measures recommended by authors				
1. Adopt guidance/protocols for fish removal and exclusion	11.1	070, 100, 120, 150, 271, 310	Since dewatering is common to many project types, WDFW may want to consider a separate WAC section for provisions	4.19, 5.2, 6.30 6.31, 7.3, 7.5, 7.13, 7.16, 7.17, 8.4, 8.5, 8.11, 9.1, 9.5, 9.6, 10.1, 11.1, 11.2, 15.34, 15.39
2. Develop guidelines for channel dewatering and stream bypasses				
3. Adhere to fish screen criteria where pumps are used		190		
4. Define qualifications for persons authorized to capture and handle fish				
5. Use measures in Snyder (2003) to minimize harmful effects of electrofishing			Use low power direct current, use spherical anodes and cable cathodes apropos to water conductivity, minimize handling, change holding water frequently	
6. Require risk take assessment for each HPA application	11.2	070, 100, 150, 310	No specific WACs for saltwater crossings except for 310	
7. Minimize impacts on channel hydraulics per Bates (2003)			Find alternative to building the structure, site outside active channel, minimize footprint, design generally to have least effect	
8. Require hydraulic model for any project that fills in OHWL				
9. Use measures from Fisheries and Oceans Canada (2006) and California Coastal Commission (2000) to avoid "frac-out"				
10. Increase design standard to 500-year event capacity				

11. Use fords where fish passage not an issue		None	Use of an established ford does not require a HPA	
12. Site piers/abutments to span channel migration zone		060, 120, 271, 300 060, 300 060, 300 060, 300		
13. Bury conduits below sediment surface	11.3			
14. Design pile-support structures to not interfere with littoral drift				
15. Minimize dimensions of floating structures perpendicular to the shore				
16. Minimize fill by spanning channel with abutments and use bottomless culverts	11.4			
17. Minimize use of approach fills or use flood-relief culverts				
18. Site bridges or culverts at naturally confined areas				
19. Oversize culverts to pass LWD and large bedload particles				
20. Same as numbers 35 to 40, Appendix Table H-2	11.5			
21. Same as numbers 15-17 and 19, Appendix Table H-2	11.6			
22. Space pilings to minimize shade				
23. Minimize overwater dimensions of bridges				
24. Include design elements to reduce shade				
25. Orient bridges to reduce shade				
26. Locate bridge deck high above water				
27. Maximize distance between eelgrass and vessel propellers				
28. Same as number 20, Appendix Table H-2	11.7			
29. Same as numbers 21 to 25, Appendix Tale H-2.	11.8			
30. Require performance bond for large projects			WDFW may not currently have the authority to do so	
31. Same as numbers 9 and 10, Appendix Table H-3	11.9			
32. Same as number 11, Appendix Table H-2	11.10			
33. Increase overwater height	11.11			
34. Decrease structure width				
35. Use smallest possible number of pilings				
36. Use grated deck				

37. Require construction vessel operation plans	11.12			
Measures recommended by reviewers—see Appendix E				
1. WACs should specify seine mesh size and material; consider using a sump congregate fish	11.1, reviewers number 3 and 5 comments	060, 120, 271, 300 060, 300		
2. Before requiring dewatering, determine if that is t he best approach	11.1, reviewer number 4 comment			
3. Minimize dewatered area, extend height of dewatering structure to maximum water level expected, sequence installation of structure to discourage fish entry, dewater in stages, and remove coffer dam when turbidly equals ambient	11.1, reviewer number 5 comments			
4. Preclude in-water piers, use drilled shafts for abutments and extend below scour line, and limit any necessary scour protection	11.2, reviewer number 5 comments			
5. Use BMPs developed by Western Wood Preservers Institute	11.5, reviewer number 4 comments			9.5, 15.15
6. Require risk assessment for certain uses of treated wood	11.5, reviewer number 5 comments			9.5, 15.15
7. Require treated wood be coated with impact resistant inert substance	11.5, reviewer number 5 comments			9.5, 15.15
8. For stormwater, allow no net increase of dissolved copper and zinc, use infiltration BMPs or discharge into large volume water body, and treat all runoff				9.5, 15.15
9. Allow use of non-native vegetation in some cases	11.8, reviewer number 4 comments			
10. Require bubble curtains that confine 100% of pile driving area unless water velocity meets certain criteria	11.9, reviewer number 5 comments			