An Independent Peer Review of the Draft Recovery Plan for Central California Coast Coho Salmon

Independent Peer Review for the Center for Independent Experts

By

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Executive Summary

In this report, I reviewed and commented on the CCC Coho Salmon Recovery Plan, and its associated appendices. My findings are grouped into two general categories. First, I listed a number of primarily editorial items that should be helpful for the authors to refine the document so that it reads better. Second, the majority of the review is approached by answering the questions provided in the Scope of Work, Terms of Reference. Under each of those questions, I raised concerns or issues, where appropriate, that should help to meet the three objectives of the review, which were to assess: (1) the use of the best available scientific and commercial information; (2) interpretation and application of the National Marine Fisheries Service Southwest Fisheries Science Center Technical Recovery Team (TRT) recovery planning supporting documents and (3) determination on whether methods employed provide adequate linkages between TRT criteria, habitat-based threats and recovery actions and strategies. My comments under these questions should be taken as my recommendations for improving the Plan.

Overall, the Plan is a large and complex document designed to guide recovery of this endangered ESU into the future. For the most part, the Plan provides the information needed about the relevant threats to recovery and the recovery actions required to restore the ESU to viability. The detailed exceptions to this are listed in the comments under each question.

I generally raised concerns about the relative treatment of specific freshwater habitat threats, which are mostly very thorough and specific, as compared to other threats and issues, for which the treatment is not as thorough. In particular, incidental marine harvest and hooking mortality, climate change, and ocean variability are only addressed cursorily. In the freshwater environment, water toxins, invasive species, large dams, and marine derived nutrient were not fully addressed. Monitoring and research should be more fully developed in the Plan. I recommend that the Plan authors review these and my other comments and make revisions to the Plan accordingly.

Background

I was requested by the Center for Independent Experts to conduct a review of the partial draft of the NCCC Recovery Plan and CCC coho salmon ESU component. The scope of work focused on the principal elements required in a recovery plan. These principal elements have been defined in section 4(f)(1) of the federal Endangered Species Act (ESA) and sections 1.1 and 1.2 of the National Marine Fisheries Service Interim Recovery Planning Guidance (NMFS 2006)

Section 4(f)(1)(b) of ESA states that "each plan must include, to the maximum extent practicable,

- a description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species;
- objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list; and,
- estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal."

From section 1.1, a recovery plan should:

- "Delineate those aspects of the species' biology, life history, and threats that are pertinent to its endangerment and recovery;
- Outline and justify a strategy to achieve recovery;
- Identify the actions necessary to achieve recovery of the species; and,
- Identify goals and criteria by which to measure the species' achievement of recovery."

Description of Review Activities

This impartial peer review was conducted to ensure that Recovery Plan results and conclusions are based on sound science.

In the course of this review, I became familiar with the following which are supporting information to the Draft NCCC Recovery Plan and CCC coho salmon module:

- Technical Recovery Team Reports: Historical Structure and Draft Population Viability (http://swfsc.noaa.gov/textblock.aspx?Division=FED&id=2266)
- NCCC Domain Population Viability Report, draft on previous site but Final Report at http://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-423.pdf
- 2006 Interim Recovery Planning Guidance (http://www.nmfs.noaa.gov/pr/recovery/)
- Endangered Species Act (http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf)
- CAPS process http://conserveonline.org/workspaces/cbdgateway/cap.

Reviews and comments were focused upon: (1) the use of the best available scientific and commercial information; (2) interpretation and application of the National Marine Fisheries Service Southwest Fisheries Science Center Technical Recovery Team (TRT) recovery planning supporting documents and (3) determination on whether methods employed provide adequate linkages between TRT criteria, habitat-based threats and recovery actions and strategies. I did not evaluate or comment upon the TRT documents or the Threats Assessment template. The core of my review focused on answering the questions listed under the ToR. The next section is structured according to those questions, with my responses serving as my review comments.

Finally, as result of my review of the Recovery Plan, the answers to the questions below, a review and familiarity with the associated TRT and ESAA documents, and my general expertise in salmon biology, ecology, and recovery, the review is a list of conclusions and recommendations for improving the Plan.

Summary of Analyses and Comments as Guided by the Terms of Reference

This review of the draft CCC Coho Recovery Plan was conducted primarily in light of the questions asked of the reviewers under the Terms of Reference in the Statement of Work, as detailed below. However, during the course of my review, I noted a number of editorial and organizational issues that, when addressed, will likely be helpful for the authors in their revision of the Plan. Those comments follow here.

General Editorial Comments on Recovery Plan:

1. The draft Plan would benefit from detailed technical editing. I found numerous grammatical, punctuation, and relatively minor technical errors as I reviewed the Plan and its Appendices. These were too numerous to list.
2. The Executive Summary is generally somewhat vague and does not fully reflect the tone of the Plan. For example, devoting three short sentences to the threats to CCC coho salmon, when so much of the volume of the Plan is devoted to that topic, seems like a dramatic understatement of the problems.
3. Figures 1 and 2 are out of sequential order of appearance in the document, as are other figures. In technical writing, it is customary to display tables and figures in the order in which they are referred to in the text. Doing so makes it easier for the reader to follow the flow of the document.
4. It would be helpful if the last bullet under “Conservation Targets”, on p. 51 of the Plan, included some examples of circumstances that applied to “multiple life stages”.
5. The eleven attributes referred to at the bottom of p. 51 are difficult to identify in Appendix C. They should be prominently listed in Appendix C.
6. The discussion on the bottom of p. 52 and the top p. 53 is very weak. It is nearly impossible to discern what Figure 9 is about, or from where the information to be summarized in such tables would originate. The terms “Landscape Context,

Condition, and Size" are very poorly defined and have little inherent meaning without definition in this context.

7. Furthermore, the statement "The viability attribute relates to population abundance, distribution, etc., and was therefore grouped into the "Size" category." has no apparent meaning in Figure 9.
8. It looks like "Adult Population Viability" and "Freshwater Harvest", for example, are included with other, mostly habitat attributes in Appendix C. But this is not well described in the text on pp. 52-53.
9. Another example of the weak description of the CAP workbook process in chapter 5 is that I was unable to discern how viability was assessed in the workbook process until I read in Chapter 7 that: "Coho salmon viability, as characterized by the four population viability indicators (adult density, juvenile density, juvenile distribution, and smolt productivity) rated in the CAP workbooks….."(p. 64). Even then, it was still unclear how these four attributes were combined to determine viability.
10. It would be very helpful to know the relative use of qualitative assessments compared to quantitative ones, as described on the middle of p. 54: "A total of 13 indicators relied on this approach to include instream flow conditions, estuary condition (to some degree), and toxicity." This sentence should include "a total of 13 out X indicators….".
11. On p. 56, the sentence "The Threats Table is organized into Stresses and Source of Stresses, which, when combined, constitute a threat to the species." leads the reader to think that an example might be shown, as was done with Table 5, or a reference to an example might be provided, but they are not. Therefore, this description leads to confusion about where the "Threats Tables" fit in to the process.
12. A misstatement on p. 58 claims that "A complete list of all actions for the Domain, including priorities and costs, can be found in Appendix G (Implementation Schedule)." Appendix G shows only the actions for the Lagunitas Creek watershed.
13. The Plan, referring to Table 8, states that "The San Lorenzo River, Russian River, and Walker Creek are, by this measure, in the worst condition." (p. 65). However, Navarro, Pescadero, Gualala, and Redwood are all in nearly as bad condition. This should be acknowledged.
14. A number of pages after p. 102 are unnumbered.
15. In the section describing Core Areas and Phase I and Phase II areas, pp. 76-77, it would be very helpful if some language were added as to where the reader can find an illustration of these concepts (they are illustrated on the maps in each focus watershed in Chapter 10, for example, but the reader does not know this while reading Chapter 8.
16. The statement "Thus, these interim timelines have been developed to provide more achievable and realistic steps on the long road to recovery." (p. 77) is a non-sequitur. No interim timelines preceded or followed this sentence.
17. On p. 90, there is a need for a citation or web link to the item referenced in "This organizational framework should be based on the same framework established in Washington State and approved by NMFS and CDFG." Readers should be

able to see the proposed framework, so they can understand what it means to CCC coho salmon recovery.

18. The wording for the downlisting and delisting criteria for disease, predation, and competition on p. 92 is currently meaningless without some work on sentence structure.
19. Appendix L shows up in the text before (on p. 96) before appendices J and K are referenced.
20. What is an EDOC and how does it work? There should be a citation or web link for the following reference: "(similar to the EDOC developed in Washington State)" (p. 97).
21. Additional cross-referencing would be helpful in the document. For example, the term "life-cycle monitoring station" arises for the first time in Section 9.1.3.1, Albion watershed, Chapter 10 (no page numbers), but there is no indication of what it means. After searching, one can find the term in Chapter 11 (although it is still not really defined).
22. The viability tables in the watershed-specific sections of Chapter 10 are poorly arranged, with the source of information in the first column. Normally the left-most columns would list the characteristic being assessed so, in this case: Target, Habitat Attribute, Indicator, then followed with the metrics for the characteristic (Results and Rating).
23. The Marine Viability Summary Table on p. 491 needs additional clarification. What do the columns (e.g. poor, fair, etc.) mean? Why aren't all the cells completed? Why are some of the Current Rating cells empty?
24. What is the purpose of the figure on p. 493?
25. Figure 11 (the figure on p. 519?) is not labeled with a caption.
26. Is the Adaptive Management Plan at the bottom of Figure 11 synonymous with the CCC coho salmon Recovery Plan? If not, where does the Recovery Plan fit in, and what is the Adaptive Management Plan?
27. Chapter 16 wins the prize for shortest chapter ever.

General Comment on Appendices:

1. On the third page of Appendix A, there is a reference to Figure 2.4 which cannot be found.
2. There is no Table 2.3, as referenced in Appendix A.
3. There is no Literature Cited section for Appendix A, even though there are references cited in the text.
4. Appendix A is only weakly supported with available references. Many statements made could be supported with references from the literature.
5. The discussion about commercial harvests on the top of p. 20 of Appendix A, seemed to be about chinook rather than coho. Is this an error, or is there no similar information for coho? This should be clarified.
6. Appendix C: Page numbers in Table of Contents are not correct.

Fundamental Questions for the CIE reviewers:

Does the plan meet the minimum standards described in section 4(f)(1)(b) of ESA by including site-specific management actions, objective measurable criteria and estimates of time and cost?

Chapter 10 of the Plan adequately and thoroughly covered the freshwater habitat actions required to improve conditions that will be conducive to viability of the CCC coho salmon. On the broader scale, some of the threats to viability may not be adequately addressed. For example, there is little specific description of or plans for controlling the incidental harvest of CCC coho salmon in commercial and recreational marine fisheries throughout their migration range. Further similar concerns are detailed in responses to questions below.

The Plan does provide objective, measurable criteria for recovery that can be used to in a determination that the ESU could be downlisted or delisted. However, some concerns were raised about the criteria used to generate the criteria and the methods of measurements. These concerns are elaborated below.

Estimates of the time required and the cost to carry out the measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal are spelled out in the Plan. However, the time estimates are vague (50-100 years) and there is no information provided to identify the sources of the over $3 billion required for implementation of the recommendations in this Plan.

Does the recovery plan delineate those aspects of the species biology, life history, and threats that are pertinent to its endangerment and recovery?

For the most part, the Plan adequately describes the aspects of the species biology, life history, and threats that are pertinent to its endangerment and recovery, especially in Appendix A. However, Chapter 2, as an introduction to these topics, does not thoroughly address species biology, life history, or threats. In fact, several significant threats are never mentioned in the chapter, including: poor water quality (e.g., toxins, low dissolved oxygen); invasive species, and directed or incidental fishing. Some key aspects of the relationship between species biology, life history, and/or threats have been overlooked or are obscure in the report, as described below.

Water pollution, toxics, etc.

Toxic and deleterious water quality conditions are only treated as if they are subtopics under other topics, but water quality should be a threat topic unto itself. This is because water quality problems can arise from multiple sources (urbanization, forestry, agriculture, roads and highways) so that, taken together, water quality is a major threat. For example, water quality is not even mentioned in Chapter 2, and in Appendix A, water quality issues are only mentioned in general terms. There is a paragraph under "Roads" stating: "Toxic materials from roads and parking lots are often routed directly to streams with no stormwater treatment to remove pollutants. These materials

(petroleum hydrocarbons and heavy metals from cars and trucks) can adversely affect salmonids by reducing feeding, impairing migration behaviors, and injuring or killing them. For example, metals can reduce growth, reproduction, and fecundity, cause genetic damage, and impair olfactory functions (Eisler 2000)." (Appendix A, p. 14).

Water quality problems due to toxics are mentioned again on p. 16 of Appendix A, under Urbanization although there is no mention of wastewater treatment plants as an important source of heavy metals, pharmaceuticals, and other contaminants. There is a paragraph on p. 19, Appendix A, about water quality, but it does not mention fluoride or pharmaceuticals.

Research by the National Marine Fisheries Service on the Columbia River has shown that salmon migration is inhibited with fluoride levels as low as 0.2 parts per million (Damkaer and Dey 1989). These levels are routinely exceeded in municipal wastewater streams (e.g., http://www.env.gov.bc.ca/wat/wq/BCguidelines/fluoride/fluoridetoo-01.html#top), especially where the drinking water is fluoridated. This effect has not been addressed in the Plan.

Toxins create a serious, but relatively unknown, threat to CCC coho salmon recovery and should be elevated to their own threat category in the Plan. For example, there is no mention of water quality or toxins as a habitat factor in Table 3. (p. 28). Appendix C (p. 49) does describe the potential threat from toxins but states that there is little quantification of toxins in many watersheds.

Invasive Species

The effects of invasive species are only mentioned once in the Plan (p. 428), where predation by striped bass is cited as a significant effect on coho salmon recovery. Yet, striped bass' effects are certainly more widely distributed than just in Waddell Creek. For example, the map of striped bass distribution shows them distributed in almost all coastal estuaries in the CCC coho salmon range (http://ice.ucdavis.edu/aquadiv/fishcovs/sb.gif).

Incidental Harvest and By-Catch

It is highly likely that CCC coho salmon are captured incidentally as by-catch in marine salmon fisheries throughout their range from British Columbia to California. This fact was mentioned as a possible source of loss but was not emphasized in the Plan. This will be discussed further below.

Does the plan have a logical strategy to achieve recovery that is relevant to habitats, life stages, populations, diversity groups and the overall ESU?

The answer to this question is generally yes. I do note, however, a dramatic emphasis on freshwater habitat as the primary area of recovery efforts. While there is great need to accomplish all of the huge number of freshwater restoration items listed in the 23

individual watershed sections of 10, much less specific attention is paid to ESU-wide and the diversity strata-wide actions, as well as the marine environment.

Questions could be raised about how well this plan "…. guide enhancement provisions of sections 4 and 5, take prohibitions through sections 4(d) and 9, cooperation with state(s) under section 6, needed research under section 10, fishery management actions taken and Essential Fish Habitat (EFH) consultations conducted under the provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA)." as stated on p. 499. For one example, the effect of incidental harvest are stated to be relatively unknown, but the list of actions to resolve the effects of by-catch does not even include an assessment or control of by-catch in marine fisheries (p.82), other than a general recovery criterion for downlisting and delisting (p. 95). Additional specific examples are explored further below.

Another concern about the strategy in the Plan is a risk that Phase I and especially Phase II areas will continue to be degraded if attention is not brought to them now. What will protect those areas from getting worse? This concern relates to the following statement: "Once Core areas are secured, Phase I areas are designated for necessary recovery actions to expand current populations. Phase II areas are designated for long-term recovery actions. Phase II areas are typically more degraded than Core and Phase I areas where restoring watershed processes and preventing further degradation will likely take an extended period of time." (p. 5).

Although it is understandable that the plan needed to focus only on certain of the 76 historical coho watersheds, as explained on pp. 59-60, questions arise as to why those particular 23 were selected. Why not more or fewer watersheds? What actions are going to be taken relative to the other remaining populations? Should the plan include recommended actions for the remaining watersheds? Also, should not the status of CCC coho in the remaining 53 watersheds be listed somewhere, so that the public and managers know what other watersheds need attention/protection?

I wonder about whether the recovery criteria for connectedness will be met: "The distribution of populations across the ESU must maintain connectivity between populations. Unoccupied gaps along the coastline of more than 20 to 30 km may be sufficient to disrupt normal patterns of dispersal and connectivity." (p.80). For example, Redwood Creek (Marin County) appears to be separated from Pescadero Creek, the next closest independent population, by more than 30 km.

The CAP process, as described in Chapter 6 and Appendix C, only addresses habitat and related biological attributes, like density. How were other threats evaluated? Why not incorporate the non-habitat threats, such as predation, competition, disease, legal policy issues, and incidental harvest into the same process? Table 5 would be much more complete if all the threats were listed in it.

Chapter 8, which is about the strategy for recovery, is only three pages long. It is a weak description of the strategy and not well-linked to the other chapters. It would be more

helpful if, after the core and phase areas were described, there were further description of how they were/are applied, perhaps giving an example. Furthermore, the brief discussion about timelines provides no specifics, other than to say that observations of abundance will be evaluated every three generations.

The population-level criteria on page 80 appear to be unsubstantiated, and they do not coincide with the recovery targets set out in earlier chapters. Criterion PL1 reads: "The total number of spawning adults per generation for each independent population must be greater than or equal to 2500 fish. Because they have a three year life cycle, a single generation includes coho salmon from three consecutive year classes. This equates to an annual abundance of 834 spawning adults (i.e. 2500 divided by three). Annual abundance is measured as the average number of spawning adults over a 12 year period (i.e. average over three generations)." (p. 80). This contradicts Tables 6 and 7 which indicated that recovery targets, which coincided with the low extinction risk targets, would be the IP-kms multiplied times 40-42, except in the Russian River (p. 59). From p. 509, then, the independent populations' recovery targets would range from 2,400 to 10,080 annually. This does not match the recovery criteria of 834 spawners per year described on p. 80. Yet there is no explanation of this discrepancy, making it seem like Chapter 9 ignored the previous chapters. Furthermore, even though Appendix I (Spence et al. 2008) is cited on p. 79 as a source of demographics, that document does not lay out specific recovery targets, as do Tables 6 and 7.

There is also confusion about the use of the term density target. On top of p. 47, density targets are described as ranging "between 40 to 42 per IP km" and then following on, "the total population recovery criteria are the product of the density targets times the total number of IP km in that watershed." (p.47). However, in Table 11, the density targets range between 24.76 and 41.76 per IP km. The only statement about what the different targets found in Table 11 are based on is: "**Criterion PL4:** For the smallest of independent populations (32 km), adult spawning densities should exceed 40 fish per IP km. Densities may decrease to 20 fish per IP km as the size of independent populations approaches ten times the minimum size for independent populations." (p. 80). However, there is no biologically/scientifically based explanation of why that criterion was delineated or applied to the previously determined recovery targets.

In the population-level criterion, there appears to be an erroneous statement: "Annual abundance is measured as the average number of spawning adults over a 12 year period (i.e. average over three generations)." (p. 81). Since these are three-year-old fish, there would be four generations in 12 years, not three.

The Plan does a poor job of describing the Marine CAP process. It looks like Chapter 6 is only about freshwater, yet Appendix F lists threats for a marine CAP. At the bottom of p. 50, it says a "single CAP workbook was developed for the marine environment", and that is the only description in Chapter 6. Marine threat abatement criteria are described on pp. 94-95, but they are general and vague and lacking specific action, unlike the level of detail provided for freshwater habitat recovery criteria and threat abatement criteria.

Is the recovery plan grounded in a clearly articulated and biologically meaningful conceptual framework? Does the plan use best available scientific information? If better data or analyses are available, please identify.

The Plan was not clearly articulated in that it follows a conceptual framework that is somewhat convoluted and disjointed. However, with significant study, it was eventually found to be mostly biologically meaningful (other than the exceptions noted throughout these comments). In one obvious example, the chapters seem to jump from subject to subject, especially chapters 4 through 8.

The Plan appears to be based on the best scientific information available. Other than the few references offered in this review, I am not aware of additional information that was not used. As noted elsewhere, it would greatly help this Plan if any available data on the numbers of observed spawners in the streams of the ESU were presented somewhere in the Plan as a frame of reference for the recovery targets.

Is the plan suitable for serving as an outreach tool and does it invite public participation in the process?

The esoteric wording, poor organization, and complexity of the Plan make it way too inaccessible for the general public (or even many agency employees without intense study). This Plan would require a very concise companion, summary document, or an effectively expanded Executive Summary, to become useful as an outreach tool.

The Plan does not obviously invite public participation in the process, except for several references to public participation in restoration (Chapter 13).

<u>Question Regarding Use and Application of the Technical Recovery Team Reports</u>

Are the outputs from the historical population structure and population viability criteria described, and applied, appropriately?

The work reported in the background documents (Bjorkstedt et al. 2005, Spence et al. 2008) and summarized in Chapter 5 follows accepted practices in the state of the art of salmon population structure and viability analyses.

A glaring lack, however, was that neither of these reports, nor the Plan itself, presented any data or estimates on spawner abundance in the CCC coho salmon streams.

Is the plan clear about the differences between viability criteria and recovery criteria?

The differences between viability criteria and recovery criteria are generally very clear, mainly due to the different descriptions presented in Chapters 5 and 9. The biological viability criteria are described in Chapter 5. Six population-level viability criteria are listed on p. 42: "Six population viability criteria (also termed extinction risk) were developed and, when met, are expected to result in populations with a low risk of extinction (i.e., viable). These criteria are: (1) extinction risk; (2) effective population size or total population size; (3) population decline; (4) catastrophic decline; (5) spawner density, and; (6) hatchery influence (Table 4)."(p. 42). ESU-level viability criteria are listed on p. 46. Application of the biological viability criteria is generally described as follows: "The biological viability criteria "defines sets of conditions or rules that, if satisfied, would suggest that the ESU is at low risk of extinction" (Spence *et al.* 2008). These general conditions are to: (1) achieve population viability across selected populations and (2) attain the number and configuration of these viable populations across the landscape." (p. 46).

There may be some amount of confusion about the terminology of "Recovery criteria". – For example, one place in Chapter 5 reads: "Density targets range between 40 and 42 spawners per IP km, the total population recovery criteria are the product of the density targets times the total number of IP km in that watershed." (p.47).

Yet, Chapter 9, which is all about Recovery Criteria, opens with a definition of Recovery Criteria as : "Recovery criteria, or formal delisting criteria, include three elements: (1) population based biological criteria; (2) criteria to measure whether threats to the species have been controlled and abated; and (3) criteria for future commercial, recreational, and tribal harvest. Recovery criteria that would allow reclassification of CCC coho salmon to threatened status or to be completely delisted can only be met when: (1) the population-based criteria are met; and (2) threats to the species are sufficiently reduced or removed. These criteria require evidence the population's status has improved in response to the reduction of threats, while the criteria to reduce and/or eliminate threats requires evidence the threats have been eliminated or controlled and are unlikely to return. Any new factors or threats identified since listing must also be addressed to ensure the species no longer requires protection under the ESA. " (p. 78). So the use of "Recovery Criteria" in Chapter 5, as cited in the previous paragraph, is not the same as the use of the same terminology in Chapter 9.

Question regarding the Threats Assessment Process

Is there an explicit analysis of threats discussed in terms of the five listing factors (e.g., threats)? Does the plan provide continuity between new threats and changes to threats identified in the listing rule since publication?

Chapter 3 lists the threats in terms of the five listing factors, both before and since listing. This listing of threats tends to be more general, rather than explicit. Chapter 3 does not provide specific details about those threats. Threats are more explicitly listed in Chapters 7 and 10, although not following the five listing factors.

Table 3 (p. 29) does not indicate the threats due to Inadequate Regulatory Mechanisms.

Does the plan contain a fair assessment, and prioritization, of conditions, stresses and sources of stresses?

The Plan contains a fair, although somewhat convoluted, assessment of the conditions, and sources of the stresses. Chapters 4, 6, and 7 focus on threats due to habitat but do not include other non-habitat threats. Non-habitat threats are mostly not included in the threats tables – it would be preferable if they were. They are listed separately under recovery criteria, but should be better melded into the threats tables.

Chapter 7 describes the system by which threats were ranked (prioritized?), according to threats categories, relative to each other within the 23 focus watersheds.

Appendix G is an example of how recovery actions aimed at reducing specific threats, as identified in Chapter 10, were prioritized within each watershed, but it does not directly prioritize stresses.

Are other factors considered for each threat and its source such as scope, severity, frequency, magnitude, etc. as suggested in the Recovery Guidance?

The CAP viability tables were an attempt to rank the relative severity of the threats for each watershed. Conclusions in those tables were based on the CAP workbook process where a rating scheme was developed to compare conditions in each watershed to metrics designed to rate the status for each threat category. I have some concerns about the rating system and the arbitrary nature of the rating values.

Although there is a system to rate each threat compared to the CAP workbook rating criteria, there is no apparent weighting of the relative significance of threats among categories. There are a number of cases is where weighting the extent of each threat may be relevant. For example, high run-off, having the potential to scour out an entire year-class of eggs, should carry more weight in terms of the potential effect on viability than, say opening some additional off-channel habitat. There does not seem to be an accounting for such inter-category relative importance.

Is the threats assessment objective and are all realistic threats identified (even if it may not be feasible to address it in the recovery plan)?

Most threats have been identified and accounted for. A few are missing or are inappropriately minimized.

It is unclear how the effects of larger dams were treated. They seem to have been disregarded because "Critical Habitat" was designated as all accessible areas within the historic range, except those above dams. For example, "Inaccessible reaches (areas excluded from designation) are those above the following dams: Newell Dam (Lock Lomond), Phoenix Dam (Phoenix Lake), Peters Dam (Kent Lake), Seeger Dam (Nicasio Reservoir), Warm Springs Dam (Lake Sonoma), Coyote Dam (Lake Mendocino)." (Appendix A, p. 7). Leaving the threats of inaccessibility above existing dams off the Critical Habitat list overlooks the critical importance of those habitats previously available for spawning (coho often prefer spawning habitats in upper reaches).

Dams are not listed as a habitat indicator in Table 8 nor in the threats summary of Table 9. Physical barriers are rated as poor in only one stream (Aptos) in Table 8. Large dams are never mentioned in the Recovery Criteria for Habitat Indicators (starting on p. 84) nor in the Threat Abatement Criteria (starting on page 89).

In regard to hatchery genetic effects on the populations, both negative and positive, described in Appendix A, pp.26-29, the authors should review some recent additional important science on the effects of inbreeding depression (Araki et al. 2007).

It seems unlikely that every watershed should be rated as "good" for the impervious surface factor (Table 8, p. 72). The fact that there is no variation in this factor indicates that it was not well-deigned and/or was improperly applied.

I also question the rating methods and results for toxicity. To conclude only that "Toxicity was rated as poor in Walker Creek, due to intense livestock use" (p.66) is to overlook a much more extensive problem. Further in Table 8, the fact that only four of the 23 watersheds were rated as fair or worse for toxicity does not coincide with the likelihood that toxins are playing a major role in poor survival and hence recovery. The problem is that one run-off event that includes, for example, excessive copper (McIntyre et al. 2008, and references therein), can result in death or sub-lethal but functionally limiting effects. These events often occur at the first freshet and usually only briefly, so are not recorded by extant water quality sampling programs. This insidious effect is likely a major cause of low recovery rates observed in listed salmonids. Therefore, it should be more thoroughly evaluated and prescriptions for prevention should be part of recovery plans.

Likewise, the statement regarding access at stream mouths indicates a misperception about the importance of spawner escapements. In fact, the following text contradicts itself: "Passage-at-the-mouth for spawning adults was rated as fair, good, or very good across all focus watersheds, indicating the factor is not likely limiting the populations. However, during drought conditions it could potentially result in severe adverse effects (e.g., the 2007/2008 cohort in Scott Creek)." (p. 66). Because coho salmon are almost entirely three years old at return, the blockage of one cohort automatically reduces the abundance of returning adults three years later. If this occurs in succeeding years, perhaps due to extended drought, the entire population can quickly be dramatically

reduced. It seems like there should be a weighting for factors that may at times not be an issue but, when they do occur, can be catastrophic, such as drought-related blockages, or storm-related flooding, which can also wipe out a cohort in one major event.

Also apparently missing from the threats assessment is the effect of poaching (illegal fishing) and harassment by kids and dogs. Appendix C addresses incidental recreational fishing but not other aspects of illegal harvest and "take". Although poaching and harassment are difficult to assess, these can generally be correlated to density of urbanization and density of fish – a metric as valid as many of the others used in the CAP workbook could be devised. In some ways, poaching and harassment is a threat that can be ameliorated, especially through educational programs and increased enforcement.

Indirect and/or incidental fishing in marine waters is another factor that is not adequately addressed. CCC coho salmon are likely captured in marine salmon fisheries from British Columbia to California, although the extent is currently unknown. The effects of this are underrated. Table 9 lists fishing and collecting as a high threat for three out of 23 watersheds, but this only applies to freshwater. On p. 95, there are downlisting and delisting criteria for commercial and recreational by-catch but there are no specific actions in the Plan to ensue that these criteria are met. Additionally, there are concerns about the effects of incidental harvest, such as this: "Coho are still intercepted in Chinook-directed fisheries and must be immediately released. However, some of them are expected to die, as reflected by the 13.0% marine fishery mortality rate allowed for Rogue/Klamath hatchery coho in the Biological Opinion for the Pacific Fishery Management Plan (NMFS 1999)." (Appendix A, p. 21). This only addresses the chinook fishery; CCC coho are similarly subject to other salmon fisheries further north.

Under Recovery Criterion B1 (p. 83), additional recovery actions should include:

1. **Recovery Action:** Implement studies to determine the relative harvest and/or catch and release mortalities of CCC coho salmon in the coastal marine commercial and recreational fisheries of British Columbia, Washington, Oregon, and California.
2. **Recovery Action:** Implement a range-wide educational program to teach the public, especially children and pet owners, about the importance of allowing salmon to spawn unmolested and to report poachers or other violators to authorities.

Without these actions, the effects of marine fisheries will be unaccounted for, and the harassment of spawners will continue.

Marine-derived nutrients are discussed in Appendix A, p. 35, but they are not mentioned anywhere in the Plan. The lack of these nutrients, due to decreases in salmon carcasses being delivered to the watersheds, could certainly be contributing to reduced productivity of CCC coho salmon smolts.

Does the plan explicitly identify threats and track, through objective measurable criteria, how each threat will be reduced or ameliorated, through site-specific management actions? Are these final threats linked to the five listing factors for this ESU?

For the most part, the Plan does identify threats and track plans for reducing the threats through measurable criteria. The specific actions listed in Chapter 10 will go a long way toward ameliorating the threats identified under the five listing factors. However, the Plan does not directly link the specific recovery actions back to the five listing factors.

In the Section on Recovery Criteria for Habitats (p. 85), I note that most of the criteria for down-listing or de-listing will be assessed by some measure or percent of the habitat factor in a certain target condition. The source of these target levels is completely unclear. Who developed these target levels and how were they developed?

Furthermore, some of the habitat recovery criteria listed seem somewhat unrealistic (e.g. "No toxins are present in the water column in the focus watersheds." – p. 89) or unfounded (e.g., "Average annual number of steelhead fishing trips should be less than 150 for the entire watershed during the adult coho salmon migration period." – p.87). On what are these and other criteria based?

On p. 91, is the following statement part of the down-listing and de-listing criterion? It seems to be a stand-alone sentence not connected to the criterion. "In addition, each of the 23 focus watersheds maintains cool water refugia in at least 60 percent the potential IP rearing habitat identified for coho salmon."

The threat abatement criteria for storms and flooding on p. 94 are the same for both downlisting and delisting. More importantly, there is no value for the criteria by which these effects would be measured. The wording only states: "Implementation of TMDLs and/or watershed restoration plans has been demonstrated to provide resistance to erosion from high intensity storm events." There is no specification for how much the resistance from erosion will be abated, as it is specified for other threats.

What is the source for the list of Diversity Strata Recovery Actions beginning on p. 98? There is no indication of where those listed actions are derived from, nor whether it has been correlated with all the diversity strata-wide threats. This should be more fully explained before the list is presented.

Under Marine Threat Abatement, the climate change criteria are not quantified (p. 94). It may be possible to quantify the downlisting and delisting criteria for climate change in terms of smolt survival rates that would ensure a reasonable return of adults even under low marine survival conditions (see for example Nickelson and Lawson 1998).

Under Listing Factor A, Recovery Criterion Al states: "Eighty percent of all habitat indicators are determined, on the average, to be in good condition. Eighty percent of threats are determined to rank as low." (p.82). First, how will this eighty percent be measured across disparate habitat indicators; i.e., how do you compare and quantify

the percents of effects of roads with the effects of agriculture? Second, and more importantly, how will the relative effects of certain habitat threats be evaluated relative to their effect on CCC coho salmon? That is, eighty percent of a certain threat may be eliminated, but the remaining twenty percent may include the most detrimental sources of that factor. It seems like a method for weighting the magnitude of each threat within each indicator is required.

Listing Factor C should include competition from native and non-native species, as well as disease and predation (p. 83).

Listing Factor D (p. 83) should include requirements for counties and municipalities to create and/or enforce planning and development regulations to reduce or eliminate development that causes negative effects on streams or estuaries, or to support retrofitting developments with features that reduce their impact.

Listing Factor E (p. 84) should include language or an action item that addresses the concept that all actions that relate to climate warming should be given extra weight, e.g., impoundments should be created to augment the expected worsened low flows, etc.

Is the Threats Assessment protocol/methodology employed for assessing salmonid threats effective?

- **Do the scoring and rankings in the matrices link logically to your understanding of the species and the systems they live in?**
- **Are the habitat types as defined in the matrices sufficient?**
- **Are the linkages between habitat types and life stages correct and complete?**
- **Does the protocol for threats assessment have a high likelihood of correctly identifying the dominant stressors for each population?**

The threats assessment is generally effective, although I have some concerns about how specific threats were assessed for each watershed for several reasons:

1. Looking at some of the results in Table 8 raised questions about the outcomes and I found it difficult (nearly impossible) to track back through the process to find out how a certain rating was derived for a specific watershed;
2. The description of methods in Chapter 5 is not helpful for guiding the reader to the actual results of the CAP workbook process;
3. This leaves the reader with having to trust the results in the Viability tables in Chapter 10, and no way to backtrack to evaluate relative agreement with the outcomes that are presented.

I also have concerns about how water quality threats were assessed. In Appendix D, the method to determine whether "toxins" were a problem was to do a search for the words "toxic", "toxin", and "metals" (Appendix D, p. 9). However, other words like pesticides, PAH, pharmaceuticals, and others, were also relevant to such a search, so the effects of these other toxins were not accounted for.

The habitat results by marine life stage, as generally described on p. 68, are apparently not incorporated into the considerations of viability, as indicated in Table 8, or in the Threats or Viability table results (see Albion section of Chapter 10, for example). So how were the marine results ever used?

Does the recovery plan adequately address potential uncertainties related to threats assessment?

There is no apparent direct assessment of uncertainty in the Plan. The uncertainty of threat assessments is recognized in several passages of the Plan, but it is never quantified.

To some extent, uncertainty is generally addressed by recognizing that recovery may take 50-100 years. Also, by setting the recovery criteria and invoking a monitoring program, uncertainty is implied in the process of assessing progress relative to the recovery criteria.

Question regarding the Conservation Assessment Process

Does the plan adequately assess the effectiveness of conservation actions to date including, if the action was in place before listing and the reasons why the efforts were considered insufficient?

Chapter 4 includes a listing of the pre- and post-listing recovery actions. However, it is simply a descriptive listing, and does not assess the effectiveness of conservation actions to date, except in very general terms. The tenuous nature of the CCC coho population survival (Spence et al. 2007, McFarlaine et al 2008) necessitates a rigorous evaluation of whether actions to date have stemmed the decline and if not, why not. This evaluation appears to be missing from the Plan – there was no direct comparison of results from actions taken before and since listing, or whether they have been effective.

In regard to conservation efforts taken thus far, the following quotation speaks for itself. "While the Federal, State, County and non-governmental efforts are underway, and collectively enhance the potential that populations and habitats of the CCC coho salmon ESU can be protected, they do not provide sufficient certainty of implementation and effectiveness to substantially ameliorate the level of assessed extinction risk for CCC coho salmon. The fact that CCC coho salmon continue to decline is an indication that conservation efforts may need refocusing and restructuring to align with the highest priorities to, first, prevent this species' extinction and, second, provide for its long-term survival." (p. 38)

Is it clear what threats are being addressed through conservation efforts and what threats remain unaddressed?

The lists of conservation efforts before and since listing can be used to gain an overall view of what threats are being addressed through conservation efforts but those lists do not describe what threats are not being addressed. While there is no specific, organized summary that compares which threats are being addressed versus which are not, the chapters that list the threats, recovery criteria, and specific recovery actions essentially describe the threats that are unaddressed or need further action.

There is also a need to look at the effectiveness of conservation hatchery programs. Are they expected to help? How are they doing so far? For example, "There are now only two CCC coho salmon hatcheries currently in operation within the NCCC domain: Don Clausen Fish Hatchery (Dry Creek, tributary to the Russian River, Sonoma County), and the Monterey Bay Salmon and Trout Project (Big Creek Hatchery/NMFS SWFSC), Santa Cruz County). Both of these hatchery programs are now operated as conservation hatcheries with a captive broodstock component." (Appendix A, p. 27). Additional captive brood stock programs are suggested in Chapter 10. Are the existing programs helping? (Not on the Russian River apparently – p. 62 and Appendix A, p. 28.) If not, then why not? Why would they be expected to help in other locations if they are not working in their current locations? Perhaps the TRT or some other group of hatchery experts could propose a captive brood and supplementation plan that would be more effective.

Question regarding the Recovery Strategy

If the species (ESU) met all the recovery criteria, does it seem feasible that this species would likely persist for the foreseeable future?

Yes, IF all the recovery criteria were actually met, the species would most likely persist into the foreseeable future. However, that is an extremely uncertain IF. The general concepts embodied in the statements from the Plan about the costs of recovery reflect the overall challenges of meeting the recovery criteria: "While there is an extensive list of actions that need to be undertaken to recover coho salmon, there are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long term and future funding." (p. 514). I would also add to that the uncertainties of expected patterns of human population increase and the associated development. The expansion of human activities is a juggernaut, the pervasive effects of which may never be significantly reduced because they are on an inevitable trajectory of expansion (Lackey et al. 2006, and authors therein).

Unfortunately, the ESU may be too close to extinction already, as evidenced by these quotes from the Plan itself: "Due to severe population declines its listing status was reclassified to endangered on June 28, 2005 (70 FR 37160). More recent studies are indicating a probable population collapse (McFarlane and Hayes 2008, in draft) across the species range; increasing the likelihood of extinction. Only a few watersheds currently support more than remnant populations (e.g., Pudding Creek, Albion River, and Lagunitas

Creek)" (Executive Summary p. 4) . Also, "In spite of the protections afforded by these listing and the development of a State Recovery Plan, the population has continued to decline precipitously. Unless major restoration and threat abatement actions are initiated immediately, CCC coho salmon will likely become functionally extinct in the foreseeable future." (p. 27).

Using the viability criteria on p. 46 of the Plan, and comparing that to Figure 4, it seems like some of the strata, at least the San Francisco Bay stratum, would not meet the recovery criteria.

One of the long-term challenges for this species is that "Most of the land use practices on private ownership do not trigger interagency consultation. This lack of consultation nexus is due in large part to the Corps' Clean Water Act section 404(f) exemptions for farming, logging, and ranching activities. These exemptions eliminate Federal oversight and review for these land management activities, including actions adversely affecting coho salmon and their habitat. Without a nexus, the contribution section 7(a)(2) provides to CCC coho salmon recovery is limited." (p. 501). Whether CCC coho salmon continue to avoid extirpation and/or ultimately achieve viability likely depends largely on the outcomes of the actions described on pp. 502-503. It will be essential for NMFS to work closely those federal and state agencies to modify those exemptions or to create similar 7(a)(2) protections through other state and local agreements, and to take necessary actions to ameliorate the effects of logging, ranching, agriculture, and urban and residential development.

Ultimately, the most likely barrier to achieving the recovery criteria is the huge price tag (over $3 billion – Appendix K – not including inflation) (p. 514). I did not find any information in the Plan that indicated the source of that huge sum or who was ultimately responsible to pay for it.

Do the recovery strategy and recovery criteria adequately consider large-scale environmental perturbations such as climate change and ocean variability?

Climate change and ocean variability are both addressed in the Plan (and in Appendix A, pp. 31-35), although relatively cursorily. There are not many management options that can address either of these effects. Accounting for these effects both as they affect both freshwater and marine productivity is essential to effective management of all salmonid populations. In freshwater, accommodating the effects of both droughts and floods due to the extremes of climate change requires exaggerated accommodations for water availability during droughts, and run-off control during high rainfall events. Marine variability is obviously uncontrollable, but managers can control, to at least some extent, the number of smolts entering the ocean. The greater the number of smolts that go to sea, the more adults will return, as moderated by the survival rate.

Are the links between human activities, effects on habitat, effects on individual fish, and expected responses of populations clearly described?

First off, the links between human population growth and the effects on habitat (e.g., Lackey et al. 2006) are not addressed in Plan. Only the habitat degradation itself is addressed, and not the true source of the changes.

The effects on habitat are reasonably described, as are the expected responses of the populations. Because of the serious declines of the coho populations, and the extent of the habitat and other deleterious issues though, expectations for recovery are not presented as being particularly high.

I have concerns that the emphasis on Core Areas, with postponement of attention on Phase I and especially Phase II areas, as well as the 53 streams not subject to the 23 focus streams of this plan, will result in further degradation of these non-focus, non-Core Area locations. For example, "Once Core areas are secured, Phase I areas are designated for necessary recovery actions to expand current populations. Phase II areas are designated for long-term recovery actions. Phase II areas are typically more degraded than Core and Phase I areas where restoring watershed processes and preventing further degradation will likely take an extended period of time." (Executive Summary, p. 5). Is there a risk that Phase I and II areas will continue to be degraded if attention is not brought to them now? Why wait till later? They will be worse later and even more difficult to restore.

Does the recovery plan contain a logical framework for prioritizing recovery efforts at multiple spatial scales? i.e.,

- **For each of these populations, have the primary stressors been identified? Given the prioritized stressors, do the recovery actions have a high likelihood of achieving measurable results? Is there a logical link between stressors, populations and prioritized recovery actions such that they will have the highest likelihood for success?**

The Plan does contain a logical, although difficult to follow, framework for prioritizing recovery. In most cases, the primary stressors have been identified for each of the 23 focus populations. Several issues raise questions about whether there all logical links between stressors, populations and recovery actions will lead to the highest likelihood of success.

First, given the extremely tenuous condition of this ESU, it is doubtful that recovery is possible when the fishery is allowed any take. As described in Plan: "The conservation objectives established in the RPA require that no directed coho salmon fisheries or retention of coho salmon in Chinook salmon-directed fisheries be allowed off California and that management measures developed under the FMP be designed to achieve an ocean exploitation rate on Rogue/Klamath hatchery coho salmon stocks of no more than 13 % to protect CCC and SONCC coho salmon, respectively." (Appendix A, p. 21). Also, "Generally speaking, listed salmon and steelhead are likely to occur at the same time,

and in the same locations, as non-listed salmonids, and are likely to be efficiently captured by the same gear and fishing methods. Even if all CCC coho salmon were immediately released, the bycatch mortality resulting from nearshore and inland freshwater fishing methods is unknown and may be high. Further, any adult CCC coho salmon encountered in freshwater fisheries is a returning spawner, which has survived at least a year of oceanic life and is particularly valuable for ESU recovery. Given that the impact the state salmonid fishery on CCC coho salmon is unknown but potentially significant, this fishery may pose a threat to the recovery of this ESU." (Appendix A, p. 22). This level of take can have a serious cumulative effect on CCC coho salmon, especially if it is also occurring in more northerly fisheries as well.

Likewise, there are similar concerns about the effects of freshwater recreational incidental take and/or hooking mortality, which is not fully described in the Plan. More information is needed on the recreational fishery (currently closed to coho) and its effects (incidental mortality) on CCC coho. For example, the only indication of potential losses to the recreational fishery is found in the following statement: "In 2007, 9000 salmon were reported landed in California's recreational fishery." (Appendix A, p. 24).

There is no specific documentation in the Plan regarding who will implement the incredibly long list of actions listed in the individual watershed sections of Chapter 10.

Do the proposed recovery actions link logically to threats identified in the threats assessment?

- **Do proposed recovery actions target the primary stresses/stressors for each population?**
- **Are recovery actions prioritized in a manner consistent with identified threats?**

In regard to linking threats to recovery actions, it would be preferable if all the watershed-specific recovery actions in Chapter 10 were linked at least to threat categories. As it now stands, the listings of recovery actions for each watershed, beginning on p. 103, do not coincide with the listings of threat categories beginning on p. 84. For one of many examples, smolt passage flow is listed as a threat category on p. 87, but that threat is never referred to again in the watershed-specific recovery actions.

The ESU-level recovery actions listed near the beginning of Chapter 10 (starting on p. 97) do not necessarily link to threats and threat abatements previously described. For example, the actions do not address all the threat items listed at the ESU level in Chapter 9, beginning at p. 84.

A glaring omission of recovery criterion for threats is blockage of upstream passage by dams and other blockages such as water diversions and faulty culverts. Neither the Recovery Criteria for Habitat Indicators (p. 84 and onwards) nor the Threats Abatement Criteria (p. 89 and onwards) lists migration blockages by dams, diversions, or culverts. I

do note, however, that passage blocks appear to be addressed within the individual watershed sections of Chapter 10.

Under the section ESU Level Recovery Actions, what does the following statement mean: "Encourage amendments to Army Corps 404 Clean Water Act exemptions for farming, logging, and ranching activities;" (p. 98)? This needs additional wording to more clearly specify what amendments are encouraged.

It could be debatable about whether the recovery actions target the primary stressors. At the watershed level, for example, specific actions were delineated for all threats that were rated as poor, as noted in "Strategic actions and action steps were developed to address all habitat attributes ranked as poor." (p. 101). However, many attributes rated as fair were not addressed: "For attributes determined to be limiting in some watersheds, strategies were also developed for those ranked as fair…… strategies were not developed for most attributes ranked as fair, good or very good." (p. 101). While it is clearly important to address all attributes rated as poor, ignoring attributes rated as fair, may compromise recovery for two reasons: 1) as noted elsewhere, the rating system was not perfect and therefore some attributes could have been rated as fair but still have notable effects on coho recovery, and 2) the cumulative effects of multiple attributes rated as fair could add up to chronic levels of a stressor that together have a strong impact on coho recovery. Since the populations suffer from the synergy of all negative effects combined, every action could help (for example see #5, bottom of p. 462.). Should not such decisions be made in light of the relative pay-off of possible remedies and of the status of the surrounding populations, etc.?

In the section on Recovery Criteria for Habitats (p. 85), I note that most of the criteria for downlisting or delisting will be assessed by some measure or percent of the habitat factor in a certain target condition. The source of these target levels is completely unclear. Furthermore, it would be most helpful if the current assessment of these conditions were compared in a table to the target recovery levels. That way, managers and the public would have a scorecard of what needs to be done and how far they have to go.

It is unclear how the Recovery Criteria for Habitat Indicators, which are listed beginning on p. 84, relate to the Freshwater Threat Abatement Criteria, beginning on p. 89. Many of these are redundant or closely related. Will downlisting or delisting be attained when BOTH of these sets of criteria are achieved or only when one or the other is achieved? Perhaps the intention is that Habitat Indicators are range-wide and Threat Abatement Criteria are only for those watersheds where the threat was identified as important. In any case, further description of the relationship between these two sets of criteria is required in the introduction to this section.

It would be helpful if, in the Introduction to each watershed section in Chapter 10, under the heading "Population Status and Abundance Targets", there was a clearer differentiation between current abundance and target abundance. The lines under that heading, in the Albion watershed section for example (p. 103), should be:

- Independent Population
- 59.181P-km of stream habitat
- Recent Annual Spawner Abundance: xxxx
- Annual Target Spawner Abundance (12 year yr. a^{y}.) 2,300
- Recent Annual Smolt Abundance: xxxx
- Annual Target Smolt Abundance (12 yr. a^{y}.) >230,000

That way, readers can get an idea of where each population stands relative to its target recovery goal.

Some of the watershed-specific strategic actions could be elevated to Diversity Strata-wide actions and therefore, not need to be repeated for every watershed. For example, Section 20.5 under the Albion watershed in Chapter 10 is applicable to all watersheds in the Recovery Strata.

Question regarding Monitoring and Adaptive Management

Does the plan have a well-defined methodology for adaptive management to evaluate whether recovery measures are producing the intended effects and, if not, for informing mid-course corrections in the recovery plan and its implementation?

- **Does the plan include monitoring that will allow for (a) assessment of progress toward recovery goals, and (b) ongoing evaluation of the recovery strategy in the adaptive management framework**

The Plan appears to "encourage" monitoring (see Executive Summary, bottom of p. 5), and describes the needs for monitoring, and some of the attributes to be monitored (in Chapter 11). I have some concerns that the monitoring plan is not yet fully described, other than in general terms in Chapter 11. A very helpful document has recently been completed about Pacific salmon monitoring (Johnson et al. 2007) that may be useful in planning the specifics of the monitoring program.

The Plan apparently does not provide any of the available, albeit limited, data on CCC coho salmon abundance, nor is abundance data readily apparent in the associated documents (Bjorkstedt et al. 2005, Spence et al. 2008). There is some vague reference to abundance metrics at the bottom of each watershed-specific viability table, but no indication of the data itself or the source of that information. From a monitoring standpoint, it would be preferable if any existing abundance data, along with the recovery targets, were presented, and then the annual abundance assessments from the new monitoring program could be added to the same table, as a way for managers and the public to track status.

Monitoring and follow-up have not been an integral component of restoration activities to date, as evidenced by the following quotation. "The coho salmon captive broodstock are utilized to augment production at the Monterey Bay Salmon and Trout Project's Big

Creek hatchery by spawning the captive broodstock with wild adult coho salmon in years when returns of wild coho salmon are too low, or in years that have a missing brood year. Spawning of all wild coho salmon and captive coho salmon adheres to a spawning matrix that optimizes genetic diversity. Coho salmon smolts produced at Monterey Bay Salmon and Trout Project's Big Creek hatchery are released into Santa Cruz and coastal San Mateo County streams in an effort to augment the number of spawning of coho salmon in those streams. Although limited monitoring is conducted for this program, the program does not have an extensive monitoring and evaluation component. This program is also lacking an active habitat restoration component to improve instream habitat conditions in the streams that coho salmon from the program are released into and are expected to return as adults to spawn. Unsuitable habitat conditions can reduce the spawning success and the over summer and over winter survival of the juveniles produced." (Appendix A, p. 29).

The intention to develop a series of life cycle monitoring stations should be more fully developed in Chapter 11. For example, item 1a in Chapter 11 calls, in part for: "….maintaining current lifecycle stations in dependent watersheds (e.g., Pudding Creek, Mendocino County);" (p. 495). This concept is a very important component to successful restoration, but, as stated, does not provide sufficient guidance to understand the extent of life cycle sampling that should be conducted on dependent populations within a diversity stratum. The concept of life cycle monitoring is a critical component of any salmon monitoring program because, in its most simplistic application, when a population is monitored for its smolt output, as well as its spawner returns, the effects of freshwater environment on survival can be differentiated from the effect of the marine environment. The concept is mentioned as important on p. 495, but the discussion should be expanded to emphasize why it is important.

Item 1b on p. 496 should be elevated to apply to all aspects of monitoring; independent scientific review would be beneficial to designing the best monitoring program.

In item number 3 on p. 497, suggested research on the effects of marine fisheries on by-catch of CC coho salmon should not be limited to the chinook fisheries only, but to all fisheries from British Columbia south, which may incidentally harvest or catch and release CCC coho salmon.

Lastly, some strategic discussion regarding who's going to ensure that monitoring and research are implemented, and how it will be paid for, is fully warranted.

Conclusions/Recommendations

The CCC Coho Salmon Recovery Plan, and its associated appendices, is a large and complex document designed to guide recovery of this endangered ESU into the future. For the most part, the Plan provides the information needed about the relevant threats to recovery and the recovery actions required to restore the ESU to viability. The detailed

exceptions to this are listed in the comments above, and these constitute my specific recommendations for improving the Plan.

In general, concerns are raised about the relative treatment of specific freshwater habitat threats, which are mostly very thorough and specific, as compared to other threats and issues, for which the treatment is not as thorough. In particular, incidental marine harvest and hooking mortality, climate change, and ocean variability are only addressed cursorily. In the freshwater environment, water toxins, invasive species, large dams, and marine derived nutrient are not fully addressed. Monitoring and research should be more fully developed in the Plan. I recommend that the Plan authors review these and other comments and make revisions to the Plan accordingly.

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Appendix A: Bibliography of Materials Reviewed by Eric Knudsen

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Appendix A: Central California Coast Coho Salmon: Taxonomy, Trends, Life History, Habitat Needs and Critical Habitat of the Central California Coast Coho Salmon *(Oncorhynchus kisutch);* North Central California Coast Recovery Domain Setting; and General Overview of Threats for the CCC coho salmon ESU

Appendix B: *Federal Register* analyses of the Summary of Factors Affecting the Species (e.g., listing factors) and of conservation actions evaluated under the protocols of Policy for Evaluation of Conservation Efforts When Making Listing Decisions (68 FR 15100)

Appendix C: Conservation Action Planning Viability Table Report Part 1: Structure and Methods, Draft September 2008

Appendix D: Sonoma Ecology Center Final Report,

May Appendix E: 2008 Lagunitas Creek Watershed

Appendix F; Characterization Report NMFS Threat

Appendix G: NMFS Recovery Implementation Schedule

Appendix H: Strategies Database Bibliography

Appendix I: *A Framework for Assessing the Viability of Threatened and Endangered Salmon and Steelhead in North-Central California Coast Recovery Domain (Spence et al. 2008)*

Appendix J: NMFS PRD Strategic Plan 2007-2011

Appendix K: *Habitat Restoration Cost References for Salmon Recovery Planning;* Coho Salmon Recovery in California: A Summary of Recent Economic Evidence

Appendix L: Recovery Outline by Threat Category

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National Marine Fisheries Service, Southwest Fisheries Science Center, NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-423.

2006 Interim Recovery Planning Guidance (http://www.nmfs.noaa.gov/pr/recovery/)

Endangered Species Act (http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf)

Appendix B:

Statement of Work for Dr. Eric Knudsen

Independent Peer Review by the Center for Independent Experts (CIE)

Assessment of the Draft Recovery Plan for the Central California Coast Coho Salmon Evolutionarily Significant Unit

Introduction

The purpose of this independent review is to evaluate and comment on the Draft Recovery Plan for the North Central California Coast Recovery Domain (NCCC Domain) and the Central California Coast coho salmon Evolutionarily Significant Unit (CCC coho salmon ESU) module. The scope of work should focus on the principal elements required in a recovery plan. These principal elements have been defined in section 4(f)(1) of the federal Endangered Species Act (ESA) and sections 1.1 and 1.2 of the National Marine Fisheries Service Interim Recovery Planning Guidance (NMFS 2006)

Section 4(f)(1)(b) of ESA states that "each plan must include, to the maximum extent practicable,

- a description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species;
- objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list; and,
- estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal."

From section 1.1, a recovery plan should:

- "Delineate those aspects of the species' biology, life history, and threats that are pertinent to its endangerment and recovery;
- Outline and justify a strategy to achieve recovery;
- Identify the actions necessary to achieve recovery of the species; and
- Identify goals and criteria by which to measure the species' achievement of recovery."

Background

There are 10 Evolutionarily Significant Units/Distinct Population Segments (ESUs/DPSs) of salmon and steelhead in California listed as Federally endangered or threatened under the ESA. They are organized into four geographic recovery domains. Each recovery domain contains one or more salmon and steelhead ESU/DPS, and (1) a Science Center led Technical Recovery Team responsible for developing historical population structure and population viability goals for the recovery plan, and identifying research and

monitoring needs; and (2) a recovery coordinator responsible for facilitating the development of a recovery plan for the domain.
The NCCC Domain recovery plan will be developed over several phases which will include one module for each ESU/DPS, with a final compilation and restructuring into a multi-species plan. The development of modules for each ESU/DPS will be in the following sequence: CCC coho Salmon ESU, Central California Coast steelhead DPS, California Coastal Chinook salmon ESU and Northern California steelhead DPS.

The final plan will be a multi-species recovery plan that will be a compendium of data and information that can be utilized on a watershed basis where species ranges overlap. The rationale for developing species specific modules was precipitated by research demonstrating that multi-species plans lacked the species-specific information needed for listing. Thus, individual species-specific information is being developed for compilation into the multi-species plan to ensure species needs are adequately addressed in terms of the viability criteria and habitat needs.

The NCCC Domain recovery plan builds from the NMFS Southwest Fisheries Science Center Technical Recovery Team (TRT) ESU/DPS reports and a conservation assessment and strategy methodology. The TRT reports outline the historical population structure and draft viability criteria to be considered in recovery planning. These reports can be found at the following website (as they are too large to transmit via email): http://swfsc.noaa.gov/textblock.aspx?Division=FED&id=2266. The conservation planning process, called the Conservation Action Planning (CAP) workbook, was developed by The Nature Conservancy and others and is endorsed in our National Recovery Planning Guidance.

Extensive information on the CAP process can be found at: http://conserveonline.org/workspaces/cbdgateway/cap.

CIE Peer Review Process:

The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the NMFS management decisions.

The NMFS Office of Science and Technology serves as the liaison between the NMFS Project Contact and CIE to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW.

The CIE selection process also requires that CIE reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review in accordance with the ToR producing a CIE independent peer review report as a deliverable. The Office of Science and Technology serves as the COTR for the CIE contract with the responsibilities to review and approve the deliverables for compliance with the SoW and ToR. When the deliverables are approved by the COTR, the NMFS Office of Science and Technology distributes the CIE reports to the NMFS Project Contact.

Requirements for CIE Reviewers:

The CIE shall provide three CIE reviewers with the required expertise in anadromous salmonid biology and ecology, preferably with experience in California's watersheds, data limitations and salmonid populations to complete an independent peer review and produce the deliverables in accordance with the SoW and ToR herein. No consensus opinion among the CIE reviewers is sought. The activities required under this Statement of Work shall be conducted electronically, so no travel is needed. Three CIE reviewers are required to conduct a desk peer review of the Assessment of the Draft Recovery Plan for the Central California Coast Coho Salmon Evolutionarily Significant Unit, and each reviewer's duties shall occupy a maximum of 7 days to review material, conduct the peer review and produce a CIE independent peer review report expertise necessary

Statement of Tasks for CIE Reviewers:

The CIE reviewers shall conduct an independent peer review of the Assessment of the Draft Recovery Plan for the Central California Coast Coho Salmon Evolutionarily Significant Unit to determine whether the best possible assessment is implemented. The CIE reviewers shall conduct preparations prior to the peer review, conduct the peer review, and complete the deliverables in accordance with the ToR and deliverable dates as specified. The CIE reviewers shall evaluate the Assessment of the Draft Recovery Plan for the Central California Coast Coho Salmon Evolutionarily Significant Unit. Their primary responsibility is to conduct an impartial peer review to ensure that results and conclusions are based on sound science, and the CIE reviewers shall not comment on management decisions. The CIE peer review shall explicitly address the following Terms of Reference.

Prior to the Peer Review: The CIE shall provide the CIE reviewers contact information (name, affiliation, address, email, and phone) to the Office of Science and Technology COTR no later than the date as specified in the SoW, and this information will be forwarded to the Project Contact.

Pre-review Documents: Approximately two weeks before the peer review, the Project Contact will send the CIE reviewers the necessary documents for the peer review, including supplementary documents for background information. The CIE reviewers shall read the pre-review documents in preparation for the peer review.

Any delays in submission of pre-review documents for the CIE peer review will result in delays with the CIE peer review process. Furthermore, the CIE reviewers are responsible for only the pre-review documents that are delivered to them in accordance to the SoW scheduled deadlines specified herein.

CIE reviewers shall be familiar with the following which are supporting information to the Draft NCCC Recovery Plan and CCC coho salmon module:

- Technical Recovery Team Reports: Historical Structure and Draft Population Viability (http://swfsc.noaa.gov/textblock.aspx?Division=FED&id=2266)
- 2006 Interim Recovery Planning Guidance (http://www.nmfs.noaa.gov/pr/recovery/)
- Endangered Species Act (http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf)

The itemized tasks of each reviewer consist of the following.

1. Read and conduct peer review of the draft NCCC Domain Recovery Plan and CCC coho salmon ESU component in accordance with the Terms of Reference herein.

2. Review and consider background documents and additional scientific information as necessary.

3. Each CIE reviewer shall submit an independent peer-review report addressing each Term of Reference in this Statement of Work in accordance with the Schedule of Milestones and Deliverables as specified herein to the CIE lead coordinator, Manoj Shivlani, at shivlanim@bellsouth.net, and CIE regional coordinator, Dr. David Die, at ddie@rsmas.miami.edu. Each report is to be based on the individual reviewer's findings, and no consensus report shall be required.

Terms of Reference:

A review of the partial draft of the NCCC Recovery Plan and CCC coho salmon ESU component is being requested. Reviews and comments are to focus upon: (1) the use of the best available scientific and commercial information; (2) interpretation and application of the National Marine Fisheries Service Southwest Fisheries Science Center Technical Recovery Team (TRT) recovery planning supporting documents and (3) determination on whether methods employed provide adequate linkages between TRT criteria, habitat-based threats and recovery actions and strategies. Reviewers are not expected to evaluate or comment upon the TRT documents or the Threats Assessment template. The CIE reviewer's peer review shall address each of the following questions.

Fundamental Questions for the CIE reviewers

Does the plan meet the minimum standards described in section 4(f)(1)(b) of ESA by including site-specific management actions, objective measurable criteria and estimates of time and cost?

Does the recovery plan delineate those aspects of the species biology, life history, and threats that are pertinent to its endangerment and recovery?

Does the plan have a logical strategy to achieve recovery that is relevant to habitats, life stages, populations, diversity groups and the overall ESU?

Is the recovery plan grounded in a clearly articulated and biologically meaningful conceptual framework? Does the plan use best available scientific information? If better data or analyses are available, please identify.

Is the plan suitable for serving as an outreach tool and does it invite public participation in the process?

Question Regarding Use and Application of the Technical Recovery Team Reports

Are the outputs from the historical population structure and population viability criteria described, and applied, appropriately?

Is the plan clear about the differences between viability criteria and recovery criteria?

Question regarding the Threats Assessment Process

Is there an explicit analysis of threats discussed in terms of the five listing factors (e.g., threats)? Does the plan provide continuity between new threats and changes to threats identified in the listing rule since publication?

Does the plan contain a fair assessment, and prioritization, of conditions, stresses and sources of stresses?

Are other factors considered for each threat and its' source such as scope, severity, frequency, magnitude, etc. as suggested in the Recovery Guidance?

Is the threats assessment objective and are all realistic threats identified (even if it may not be feasible to address it in the recovery plan)?

Does the plan explicitly identify threats and track, through objective measurable criteria, how each threat will be reduced or ameliorated, through site-specific management actions? Are these final threats linked to the five listing factors for this ESU?

Is the Threats Assessment protocol/methodology employed for assessing salmonid threats effective?

- Do the scoring and rankings in the matrices link logically to your understanding of the species and the systems they live in?
- Are the habitat types as defined in the matrices sufficient?
- Are the linkages between habitat types and life stages correct and complete?
- Does the protocol for threats assessment have a high likelihood of correctly identifying the dominant stressors for each population?

Does the recovery plan adequately address potential uncertainties related to threats assessment?

Question regarding the Conservation Assessment Process

Does the plan adequately assess the effectiveness of conservation actions to date including, if the action was in place before listing and the reasons why the efforts were considered insufficient?

Is it clear what threats are being addressed through conservation efforts and what threats remain unaddressed?

Question regarding the Recovery Strategy

If the species (ESU) met all the recovery criteria, does it seem feasible that this species would likely persist for the foreseeable future?

Do the recovery strategy and recovery criteria adequately consider large-scale environmental perturbations such as climate change and ocean variability?

Are the links between human activities, effects on habitat, effects on individual fish, and expected responses of populations clearly described?

Does the recovery plan contain a logical framework for prioritizing recovery efforts at multiple spatial scales? i.e.,

- For each of these populations, have the primary stressors been identified? Given the prioritized stressors, do the recovery actions have a high likelihood of achieving measurable results? Is there a logical link between stressors, populations and prioritized recovery actions such that they will have the highest likelihood for success?

Do the proposed recovery actions link logically to threats identified in the threats assessment?

- Do proposed recovery actions target the primary stresses/stressors for each population?
- Are recovery actions prioritized in a manner consistent with identified threats?

Question regarding Monitoring and Adaptive Management

Does the plan have a well-defined methodology for adaptive management to evaluate whether recovery measures are producing the intended effects and, if not, for informing mid-course corrections in the recovery plan and its implementation?

- Does the plan include monitoring that will allow for (a) assessment of progress toward recovery goals, and (b) ongoing evaluation of the recovery strategy in the adaptive management framework

Schedule of Milestones and Deliverables:

August 25, 2008	CIE shall provide the COTR with the CIE reviewer contact information, which will then be sent to the Project Contact
September 5, 2008	The Project Contact shall send the CIE Reviewers the pre-review documents and report
September 8-19, 2008	Each CIE reviewer shall conduct the independent peer review
September 19, 2008	Each CIE reviewer shall submit an independent peer review report to the CIE
October 3, 2008	CIE Steering Committee shall review and accept reports, and the reports shall be sent to the COTRs
October 8, 2008	COTRs will review reports for compliance, and CIE shall submit final CIE independent peer review reports to the COTRs
October 15, 2008	The COTRs shall distribute the final CIE reports to the Project Contact

Submission and Acceptance of CIE Reports:

Each CIE reviewer shall complete and submit an independent CIE peer review report in accordance with the ToR, which shall be formatted as specified in Annex 1, and the report shall be sent via email to Manoj Shivlani, CIE lead coordinator, at shivlanim@bellsouth.net and Dr. David Die, CIE regional coordinator, at ddie@rsmas.miami.edu. Upon review and acceptance of the CIE reports by the CIE Coordination and Steering Committees, CIE shall send via e-mail the CIE reports to the COTRs (William Michaels William.Michaels@noaa.gov and Stephen K. Brown Stephen.K.Brown@noaa.gov) at the NMFS Office of Science and Technology by the date in the Schedule of Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility of approval and acceptance of the deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE report in *.PDF format to the COTRs. The COTRs at the Office of

Science and Technology have the responsibility for the distribution of the final CIE reports to the Project Contacts.

Request for Changes:

Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

Key Personnel:

Contracting Officer's Technical Representative (COTR):

William Michaels
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Contractor Contacts:

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NMFS Project Contacts:

Charlotte Ambrose, NCCC Domain Recovery Coordinator
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Charlotte.A.Ambrose@noaa.gov Phone: 707-575-6068

ANNEX I:

REPORT GENERATION AND PROCEDURAL ITEMS

1. Each reviewer's report shall be prefaced with an executive summary of findings, comments and recommendations.

2. The main body of the report shall consist of a background, description of review activities, summary of analyses and comments in accordance with the ToR, and conclusions/recommendations.

3. The CIE reviewer's report shall also include as separate appendices the bibliography of materials reviewed and a copy of the statement of work.