



Eric Knudsen, Ph.D.
Consulting Fisheries Scientist

An Independent Peer Review
of the draft
Recovery Plan for the North Central California Coast Domain

Peer Review for the Center for Independent Experts

Prepared for NTVI

By

E. Eric Knudsen, Ph.D.
Consulting Fisheries Scientist
13033 Sunrise Dr.
Mt. Vernon, WA 98273
360-424-5767
ericknudsen@gci.net

December 7, 2011

Executive Summary

This report presents the findings of an independent peer review of the document entitled “Recovery Plan for the North California Coast Domain: Northern California Steelhead, California Coastal Chinook, Central California Coast Steelhead” (NMFS 2011) (hereinafter referred to as “the Plan”). This independent scientific peer review was undertaken at the request of the Center for Independent Experts (CIE) via a contract with Northern Taiga Ventures, Inc. (NTVI).

The impetus for the peer review, as described in the Terms of Reference, is for ensuring sufficiency of science of the Recovery Plan, as mandated under the Endangered Species Act (ESA). Further, the CIE reviewers “shall conduct an impartial and independent peer review”. Therefore in this report I reviewed and commented on the 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 together should help determine whether the Plan meets the requirements under Section 4(f)(1)(b) of ESA 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.”

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 the Northern California Steelhead (NC Steelhead), California Coastal Chinook (CC Chinook), and the Central California Coast Steelhead (CCC Steelhead) 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 below.

An abbreviated list of the findings, conclusions, and recommendations can be found at the end of the review under “Conclusions and Recommendations”. The primary concerns are about the relative treatment of non-focus watersheds and populations, for which the treatment is not as thorough. Other important concerns regard the application of the broad-scale restoration actions, the effects of incidental marine harvest and hooking mortality, and climate change. In the freshwater environment, water toxins, large dams,

and marine derived nutrient were not fully addressed. I recommend that the Plan authors review these and my other comments and make revisions to the Plan accordingly.

Introduction

Background

This report presents the findings of an independent peer review of the document entitled “Recovery Plan for the North California Coast Domain: Northern California Steelhead, California Coastal Chinook, Central California Coast Steelhead” (NMFS 2011) (hereinafter referred to as “the Plan”). This independent scientific peer review was undertaken at the request of the Center for Independent Experts (CIE) via a contract with Northern Taiga Ventures, Inc. (NTVI).

The impetus for the peer review, as described in the Terms of Reference, is for ensuring sufficiency of science of the Recovery Plan, as mandated under the Endangered Species Act (ESA). Further, the CIE reviewers “shall conduct an impartial and independent peer review”. Therefore, in this report I reviewed and commented on the Plan and its associated appendices.

Terms of Reference for CIE Peer Review

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 of NMFS (2006), 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 Materials Required:

There are two NMFS Science Center Technical Memoranda that form the biological framework for the recovery plan: historical population structure and viability criteria. These memoranda and other supporting information are critical to the review of the Draft NCCC Recovery Plan and include:

- Technical Recovery Team Reports: Historical Structure
 - <http://swfsc.noaa.gov/publications/FED/00671.pdf>
- Technical Recovery Team Framework for Assessing Viability
 - <http://swfsc.noaa.gov/publications/FED/00885.pdf>
- 2006 (2007 Updates) NMFS Interim Recovery Planning Guidance
 - <http://www.nmfs.noaa.gov/pr/recovery/>
- Endangered Species Act (<http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf>)

Terms of Reference (ToRs) CIE Peer Review of California's North Central Coast Domain Draft Recovery Plan

1.0 Evaluate the adequacy, appropriateness and application of data used in the Report.

1.1 In general, does the Report include and cite the best scientific and commercial information available on the species and its habitats, including threats to the species and to its habitat including large-scale perturbations such as climate change and ocean conditions?

1.2 Where available, are opposing scientific studies or theories acknowledged and discussed?

1.3 Are the scientific conclusions sound and derived logically from the results?

2.0 Evaluate the recommendations made in the Report.

2.1 Does the plan meet the minimum standards for recovery plans outlined in the NMFS Interim Recovery Guidance and mandates described in section 4(f)(1)(b) of ESA to include site-specific management actions, objective measurable criteria (criteria that links to listing factors) and estimates of time and cost?

2.2 Are the results in the Report supported by the information presented?

2.3 Does the recovery strategy and overall recovery plan provide clear guidance for the public, restorationists, managers, regulators and others to act in a relevant manner over the next several decades to promulgate recovery of salmon and steelhead?

2.4 Review the research and monitoring recommendations made in the Report and make any additional recommendations, if warranted.

CIE reviewers are contracted with the qualifications to conduct a scientific peer review, and are not required to provide regulatory or management advice.

Description of activities in the review

The primary activity undertaken was to carefully review the document entitled “Recovery Plan for the North California Coast Domain: Northern California Steelhead, California Coastal Chinook, Central California Coast Steelhead” (The Plan) (NMFS 2011) and to address the Terms of Reference from Annex I in the Statement of Work, as described above.

In addition to reviewing the Plan, several background documents, listed above, were also reviewed to varying degrees depending on their topic and relevance to the Terms of Reference. Other literature and web-based information sources were also investigated as necessary to support the review. Lastly, to complete my activities, this independent peer review of the Plan was written, using all the above information.

Summary of Findings for Each TOR

The findings of this peer review were made in regard to addressing the terms of reference. I conducted the review by responding to the specific terms of reference posed in the Statement of Work and my comments on technical content and coverage of the draft NCCD Salmon Recovery Plan (Plan) are shown under each of the reviewers’ terms of reference questions below. Under some of the questions, extended answers and comments on particular topics were given subheadings to make the responses easier to read.

As I conducted my review, I also noted a number of editorial items that, when corrected, will help the NCCD salmon Recovery Plan to read more accurately. Those are provided here for the authors’ convenience.

Editorial Comments:

Volume I:

1. I note that it is not obvious in Volume I that there are two other volumes (except in the footers). The other volumes are mentioned in the text, but it would be preferable if Volume I was labeled as such and then some reference to Volumes II and III was made up front.
2. Similarly, the current labeling of Volume II and Volume III appears to be out of order in the text. Volume III is first mentioned in the text on p. 87 (incorrectly, as noted below). Volume II appears to be first mentioned on p. 119.
3. It strikes me as curious, somewhat confusing, and redundant in places, that the Plan is generally organized by 1) NC steelhead DPS, 2) CC Chinook salmon ESU and 3) CCC steelhead DPS. Why does it jump from one species to another? It seem like it would be easier to follow and better organized if the Plan first covered one species, and then the other.

4. In the last sentence on of the first paragraph on page 2, the phrase “Unlike other salmonids,…” is incorrect. Steelhead ARE salmonids. It would be correct to say “Unlike the Pacific salmon species,…”.
5. The date on the citation to Bond (2005), second paragraph p. 7, does not match the date in the literature cited section (2006).
6. On page 8, third paragraph, the phrase: “The number of dorsal, anal, pectoral, and pelvic fins…”) should read “The number of dorsal, anal, pectoral, and pelvic fin rays…”.
7. The section about San Francisco Bay on pages 11-12 seems out of place, as it is found inserted into the middle of the section on coastal chinook, which had previously been described as having a range that did not include San Francisco Bay.
8. Further, the third sentence in the first full paragraph on page 12 is out of place since the coastal lagoons are not found within San Francisco Bay.
9. In the top paragraph of p. 62, there is a citation to Spence as a personal communication. The concept cited is accurately described in Spence et al. (2008), Appendix B, so Spence et al. would be a much a preferable citation than a personal communication (2008).
10. The text in the last two paragraphs on p. 65 is reversed relative to the figures cited. CC Chinook should be addressed in the first of the two paragraphs because they are shown in Figure 10, while CC Steelhead should be addressed in the next paragraph because they are shown in Figure 11.
11. Use of the term “Criteria Chapter” in several instances on pp 70-71 is unclear. Does this refer to Chapter 9.0? If so it would be preferable to indicate the correct chapter number.
12. On p. 77, there is a reference to “The population recovery targets are provided in 8.0 Criteria Chapter…” First, the phrase is grammatically incorrect. Second, I believe the targets are listed in Tables 19-21 which are found in Chapter 9.0.
13. It is unusual to find Figure 17, first mentioned on p. 77, to be located on p. 134, rather than being in the customary location of the next full page available. Figure 17 is also out of sequence and should be labeled Figure 5, to follow the previously mentioned figure 4.
14. The following sentence, from the bottom of p. 85, does not make complete sense: “The CAP process recognizes the shifting nature of knowledge, and challenges causing, by allowing for a regular, iterative process of successive approximations (TNC 2007).”
15. Table 3 on page 87 is blank, making it difficult to understand and assess the CAP process.
16. It would be helpful for explaining the CAP process, as described further below, if the parenthetical phrase “(see, for example, tables 4-6)” were added to the end of the first sentence, first paragraph, on page 87.
17. The reference to Appendix B, Volume III in the second paragraph on p. 87 is incorrect or mislabeled. Appendix B in Volume III contains a “Discussion of Density Criteria and their Application”. The paragraph appears to refer to the Viability Tables which are presently found in Volume II. The description of this and the reference on p. 87 should be corrected.
18. A sentence is incomplete, or a period is missing at the end of the second paragraph on p. 87.

19. A similar incorrect reference to Volume III occurs on page 90.
20. On page 90, second sentence of the first paragraph, three new terms are introduced: “rating criteria, thresholds, and rating boundaries” without definition. The lack of definition may contribute to the difficulties in adequately describing the CAP process, as described below.
21. The sentence at the top of page 96 should include a reference to Volume II, so the reader would be directed to examples of the results referred to in the sentence.
22. On page 98, the first sentence of the first full paragraph should start with “Three” instead of “Five”.
23. It would be helpful in the description of CAP Threats summaries if references were made to appropriate tables, as is customarily done in scientific writing. An example of this is in the last full paragraph of p. 102.
24. “Salmon” is misspelled in the last line of p. 107.
25. The acronym PCE is used in the first line of the first paragraph on p. 117 without having been defined.
26. Figure 16 and its caption need to be adjacent on page 129.
27. Figure 17 on p. 134 is very difficult to read. Legibility would be greatly increased if the green background and the elevation relief markings were eliminated.
28. It is unusual to cite a table (e.g., Table 19 on p. 135) that is found many pages later in the report. Customarily, the table would occur on the next full page following such a call-out.
29. The statement in the last full paragraph on p. 144 that “...are individually organized alphabetically for NC steelhead, CC Chinook salmon, and CCC steelhead.” appears to be incorrect because the chapters in Volume II cover each profile watershed and combine species. There are no separate implementation tables for each species in a watershed.
30. The bottom paragraph on page 145 would be clearer if a sentence such as the following were added: “Specific recovery actions for each focus population are listed in Volume II.”
31. Why is the eighth bullet on p. 146 limited only to CCC steelhead? It seems applicable to the other ESU and DPS as well.
32. The top bullet on p. 148 contains confusing wording.
33. The last sentence in the third bullet on p 148 should read: “A full list of freshwater fishing recommendations are provided in Volume III in Appendix F.”
34. The fourth bullet on p. 149 needs rewording.
35. Under current formatting, the eighth bullet on p. 149 is unnecessary.
36. The acronym GCP is used in the middle of P. 151, but was not defined.
37. The acronym CFPR in the second bullet from the bottom of page 157 is undefined.
38. In the second to last sentence on p. 162, there is an extra “not”.
39. Table 16, on p. 165, and Table 18, on p. 168, are not cited anywhere in the text.
40. The following sentence from the first full paragraph on p. 165 needs to be reworded and there is a missing parentheses at the end: “These criteria take into consideration the landscape context influencing our watersheds and salmon, and the expectation that as these ecological processes are rebuilt to support ecosystem health and productivity, a surplus of salmon can develop for tribal, recreational or commercial harvests (numeric criteria not included in Spence *et al.* (2008).”

41. The footnote in Table 17, p. 167, needs to be adjusted.
42. Tables 19-20 are not cited in the text until many pages after they first appear, although they are certainly relevant to immediately preceding text and should be cited there.

Volume II:

1. There is no title page.
2. What are the headings in pages 1 and 295 for? Subsequent chapters seem to cover multiple species.

Volume III:

1. It will help to add a table of contents to Volume III.
2. Some confusion over the references to Appendix B in the Plan will arise because Appendix A in Volume III contains its own Appendix B, but there is a separate Appendix B in Volume III.

Review Comments Organized by Reviewers' ToR Questions:

1.0 Evaluate the adequacy, appropriateness and application of data used in the Report.

1.1 In general, does the Report include and cite the best scientific and commercial information available on the species and its habitats, including threats to the species and to its habitat including large-scale perturbations such as climate change and ocean conditions?

The Plan is generally very thorough and the authors should be commended. The organization and presentation of the CAP results threats and stressors, as based on the detailed work presented in Volume II, are especially well-developed and presented in a very helpful display (Tables 7-14). My comments below are intended to strengthen the document to an even more rigorous Plan for salmon recovery in the NCCC Domain.

The most obvious lack of information in the report in the section on CAP results where there are a number of instances of: "NOTE: Results of CAP assessment, including current conditions, stresses and threats are pending completion by the NMFS NCC Office." (Plan, p. 100, 101, 107, 108, 109). Likewise, a number of sections in the diversity strata results section were incomplete. Therefore the summary tables (tables 7-12) are not complete. This made it somewhat difficult to fully review the Plan.

The section on "Protective efforts at or since the time of listing", p. 24-25, appears to be insufficient. The only topic addressed is gravel mining. It is inconceivable that the many other areas of habitat threats, such as dams, diversions, culverts, streamside management, etc. have not been recently addressed, at least to some degree. I noted that many of those remedial habitat issues are subsequently covered under "regulatory" effects, especially on p. 33-34. Many of the habitat restoration efforts referred to on pp 33-34 are the result of the regulatory changes but the actions themselves should more appropriately be addressed under Protective efforts at or since the time of listing, on p. 24-25.

Pre- and Post-Listing Restoration Actions

Chapter 3 includes a general listing of the pre- and post-listing recovery actions. 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 ESU/DPSs (Spence et al. 2008) necessitates a rigorous evaluation of whether actions to date have stemmed the decline and if not, why not. It is pointed out in the Plan (p. 21) that a list of the major restoration efforts going on at the time of listing has been compiled and that the reader can request the lists of pre-listing and current actions upon request. Perhaps these lists should be made available as an appendix to the Plan. More importantly, an evaluation of the effectiveness of previous work 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.

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.

Water Quality Toxins

The Plan may give insufficient recognition of water quality problems. Toxic run-off from stormwater has been identified as one of the most important emerging threats to aquatic ecosystems (McCarthy et al. 2008). Toxic substances, including PAHs, pesticides, anti-freeze, heavy metals, and pharmaceuticals, among others, have insidious effects on aquatic ecosystems and their resident animals because they enter the systems gradually from wastewater inputs and surface run-off from neighborhoods (lawns, etc.), streets and roadways, and agriculture (e.g., Sandahl et al. 2007). Toxins can cause die-offs of salmon (McCarthy et al. 2008) or may have sub-lethal but deleterious effects such as reduced growth, reproduction, and fecundity, can cause genetic damage, and impair olfactory functions (Eisler 2000, Baldwin et al. 2003).

In another example, research by NMFS 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 sufficiently addressed in the Plan.

While I note that water quality is addressed as “fair” or “poor” in many of the focus watersheds for the CCC Steelhead, for example (Table 14), a search of Volume II does not reveal a detailed accounting or understanding of the specific water quality stressors. Instead, poor water quality is only generally identified under the individual watersheds in Volume II. So a question remains as to whether the specific water quality issues have been identified and/or can be remediated.

Hatcheries

The potential negative effects of hatcheries may not have been fully addressed in the Plan. Hatcheries cause problems for natural salmon populations via 1) genetic effects, 2) increased fishing pressure on wild populations in mixed stock fisheries, 3) potential spread of disease, and possible competition and predation effects. Since the effects of hatcheries have been recognized as one of the six viability criteria (Plan, p.71), it is essential that the perceived effects of hatcheries be fully evaluated in the Plan and appropriate recovery actions be prescribed.

For NC Steelhead, it was noted that: “The BRT was also concerned about the negative influences of hatchery stocks, especially from the Mad River Hatchery, which is not considered part of the DPS. . . .The hatchery has been operating at a smaller production capacity since 2006-2007 (as compared with past production rates), largely through the efforts of volunteer staff.” (Plan, p.4-5). Also, “NMFS is currently working with the DFG in the development of a Hatchery and Genetic Management Plan for the Mad River Hatchery (this hatchery is not considered part of this DPS but it may impact the NC steelhead DPS).” (Plan, p. 35).

It is difficult to assess how the Plan will deal with the Mad River Hatchery issues, since the Mad River hatchery effects are not mentioned specifically in Volume I or in Volume II. Although the Mad River itself is not considered part of the DPS, steelhead from the hatchery may stray into wild spawning areas. The degree of effects on the DPS will depend on the degree of this straying. In any case, this situation should be fully evaluated in the Plan.

For CCC steelhead, it was noted that: “Two artificial propagation programs are considered to be part of the DPS: the Don Clausen Fish Hatchery on Dry Creek (Russian River basin), and Kingfisher Flat Hatchery located in the Scott Creek watershed (Monterey Bay Salmon and Trout Project). The artificially propagated stocks at these two hatcheries have been found to be genetically no more divergent relative to the local natural populations than what would be expected between closely related natural populations within the DPS.” (Plan, p. 13). Also “... we have determined that both hatchery programs continue to be operational and propagate stocks that are part of the DPS.” (Plan, p. 58-59). Also, “Artificial propagation programs considered part of the CCC steelhead ... are managed as conservation facilities and not for fishing supplementation. Broodstock collection is closely monitored and constrained to minimize impacts to this DPS.” (p. 53). And, lastly, “The two artificial propagation programs discussed above are likely to provide some limited benefits to the CCC steelhead DPS viability by contributing to local population abundance, however these programs do not substantially reduce extinction risk to the CCC steelhead DPS. Genetic diversity risk associated with out-of-basin transfers appeared to be minimal, but diversity risk from domestication selection and low effective population sizes in the remaining hatchery programs remained a concern. DFG has adopted policies designed to ensure artificial propagation measures are conducted in a manner consistent with the conservation and recovery of natural, indigenous steelhead stocks. The careful monitoring and

management of current programs, and the continued scrutiny of proposed programs, are necessary to minimize impacts on listed salmonid species.” (p. 59)

In response to these concerns, both for NC Steelhead and CCC Steelhead, the Plan includes language, under the broad-scale ESU/DPS-level recovery actions, to: “Eliminate the stocking of hatchery-reared steelhead in anadromous waters unless part of a broodstock program or, at a minimum, operating under a Hatchery and Genetic Management Plan (HGMP). Where stocking is otherwise appropriate, use sterile triploid fish in all waters where stocked fish may enter anadromous waters.” And “The conservation actions required by HGMPs are expected to substantially improve the genetic viability and abundance of natural salmonid populations’ overtime and reduce the extinction risk cause by hatchery production.” (Plan, p. 147). Although it would be preferable if these analyses were part of the Plan, the language above should help to address concerns about the effects of hatcheries in the future recovery of the ESU/DPSs.

Climate Change

Global climate change is viewed as one of the major factors that is potentially threatening the ESU and DPSs and will likely prevent increasing challenges to restoration (Plan, pp. 35, 48, 59 and Chapter 5). This is particularly true for the CCC Steelhead, which are at the southern end of their species range. The question arises as to whether the Plan sufficiently addresses the issue of climate change. It is noted that biological criteria in the Plan do not “... provide context on recovering populations under the influence of climate change or ocean conditions.” (Plan, p. 70). While there are several recommended actions to deal with climate change on the list of ESU and DPS-wide recovery actions, there may be several actions that could be taken and published in the Plan. For example, the models mentioned at the bottom of p. 149, could be used to analyze the likelihood of extinction or, conversely, population growth under differing climate scenarios (see, e.g., Battin et al. 2007).

A related point that is missed in the Plan is the relative importance in emphasizing the maximum number of smolts as a way to ameliorate the uncontrollable variation in marine survival. Even though marine variability is obviously beyond human control, managers can at least to some extent control the number of smolts entering the ocean. The greater number of smolts that go to sea, the more adults will return, as moderated by the survival rate (see for example, Nickelson 1986).

Critical Habitats

Although formally outside the scope of this scientific peer review, I raise concerns about the “exclusions” of critical habitats indicated on pages 7, 12, and 15. Every possible habitat is important to the recovery of these seriously threatened or endangered ESUs or DPSs so should be included in the recovery plan (unless these habitats have been excluded because the effectiveness of recovery is stronger without inclusion).

Marine-Derived Nutrients

Marine-derived nutrients are only mentioned in the Introduction to the Plan but are not mentioned anywhere else 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 (growth and survival) of Chinook and steelhead smolts (e.g., Wipfli et al. 2010). This important topic should be identified as a limiting factor to recovery.

1.2 Where available, are opposing scientific studies or theories acknowledged and discussed?

There are several cases in the Plan where opposing views or alternative approaches were not considered. The Plan simply lays out the approach selected and does not discuss alternatives. Several cases are described below.

Estimating Potential Production

The Plan does not appear to consider alternative methods for estimating the potential production of salmon or steelhead from the habitat. The Plan cites Spence et al. (2008), Bjorkstedt et al. (2005), and Agrawal (2005), who all relied on Burnett's (2003) intrinsic potential model (Plan, p. 62), and does not discuss any alternative approaches. Other methods, such as Ecosystem Diagnostic Treatment (EDT) (Mobernd et al. 1997), have been used for estimating potential production from underutilized salmonid habitat. In particular, the EDT model was applied in at least three other salmon/steelhead recovery plans (Beamesderfer et al. 2010, LCFRB 2010, Carmichael and Taylor 2010). Yet, the relative merits of this or any other techniques were not even discussed in the Plan or any of the supporting documents.

Further, the description of how the estimates of numbers of spawners required for a population to be viable-in-isolation were derived, at the bottom of p. 62 and top of p. 63 is inadequate. The methods simply say the IP kms required were selected "for consistency with other TRTs" and cites Nickelson and Lawson (1998). That paper focused on coho salmon, not Chinook or steelhead. If the simulation methods described in Nickelson and Lawson (1998) were applied somehow to steelhead and Chinook, then that process should be described or cited as such. (I see that this topic may have been sufficiently developed on p. 39 of Spence et al. (2008). If that is the source of these numbers, then the last full sentence on p. 63 of the Plan, should cite Spence et al. 2008). Likewise, the section on PIPs, FIPs, and DPs on page 64 of the Plan should cite Spence et al. (2008).

Focus Populations

The section on "focus populations" does not present any alternative views on the rationale for dropping a large number of the identified populations and how that strategy will still allow full recovery of the DPS and/or ESU (Plan, p. 76-79). There certainly are alternative views about the necessity to include all, or at least more, populations in the recovery effort, i.e., reducing threats and stressors on all populations, to ensure full recovery.

As a back-drop, it is noted that:

1. Of 79 NC Steelhead populations, and assuming summer and winter run combined, only 23 (29%) were considered focus populations (Table 2).

2. Of 32 CC Chinook populations identified by Spence et al. 2008 (App A), (Plan, Fig. 10) only 11 (34%) are considered in the Plan as focus populations.
 3. Of 63 CCC Steelhead (Fig. 11) only 31 (49%) are considered “focus” populations.
- Furthermore, as suggested in the captions of Figs 9, 10, and 11, there are even more dependent populations that are not included in these total numbers of populations.

Dependent populations may be particularly important since “NC steelhead, CC Chinook salmon and CCC steelhead are all at a high risk of extinction.” (Plan, p.77). However, the Plan states: “Occupancy targets were not developed by the TRT nor recovery planners for DPSs for this draft.” (Plan, p. 77). The dependent populations are not simply dependent on the independent populations, but they 1) produce fish themselves, 2) their habitats are templates for local adaptation, and 3) provide biological insurance against catastrophic losses of genetic material from neighboring independent populations. The Plan recognizes these values: “The “non-viable” or dependent population criteria were designed to ensure reservoirs of genetic diversity, contribute to connectivity, reduce risk of ESU/DPS extinction, and provide a source of colonizers to extirpated watersheds and buffer against stochastic perturbations within Independent populations.” (Plan, p. 71).

There is contradictory language in the Plan regarding dependent populations. In the Chapter on population viability, it is stated that the general conditions of recovery require: “(1) achieving population viability across selected populations and (2) attaining the necessary number and configuration of these viable populations across the landscape.” Further, “these criteria do not include abundance of dependent populations nor do they provide context on recovering populations under the influence of climate change or ocean conditions.” (Plan, p. 70).

However, on p. 166, the delisting criteria include the element: “numeric criteria for Dependent populations”. Further, Table 17 states “All Dependent populations meet recovery abundance targets”, and the footnote cites a table for spawner abundances. That table is not apparent in the Plan.

Ideally, the number of spawners based on the IP km estimates for every population, including all dependent populations, would be clearly presented so that all parties were in agreement, and could be reminded, that ultimate recovery includes restoration of an array of as many populations as possible, regardless of their relative size or importance. Tables A4 through A9 in Spence et al. (2008) should be modified by simply adding a column of the IP km-estimated number of spawners and those tables should be presented in either Chapter 4 or 9 of the Plan.

In addition to giving all dependent populations higher visibility in the Plan, it is very important that at least the following paragraph be implemented: “The current strategy has unoccupied gaps along the coastline and between adjacent populations of more than 20-30 km, enough to sufficiently disrupt normal patterns of dispersal and connectivity (Figure 17). Thus, additional populations are being considered for inclusion into the recovery strategy prior to release of a co-manager draft. For NC steelhead: Big Flat

Creek, Telegraph Creek, Pudding Creek, Elk Creek, Garcia River, and Schooner Gulch. For CC Chinook salmon: Ten Mile River, Navarro River and Elk Creek. For CCC steelhead: Lagunitas Creek, San Francisquito Creek, Arroyo Corte Madera del Presidio, Wildcat Creek, San Mateo Creek, San Pedro Creek, Gazos Creek, San Vicente Creek and Laguna Creek.” (Plan, p. 77). Given the interruptions of connectivity between presently proposed focus populations, it is unclear why those additional streams are not already among the focus populations in the Plan.

1.3 Are the scientific conclusions sound and derived logically from the results?

The CAP Process

The CAP sections on Key Attributes, Indicators, and Indicator Ranges, are somewhat difficult to follow. It would be helpful if the example tables were cited in those sections on pp. 89-90.

Further, some of the challenges and difficulties in understanding and following the CAP process may be exacerbated by the lack of definition of some terms. For example, on page 90, second sentence of first paragraph, three new terms are introduced: “rating criteria, thresholds, and rating boundaries” without definition. Similarly, in the middle of the same paragraph, the term “indicator boundary” is used without definition.

CAP workbooks were only developed for the focus populations. This means that all remaining habitat (for other independent, potentially independent, and dependent populations) is unaddressed in the Plan. Those habitats and populations are only protected by existing habitat and fish population regulations which have not been sufficient to date to protect the populations.

CAP Results

On p. 96, there are several contradictions about the highest threats. At the top of the page, three (mostly redundant) listings of highest threats are presented for each of the three DPS/ESUs. For example, in the listings at the top of p. 96, fire and fishing and collecting are each shown as high threats for all three of the ESU/DPSs. But further down the page, under Threat Results, those two stressors are not mentioned.

The description at the top of page 135 is very difficult to follow because, for example in the first sentence, “IP habitat for each species were output for each population and are displayed on maps that include a range of IP values across three scales: 0.0 to 0.35; 0.35 to 0.7 and > 0.7.” there is no reference to what the units are or where the maps can be found in the Plan.

Incidental Harvest and By-Catch

Chinook.- CC Chinook salmon are captured incidentally as by-catch in tribal, commercial, and sport marine salmon fisheries throughout their range from British Columbia to California. The Plan (Plan, p. 40) estimates that incidental harvest may be in the 12-15% range (I believe this is for marine commercial fisheries only and does not include marine sport fishing mortality). The threats listed in Table 12 for

fishing/collecting should all be listed as at least “medium” due to this challenge of ongoing mortality in marine fisheries.

These fisheries are driven primarily by hatchery production from the Klamath Basin and the Central Valley (Plan, p. 40). Apparently “several ocean and freshwater fishing regulations have been modified to further conserve CC Chinook and other salmonids including gear restrictions, area and seasonal closures, and size limits.” (Plan, p. 42).

From Chapter 12: “NMFS will implement fishery regulations to maintain salmon harvest levels at or below those necessary to allow for the recovery of listed salmon. Recovery strategies and objectives will serve as a guide when providing conservation recommendations for actions that may adversely affect EFH. In addition, NMFS will work to implement fishery regulations to reduce by-catch of CC Chinook salmon in Federally-managed fisheries.” (Plan, p. 216).

Because fishery harvest rates are within the realm of potential control by managers, it may be possible to take these concepts in Chapter 12 a step further. For example, there is an emerging body of techniques for identifying the origin of fish in mixed stock fisheries so that managers can open and close fishery areas more precisely, both temporally and spatially, to better protect depleted populations (e.g., See Knudsen and Doyle 2005).

An obvious opportunity to reduce incidental harvest mortality of CC Chinook is to restrict the Chinook sport harvest in marine areas. A quick look at the CDFG marine fishery regulations indicates a permissible take of 2 salmon per day (except coho) (<http://www.dfg.ca.gov/marine/oceansalmon.asp>). If this were eliminated, the number of spawners would likely increase. Does sport or commercial fishery capture and retention of listed Chinook or steelhead constitute “take” under ESA section 9?

Additionally, an important harvest management tool is to remove the adipose fin from all hatchery Chinook, so that hatchery fish can be retained in fisheries while unmarked wild fish can be released to spawn.

The third agency-oriented restoration action bullet on p. 148 contains the statement: “Work with DFG to develop protective regulations to minimize impacts from ocean fishing during adult migratory periods (e.g., until sandbars open naturally) within one mile of the river mouths of focus watersheds,…” The one-mile radius seems arbitrary. Is it based on research? If so, the research should be cited. If not, why not make the radius larger?

On p. 148, it is noted that “A full list of fishing recommendations are provided in Volume III in Appendix F.” The cited listing pertains to freshwater fishing. A similar strategic review of ocean fishing should be conducted to reduce the impacts and incidental harvest, especially for CCC Chinook, in ocean fisheries.

Steelhead.- Steelhead experience only minor incidental mortalities in ocean fisheries. However, they may be more seriously impacted in freshwater recreational fisheries. The following describes the situation for steelhead sport fishing: “Steelhead fishing has been,

and continues to be, an important recreational fishery in freshwater. Recreational fishing for hatchery-origin steelhead is very popular. These fisheries are selective, and only visibly marked hatchery-origin fish may be harvested. In most streams where fishing is allowed, a bag limit exists of one or two hatchery steelhead during the winter months. On the Mad River, there is a bag limit of two hatchery steelhead. At catch and release streams, all wild steelhead must be released without further harm. Mortality rates for naturally spawned fish caught and released in these fisheries are presumed to be low, though actual rates are unknown. There are significant restrictions on gear used for angling. Poaching of summer-run fish is considered a problem in watersheds in the northern range of the DPS (NMFS 1996a). During periods of decreased habitat availability (drought or low flow conditions), recreational fisheries and poaching have a greater impact on wild steelhead.” (Plan, p. 25).

The foregoing description raises some important concerns for listed DPSs that can be ameliorated via management actions. First, there are very likely catch and release mortalities on wild steelhead. Second, it is common knowledge that anglers sometimes cannot resist the temptation to keep a wild steelhead that should legally be released. This form of poaching is largely undocumented. Third, harassment by kids and dogs is common, especially during low water events when fish are more exposed. Although poaching and harassment is difficult to assess, it 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. Studies can be invoked to estimate this loss. In terms of restoring these populations, all “take” would ideally be eliminated. In some ways, poaching and harassment is a threat that can be ameliorated, especially through educational programs and increased enforcement. These topics are not directly addressed in the Plan.

2.0 Evaluate the recommendations made in the Report.

2.1 Does the plan meet the minimum standards for recovery plans outlined in the NMFS Interim Recovery Guidance and mandates described in section 4(f)(1)(b) of ESA to include site-specific management actions, objective measurable criteria (criteria that links to listing factors) and estimates of time and cost?

Site-specific Management Actions

The Plan quite thoroughly covers the huge array of site-specific measures needed for restoration of the focus populations, especially as presented in the implementation tables in Volume II.

The Plan does not, but should, address the site specific measures needed to restore the dependent populations.

Some of the measures required for restoration are not site-specific, rather they are programmatic. These are somewhat less thoroughly covered in the Plan. For example, measures to reduce incidental harvest of the ESU/DPSs and to account for climate change could be better developed and spelled out in the Plan.

Objective, Measurable Criteria

The Plan states that “Delisting recovery criteria include: (1) biological viability criteria for Independent populations; (2) numeric criteria for Dependent populations; (3) criteria to track improvement of watershed conditions; and (4) criteria tracking the amelioration of threats, including a specific analysis of threats outlined under the five listing factors.” (Plan, p. 166). Some of these criteria appear to be met while others are not. Each of these is reviewed briefly below.

1. Biological viability criteria for independent populations are clearly identified based on the IP km-estimated target population sizes. Additionally, there is allowance for achieving ESU or DPS recovery without having every independent necessarily achieve the target.
2. Numeric criteria for dependent populations are not apparent in the Plan, but should be added.
3. Criteria to track watershed improvements are established via the implementation tables in Volume II. However, the Plan is vague about how and when the tracking will be conducted.
4. Criteria tracking the amelioration of threats appear to also be established via the implementation tables, and their roll-up of information. However, it is unclear exactly how or when this will be accomplished.

Estimates of the time required and the cost to carry out needed measures

The Plan states that NMFS estimates it will take 50-100 years to achieve recovery (Plan, p. 160). A variety of references and assessments were made regarding the costs of recovery (e.g. much of Chapter 8.0 and Appendix G in Volume III). However, I did not encounter an estimate of total costs anywhere in the Plan.

2.2 Are the results in the Report supported by the information presented?

Most of the results in the Plan are supported. However, see other comments throughout this review addressing other terms of reference questions; they also indicate some cases where the results in the Plan were not fully supported.

2.3 Does the recovery strategy and overall recovery plan provide clear guidance for the public, restorationists, managers, regulators and others to act in a relevant manner over the next several decades to promulgate recovery of salmon and steelhead?

Notwithstanding the criticisms presented in other portions of this review, the Plan contains a recovery strategy that, if fully implemented, has a high potential for at least preventing extinction, if not achieving full recovery. The details in the Plan, especially in the implementation tables of Volume II, provide very specific guidance for recovery.

The ESU/DPS-wide recovery actions (p. 145-149) also provide a large number of important actions. However, those action items are vaguer and less specific. They will

therefore be more challenging to implement, and to measure and assess whether, or how well, they are accomplished.

Large Dams

It is difficult to tell whether the Plan addresses the effects of larger dams. It is unclear why strategies for restoring habitats upstream of larger dams seem to have been somewhat disregarded.

Is this indicated by the fact that Critical Habitat was designated as all accessible areas within the historic range, except those above dams (e.g., “No unoccupied areas or offshore marine areas were designated as critical habitat.” P. 15)? Was the lack of emphasis on restoring areas upstream of dams justified by the statements on p. 132 that NMFS staff “Assessed historical and current IP km to identify historically inaccessible habitat, as well as current habitat deemed unrecoverable”? Why are the areas upstream of major dams deemed to be “unrecoverable”? Many dams in the Pacific Northwest have been retrofitted with salmon and steelhead passage systems or removed. The discussion at the top of page 133 sounds like the areas of potential IP km above “long-standing” dams were estimated, but the Plan is silent (as far as I can tell) about whether those habitats should be included in the restoration efforts.

Large dams are also not listed specifically as a habitat indicator in the Table 4 stress summary. Does the category of “impaired passage and migration” include large dams? Large dams are also not listed in the threats summary of Table 9.

As a further example, a close examination of Table 70 in Volume II for the Upper Eel River does not list Scott Dam as a location for “passage” remediation. Interestingly, the decommissioning of Scott Dam is suggested under a “hydrology” action item in Table 70. Does the suggestion of decommissioning under hydrology preclude the necessity of mentioning such dam removal under passage in Table 70? These issues should be clarified in the Plan.

2.4 Review the research and monitoring recommendations made in the Report and make any additional recommendations, if warranted.

Chapter 10, on Monitoring to Inform Delisting Criteria, presents a very rigorous, methodical, and ambitious sampling program which, if successfully executed, will most likely succeed in fully informing the restoration effort. The one thing that seems to be missing from Chapter 10, however, is a plan for funding the very expensive monitoring program. It may be advisable to add some suggestions for sources of funding for the monitoring.

However, the strategy for monitoring and accounting for marine and freshwater harvest of fish from these ESU/DPSs may not be sufficient. From Chapter 10, Monitoring: “Currently, there is not a monitoring program tracking freshwater harvest or ocean by-catch. Develop Fisheries Monitoring and Evaluation Plans (FMEP) which are specifically designed to monitor and track catch and mortality of wild and hatchery salmon and

steelhead stemming from recreational fishing in freshwater and the marine habitats.” (Plan, p. 187). This should be expanded to include marine commercial and tribal fishing. This may require establishing a genetic baseline for the populations, and then applying that to a systematic sampling scheme of the harvest fish either in marine catch sampling or sport creel surveys.

Conclusions and Recommendations

Overall, the Plan is an excellent road-map to guide the recovery and restoration of the NCC Domain steelhead and Chinook. The following comments are meant to improve the Plan and are presented in the approximate order as they appear in the full comments above.

The Plan needs to be completed in several aspects, particularly the CAP results and summary tables.

The section on “Protective efforts at or since the time of listing “, p. 24-25, appears to be insufficient.

Pre- and post-listing restoration actions do not sufficiently assess the effectiveness of conservation actions to date, except in very general terms. The lists of conservation efforts before and since listing could 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.

The Plan apparently provides insufficient recognition of water quality problems. Suggestions were given for additional level of detail to address in the Plan.

The potential negative effects of hatcheries may not have been fully addressed in the Plan. Recommendations are made to additional topics to be addressed.

Global climate change is viewed as one of the major factors that is potentially threatening the ESU and DPSs and will likely present increasing challenges to recovery. This is particularly true for the CCC Steelhead, which are at the southern end of their species range. Recommendations are made for modeling that could be used to analyze the likelihood of extinction or, conversely, population growth under differing climate scenarios (see, e.g., Battin et al. 2007).

The importance of marine-derived nutrients should be identified and emphasized in the Plan.

The Plan does not appear to consider alternative methods for estimating the potential production of salmon or steelhead from the habitat. The Plan should explain why other methods, such as Ecosystem Diagnostic Treatment (EDT) (Mobrand et al. 1997), which has been applied in at least three other salmon/steelhead recovery plans (Beamesderfer et

al. 2010, LCFRB 2010, Carmichael and Taylor 2010), was not considered for estimating habitat potential in this Plan.

The section on “focus populations” does not present any alternative views on the rationale for dropping a large number of the identified populations and how that strategy will still allow full recovery of the DPS and/or ESU. There certainly are alternative views about the necessity to include all, or at least more, populations in the recovery effort, i.e., reducing threats and stressors on all populations, to ensure full recovery.

Likewise, the relative importance of dependent populations should be emphasized more strongly even though they are not selected as focus populations for preventing extinction. Clear statements emphasizing the need to protect their habitats will reduce the tendency to downplay the importance of protecting smaller and less noticeable habitats.

In addition to giving all dependent populations higher visibility in the Plan, it is very important that at least populations identified for filling the “connectivity gaps” (p. 77) be added to the list of focus populations.

Some additional work on the description of the CAP process would be helpful in the Plan.

A method is needed for describing the importance of the habitat protection and restoration on non-focus watersheds that are still important to the long-term recovery prospects.

A method is needed for addressing the incidental harvest and by-catch of CC Chinook salmon captured in tribal, commercial, and sport marine salmon fisheries throughout their range from British Columbia to California. Recommendations are made to that effect.

Attention should also be paid to the incidental harvest, catch and release mortality and poaching of steelhead in the NCC Domain.

The Plan does not, but should, address the site specific measures needed to restore the non-focus independent, potentially independent, and dependent populations, or at least emphasize the need for habitat protection and restoration in those watersheds as well as in the focus watersheds.

Numeric criteria for dependent populations are called for in the Plan but are not apparent in the Plan. They should be added.

There does not appear to be an estimate of total costs anywhere in the Plan.

In some cases, the ESU/DPS-wide recovery actions (p. 145-149) should be made more specific, describing how they will be accomplished.

It is difficult to tell whether the Plan addresses the effects of larger dams. It is unclear why strategies for restoring habitats upstream of larger dams seem to have been somewhat disregarded.

Literature Cited:

- Agrawal, A., R.S. Schick, E. P. Bjorkstedt, S. R.G. Szerlong, M. N. Goslin, B. C. Spence, T.H. Williams, and K. M. Burnett. 2005. Predicting the potential for historical coho, Chinook and steelhead habitat in Northern California. Southwest Fisheries Science Center, NOAA Technical Memorandum NMFS-SWFSC-379.
- 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: 2266-2274.
- Battin, J., M.W. Wiley, M.H. Ruckelshaus, R.N. Palmer, E. Korb, K.K. Bartz, and H. Imaki. 2007. Projected impacts of climate change on salmon habitat restoration. *Proceedings of the National Academies of Science* 104: 6720-6725.
- Beamesderfer and 15 co-authors. 2010. Lower Columbia River conservation and recovery plan for Oregon populations of salmon and steelhead. Oregon Department of Fish and Wildlife.
- Bjorkstedt, E. P., B.C. Spence, J.C. Garza, D.G. Hankin, D. Fuller, W.E. Jones, J.J. Smith, and R. Macedo. 2005. An analysis of historical population structure for evolutionarily significant units of chinook salmon, coho salmon, and steelhead in the North-Central California Coast Recovery Domain. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-382.
- Burnett, K. M., G. Reeves, D. M., S. Clarke, K. Christiansen, and K. Vance-Borland. 2003. A first step toward broad-scale identification of freshwater protected areas for Pacific salmon and trout in Oregon, USA. Page 144–154 in *Aquatic Protected Areas: what works best and how do we know?* Australian Society for Fish Biology., Cairns, Australia.
- Carmichael, R. W. and B.J. Taylor. 2010. Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. Oregon Department of Fish and Wildlife, Unpl. Report.. http://www.eou.edu/~odfw/Oregon_Mid-C_Recovery_Plan_Feb2010.pdf.
- Damkaer, D. M. and D.B. Dey. 1989. Evidence for Fluoride Effects on Salmon Passage at John Day Dam, Columbia River, 1982—1986. *North American Journal of Fisheries Management* 9: 154-162.
- Eisler, R. Handbook of chemical risk assessment: health hazards to humans, plants, and animals. Volume I, Metals. 2000. Boca Raton, FL, Lewis Publishers.

- Gallagher, S. P., D.W. Wright, B.W. Collins, and P.B. Adams. 2010. A Regional Approach for Monitoring Salmonid Status and Trends: Results from a Pilot Study in Coastal Mendocino County, California. *North American Journal of Fisheries Management*. 30: 1075-1085.
- Hopelain, J. S. 1998. Age, growth and life history of Klamath River Basin steelhead trout (*Oncorhynchus mykiss irideus*) as determined from scale analysis. California Department of Fish and Game, Inland Fisheries Administrative Report, 98-3, Sacramento, CA. http://aquaticcommons.org/2898/1/IFD_AdminReport98-3.pdf.
- Kesner, W. D. and R.A. Barnhart. 1972. Characteristics of the fall-run steelhead trout (*Salmo Gairdneri gairdneri*) of the Klamath River system, with emphasis on the half-pounder. *California Fish and Game* 58: 204-220.
- Knudsen, E. E. and E. G. Doyle. 2006. Science and technology are essential for sustaining salmon populations and their ecosystems. Pages 311-332 in *Salmon 2100: The future of wild Pacific salmon*. American Fisheries Society, Bethesda, Maryland, USA.
- LCFRB (Lower Columbia Fish Recovery Board). 2010. Lower Columbia Fish Recovery Board. http://www.lcfrb.gen.wa.us/Recovery%20Plans/June%202010%20RP/Vol%201/Overview%202010%20June_2_Final.pdf.
- McCarthy, S. G., J.P. Incardona, and N.L. Scholz. Coastal Storms, Toxic Runoff, and the Sustainable Conservation of Fish and Fisheries. American Fisheries Society.
- McEwan, D. and T.A. Jackson. 1996. Steelhead restoration and management plan for California. State of California, The Resources Agency, Department of Fish and Game.
- McPhee, M. V., F. Utter, J. A. Stanford, K. V. Kuzishchin, K. A. S., D. S. Pavlov, and F. W. Allendorf. 2007. Population structure and partial anadromy in *Oncorhynchus mykiss* from Kamchatka: relevance for conservation strategies around the Pacific Rim. *Ecology of Freshwater Fish* 16: 539-547.
- Mobrand, L. E., Lichatowich, J. A., Lestelle, L. C., and Vogel, T. S. 1997. An approach to describing ecosystem performance "through the eyes of salmon". *Canadian Journal of Fisheries and Aquatic Sciences* 54: 2964-2973.
- Nickelson, T. E. 1986. Influences of upwelling, ocean temperature, and smolt abundance on marine survival of coho salmon (*Oncorhynchus kisutch*) in the Oregon production area. *Canadian Journal of Fisheries and Aquatic Sciences* 43: 527-535.

- Nickelson, T. E. and Lawson, P. W. 1998. Population viability of coho salmon, *Oncorhynchus kisutch*, in Oregon coastal basins: Application of a habitat-based life-cycle model. *Canadian Journal of Fisheries and Aquatic Sciences* 55: 2383-2392.
- NMFS (National Marine Fisheries Service) . 2010. Interim Endangered and Threatened Species Recovery Planning Guidance . National Marine Fisheries Service, Version 1.3, Silver Spring, MD.
<http://www.nmfs.noaa.gov/pr/pdfs/recovery/guidance.pdf>.
- NMFS (National Marine Fisheries Service) . 2010. Recovery Plan for the evolutionary significant unit of Central California coast coho salmon. National Marine Fisheries Service, Southwest Regional Office, Public Draft, Santa Rosa, California.
- NMFS (National Marine Fisheries Service) . 2011. Recovery Plan for the North Central California Coast Domain: Northern California Steelhead; California Coastal Chinook Salmon; Central California Coast Steelhead . National Marine Fisheries Service, Southwest Regional Office, Center for Independent Experts Review Draft , Santa Rosa, California.
- 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. *Environ. Sci. Technol.* 41: 2998–3004.
- Spence, B. C. and others. 2008. A framework for Assessing the viability of threatened and endangered salmon, and steelhead in the North-Central California Coast Recovery Domain. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-423.
- USDI (U.S. Department of the Interior). 2002. Endangered species act of 1973 as amended through the 108th congress. U.S. Department of the Interior, U.S. Fish and Wildlife Service. <http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf>.
- Wipfli, M. S. and C.V. Baxter. 2010. Linking Ecosystems, Food Webs, and Fish Production: Subsidies in Salmonid Watersheds. *Fisheries* 35: 373-387.

Appendix A. Bibliography of all material provided

- Technical Recovery Team Reports: Historical Structure
 - <http://swfsc.noaa.gov/publications/FED/00671.pdf>
- Technical Recovery Team Framework for Assessing Viability
 - <http://swfsc.noaa.gov/publications/FED/00885.pdf>
- 2006 (2010 Updates) NMFS 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

California's North Central Coast Domain Draft Recovery Plan

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Background: The Endangered Species Act (ESA) requires NOAA's National Marine Fisheries Service (NMFS) develop and implement recovery plans for the conservation of threatened and endangered species. The North Central Coast Draft Recovery Plan will include three ESA-listed populations: (1) Northern California steelhead (threatened); (2) California Coastal Chinook salmon (threatened); (3) Central California Coast steelhead (threatened). The draft recovery plan serves as a guideline for achieving recovery goals by describing the steps that must be taken to improve the status of the species and their habitats. Although the recovery plan itself is not a regulatory document, its primary purpose is to provide a conservation "road map" for Federal and state agencies, local governments, non-governmental entities, private businesses, and stakeholders. The NMFS Recovery Plan for the North Central Coast is expected to generate substantial interest from outside parties because it: (1) will contain recommendations involving water supplies for a variety of municipalities (including the greater San Francisco area) and agricultural users; (2) will prioritize watersheds for targeted restoration actions; (3) could influence local and regional planning efforts and decisions involving land development patterns such as county policies and forest practices; and (4) may advise state agencies and local governments on other actions necessary for recovery. The draft recovery plan will include a large geographic area in central California and has the potential for wide-ranging implications. Stakeholder interest will be high and likely lead to inquiries from elected representatives at the state and Federal levels.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. The CIE reviewers shall conduct the peer review as a 'desk' review (i.e., the review and report

writing can be accomplished from their primary locations, therefore no travel is required). Each reviewer's duties shall not exceed a maximum of ten work days.

CIE reviewers shall have expertise in salmon management, salmon conservation biology, salmon restoration practices, and salmon/water management, and it is desirable that reviewers have experience in salmon conservation under the ESA and strong credentials in west coast salmon management activities. The CIE reviewers shall have the requested expertise necessary to complete an impartial peer review and produce the deliverables in accordance with the SoW and the ToRs as stated herein (refer to the ToR in Annex 1).

The CIE reviewers shall conduct a 'desk' peer review of the California's North Central Coast Domain Draft Recovery Plan Report to ensure that its contents can be factually supported and that the methodology and conclusions are scientifically valid. The area under consideration will be the lands and waterways in Northern and Central California. Each reviewer shall conduct the peer review and develop a detailed report addressing each of the ToRs as specified in Annex 1.

Statement of Tasks for CIE Reviewers: The CIE reviewers shall conduct necessary preparations prior to the peer review, conduct the peer review, and complete the deliverables in accordance with the ToR and milestone dates as specified in the Schedule section.

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, and other pertinent information. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

Desk Peer Review: Each CIE reviewer shall conduct the independent peer review from their primary locations as a "desk" review in accordance with the SoW and ToRs to ensure the best available science is utilized for the National Marine Fisheries Service (NMFS) management decisions (refer to the ToR in Annex 1). Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator. The

CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

- 1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
- 2) Conduct an independent peer review in accordance with the ToRs (**Annex 2**).
- 3) No later than November 14, 2011, each CIE reviewer shall submit an independent peer review report addressed to the “Center for Independent Experts,” and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and CIE Regional Coordinator, via email to Dr. David Die ddie@rsmas.miami.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

28 October 2011	CIE shall provide the COTR with the CIE reviewer contact information, which will then be sent to the Project Contact
28 October 2011	The Project Contact will send the CIE Reviewers the report and background documents
31 October – 14 November 2011	Each reviewer shall conduct an independent peer review
14 November	Each reviewer shall submit an independent peer review report to the CIE
28 November 2011	CIE shall submit draft CIE independent peer review reports to the COTRs
5 December 2011	The COTRs will distribute the final CIE reports to the Project Contact

Modifications to the Statement of Work: This ‘Time and Materials’ task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council’s SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer

at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on changes. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Modifications to the Statement of Work: This ‘Time and Materials’ task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council’s SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on changes. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Support Personnel:

William Michaels, Program Manager, COTR
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov Phone: 301-427-8155

Manoj Shivlani, CIE Lead Coordinator

Northern Taiga Ventures, Inc.
10600 SW 131st Court, Miami, FL 33186
shivlanim@bellsouth.net Phone: 305-383-4229

Roger W. Peretti, Executive Vice President
Northern Taiga Ventures, Inc. (NTVI)
22375 Broderick Drive, Suite 215, Sterling, VA 20166
RPerretti@ntvifederal.com Phone: 571-223-7717

Key Personnel:

NMFS Project Contact:

Dick Butler
NMFS, Santa Rosa Area Office Supervisor
777 Sonoma Ave, Rm 325, Santa Rosa, CA 95404-6515
Dick.Butler@noaa.gov Phone: 707-575-6058

ANNEX 1:
Terms of References (ToRs)
CIE Peer Review of
California's North Central Coast Domain Draft Recovery Plan

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 of NMFS (2006), 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 Materials Required

There are two NMFS Science Center Technical Memoranda that form the biological framework for the recovery plan: historical population structure and viability criteria. These memoranda and other supporting information are critical to the review of the Draft NCCC Recovery Plan and include:

- Technical Recovery Team Reports: Historical Structure
 - <http://swfsc.noaa.gov/publications/FED/00671.pdf>
- Technical Recovery Team Framework for Assessing Viability
 - <http://swfsc.noaa.gov/publications/FED/00885.pdf>
- 2006 (2007 Updates) NMFS Interim Recovery Planning Guidance
 - <http://www.nmfs.noaa.gov/pr/recovery/>
- Endangered Species Act (<http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf>)

ANNEX 1 (continued):
Terms of References (ToRs)
CIE Peer Review of
California's North Central Coast Domain Draft Recovery Plan

1.0 Evaluate the adequacy, appropriateness and application of data used in the Report.

1.1 In general, does the Report include and cite the best scientific and commercial information available on the species and its habitats, including threats to the species and to its habitat including large-scale perturbations such as climate change and ocean conditions?

1.2 Where available, are opposing scientific studies or theories acknowledged and discussed?

1.3 Are the scientific conclusions sound and derived logically from the results?

2.0 Evaluate the recommendations made in the Report.

2.1 Does the plan meet the minimum standards for recovery plans outlined in the NMFS Interim Recovery Guidance and mandates described in section 4(f)(1)(b) of ESA to include site-specific management actions, objective measurable criteria (criteria that links to listing factors) and estimates of time and cost?

2.2 Are the results in the Report supported by the information presented?

2.3 Does the recovery strategy and overall recovery plan provide clear guidance for the public, restorationists, managers, regulators and others to act in a relevant manner over the next several decades to promulgate recovery of salmon and steelhead?

2.4 Review the research and monitoring recommendations made in the Report and make any additional recommendations, if warranted.

CIE reviewers are contracted with the qualifications to conduct a scientific peer review, and are not required to provide regulatory or management advice.

ANNEX 2

Format and Contents of CIE Independent Reports

The report should follow the outline given below. It should be prefaced with an Executive Summary that is a concise synopsis of goals for the peer review, findings, conclusions, and recommendations. The main body of the report should provide an introduction that includes a background on the purpose of the review, the terms of reference and a description of the activities the reviewer took while conducting the review. Next, the report should include a summary of findings made in the peer review followed by a section of conclusions and recommendations based on the terms of reference. Lastly the report should include appendices of information used in the review (see outline for more details).

1. Executive Summary
 - a. Impetus and goals for the review
 - b. Main conclusions and recommendations
 - c. Interpretation of the findings with respect to conclusions and management advice
2. Introduction
 - a. Background
 - b. Terms of Reference
 - c. Description of activities in the review
3. Review of Information used in the Status Review Report (as outlined in the table of contents in the Status Review Report)
4. Review of the Findings made in the Status Review Report
 - a. DPS/ESU Considerations: Populations-Habitats-Threats
 - b. Extinction Risk Analysis and Recovery Criteria
 - c. Evaluation of Regulatory and Non-regulatory Recovery Actions
 - d. Research and Monitoring Recommendations
5. Summary of findings made by the CIE peer reviewer
6. Conclusions and Recommendations (based on the Terms of Reference in Annex I)
7. Appendices
 - a. Bibliography of all material provided
 - b. Statement of Work
 - c. Other