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An Independent Peer Review
of the
South-Central California Steelhead Draft Recovery Plan

Independent Peer Review for the Center for Independent Experts

By

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1. Executive Summary

The Endangered Species Act (ESA) requires NOAA's National Marine Fisheries Service (NMFS) to develop and implement recovery plans for the conservation of threatened and endangered species. A draft recovery plan has been prepared for the endangered South-Central California Distinct Population Segment (DPS) of steelhead that occur in an area extending from Pajaro River in Monterey County south to Arroyo Grande Creek in San Luis Obispo County. The watersheds within this region fall within two basic groups: those characterized by larger inland rivers systems that extend inland through gaps in the coastal ranges (*e.g.*, Pajaro, Salinas, Carmel, Arroyo Grande) and short coastal streams draining the Santa Lucia Mountains immediately adjacent to the coast (*e.g.*, Little and Big Sur, San Carpoforo, Arroyo de la Cruz, San Simeon, and Santa Rosa).

The draft recovery plan serves as a guideline for achieving recovery goals by describing the watersheds and recovery actions that must be taken to improve the status of the species and their habitats. The Center for Independent Experts (CIE) requested that I conduct an impartial and independent peer review of the draft South Central California Steelhead Recovery Plan (SCCSRP) for the endangered South Central California Distinct Population Segment (DPS) of steelhead. The goals of the peer review were set forth in the Scope of Work Terms of Reference that ensure the principal elements of a recovery plan are included and to address the set of questions provided for reviewers, as described in the Introduction.

I reviewed and commented on the draft SCCSRP, and its associated appendices and background documents. My findings are grouped into four general sections. First, I listed a number of primarily editorial items that should be helpful for the authors to refine the document so that it is more accurate and reads better. The second section is a listing of findings and suggestions from my review of the draft plan, with particular reference to a) DPS considerations: populations, habitats and threats; b) extinction risk analysis and recovery criteria; c) evaluation of conservation measures; and d) research and monitoring recommendations. The third section is a summary of my findings, with reference to the five objectives of the recovery plan, including major recommendations. The fourth section presents the major conclusions of the review, including additional recommendations.

Overall, the SCCSRP is well-written and contains the necessary elements to support recovery of the South Central California steelhead (SCCS). I especially applaud the precautionary approaches to setting viable population levels pending development of additional information. If the recovery actions presented in the SCCSRP are successfully implemented then, at least in some populations, there is an excellent chance that the viability targets and expression of all life history forms and strategies will also be restored.

Throughout the review, I provided a number of specific comments and suggestions for improvement of the SCCSRP. Besides the numerous suggestions for improvement in body of the review, the most **significant recommendations** are:

1. Provide specific strategies for how the SCCSRP will be implemented in cooperation with existing agencies and landowners, especially local governments which control the many land-use actions that impinge on steelhead habitat.
2. Prioritize review of and planning for emergency conservation hatcheries to begin saving biological gametes for future reintroduction and population rebuilding as habitat is further protected and restored in the future.
3. Improve the nomenclature of steelhead streams/populations throughout the SCCSRP, including all streams that ever held steelhead, to reduce confusion about the role each stream plays in recovery of the SCCS DPS. Also, specifically designate the core level of all populations within the Coast Range BPG (i.e., in Table 6-1).
4. Revisit the proposed core population structure to ensure that sufficient Core 1 populations have been designated for each biogeographic population group (BPG), and that threats to Core 2 and 3 populations are sufficiently ameliorated so that SCCS will be restored to previously occupied habitats.
5. Improve the connection between the SCCSRP and background science by carefully and thoroughly citing all previous work, especially Boughton et al. (2005, 2006, 2007), wherever that work supports statements made in the SCCSRP.
6. Previous work on estimating persistence and viability should be reviewed and discussed in the SCCSRP to set the stage for the process selected for the SCCS, and to support recommendation number 10 below. For one example, see the methods used by the Lower Columbia Fish Recovery Board (LCFRB 2004).
7. The CAP workbook process, the basis for developing threats analysis and recovery actions could be better elucidated if Appendix D contained an example set of workbook tables for one watershed. It would be helpful for the reader to see an example of how the process worked from beginning to end, from the Kier and Associates workbooks, to the threats tables, to the recovery action tables in the BPG chapters.
8. To conserve genetic diversity and provide opportunities for interchange of genetic material, expeditiously implement two major activities: 1) restore access to important habitats upstream of any large and/or numerous dams that block access (to allow the full expression of genetic diversity), and 2) quickly begin evaluation of the need for, and the implementation of, conservation hatcheries that include full consideration of DPS-wide genetic integrity.
9. Several missing components of the SCCSRP should be completed, particularly a section on time and costs of the recovery actions.
10. A more detailed analysis of the SCCS extinction risk should be included in the SCCSRP, so that decision-makers will be apprised of the likelihood of extinction, depending on whether the restoration actions are implemented.

2. Introduction

2a. Background

The South Central California steelhead is a rainbow trout subspecies (*Oncorhynchus mykiss irideus*) (Behnke 2002). It has been extirpated from many of its former habitats and is now listed as Threatened under the U.S. Endangered Species Act. NOAA National Marine Fisheries Service is the lead federal agency designated to prevent steelhead from going extinct and to, in fact, develop a Recovery Plan designed to implement processes that will rebuild the populations sufficiently to eventually have this species removed from the endangered species list.

I was requested by the Center for Independent Experts to conduct a review of the draft of the South Central California Steelhead Recovery Plan (SCCSRP) (May 27, 2009 version). 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):

"The ESA mandates application of all methods and procedures which are necessary to provide for the conservation and survival of listed species, to the extent that measures pursuant to the ESA will no longer be necessary. Therefore, the plan conveys:

- An assessment of the threats facing the species, including those identified when the species was listed and any new threats;
- A strategy to achieve recovery that is transparent and adaptable;
- The actions NMFS believes are critical to abating those threats and restoring habitat conditions and species' health; and
- Criteria to measure the achievement of recovery." (NMFS 2009)

The overarching goal of the SCCSRP is the recovery of the South‐Central California Steelhead DPS and its removal from the Federal List of Endangered and Threatened Wildlife (50 C.F.R. 17.11). To achieve this goal, the ESA requires that Recovery Plans, to the maximum extent practical, incorporate objective measurable criteria which, when met, would result in a determination in accordance with the provisions of the ESA that the species be delisted (50 CFS 17.11 and 17.12) (NMFS 2009).

Furthermore, the SCCSRP states: "To recover steelhead, the following objectives have been identified:

1. Prevent steelhead extinction by protecting existing populations and their habitats;
2. Maintain current distribution of steelhead and restore distribution to previously occupied areas that are essential for recovery.
3. Increase abundance of steelhead to viable population levels, including the expression of all life history forms and strategies.

4. Conserve existing genetic diversity and provide opportunities for interchange of genetic material between and within viable populations.
5. Maintain and restore suitable habitat conditions and characteristics for all life history stages so that viable populations can be sustained.
6. Conduct research and monitoring necessary to refine and demonstrate attainment of recovery criteria." (NMFS 2009, p. 2).

2b. Terms of Reference

As specified in the Statement of Work (See Appendix 2), the Terms of Reference for this review are as follows:

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 2007)

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 (2007), 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 five NMFS Science Center Technical Memoranda that form the biological framework for the recovery plan. These memoranda and other supporting information are critical to the review of the Draft NCCC Recovery Plan and include:

- Historical Structure
- Viability Criteria
- Contraction of the southern range limit for anadromous Oncorhynchus mykiss
- Recent efforts to monitor anadromous Oncorhynchus species in the California coastal region: a compilation of metadata

- Potential steelhead over-summering habitat in the South-Central/Southern California Coast Recovery Domain: maps based on the envelope method

In addition, other important references

- 2006 (2007 Updates) NMFS Interim Recovery Planning Guidance
- Endangered Species Act (http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf
- Derek Girman and J. C. Garza. (2006) Population structure and ancestry of O. mykiss populations in South-Central California based on genetic analysis of microsatellite data. 33pp.
- Garza, J. C., and A. C. Clemento. (2008) Population genetic structure of */Oncorhynchus mykiss/* in the Santa Ynez River, California. 55pp.

CIE Peer Reviewer Questions:

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

1. In general, does the Plan 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?
2. Where available, are opposing scientific studies or theories acknowledged and discussed?
3. Are the scientific conclusions sound and derived logically from the results?

Evaluate the recommendations made in the Plan.

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. Is there a clear presentation of the species' extinction risk, the threats facing the species and the necessary actions to remove or reduce those threats such that recovery goals can be achieved?
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.
4. Review the research and monitoring recommendations made in the Report and make any additional recommendations, if warranted.

2c. Description of Activities in the review

The primary activity undertaken was to carefully review the SCCSRP (NMFS 2009) and to address the Terms of Reference from Annex I in the Statement of Work, as described above. Because this draft Recovery Plan was very similar to the previously reviewed draft Southern California Steelhead Recovery Plan (SCSRP), many of my comments are the same or similar

for both draft Plans. I decided to retain all the similar comments in this review, rather than refer to the previous review, to maintain a complete, unified record of my review comments for SCCS. However, every comment that was similar between the two reviews, and still relevant to SCCS, has been thoroughly checked to be sure they still pertain and revised wherever necessary to refer to the SCCS.

It should also be noted that, during this review of the SCCSRP, I uncovered several additional issues that pertain to both the SCCSRP and the previously reviewed SCSRP. I tried to note cases where I thought the comments would be newly applicable to the previous review of the SCSRP.

In addition to reviewing the SCCSRP, several of the background documents 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 review of the SCCSRP was written using all the above information.

3. Review of Information used in the Recovery Plan

The papers by Boughton et al. (2005, 2006, and 2007) were thoroughly reviewed as background for the SCCSRP, and other references were scanned as necessary in support of the SCCSRP review. Very few criticisms were found of the work in these papers. The few concerns found in regard to the background documents are included where relevant in the review comments on the SCCSRP.

I noted two discrepancies in the background reports that may influence some conclusions in the SCCSRP. Neither of these facts was referenced specifically in the SCCSRP. One is that, in Boughton et al (2005, p. 11), there is a reference to uncertainty about the ability of steelhead to pass barriers: “opinion varies widely about the abilities of steelhead with respect to barriers/impediments”. Steelhead are known to be among the best leapers of the salmonids (e.g., Scott and Dill 2008, Section 3.2). Their ability to pass a given barrier depends primarily on the flow rate, height of jump, and the depth and flow characteristics of the plunge pool.

The other oversight is the lack of reference to iteoparity (repeat spawning) in wild steelhead in Boughton et al. (2007). Most steelhead populations exhibit some amount of repeat spawning as mentioned in the life history section of the SCCSRP. This fact may be important in the estimation of the required mean annual run size for viability as discussed by Boughton et al. (2007). Accommodation of downstream migrating adult steelhead (called kelts) should also be accounted for in restoration planning, especially at dams and at the beach barriers.

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4. Review of the Findings made in the Recovery Plan

First, to assist the authors of the SCCSRP, this section of the review contains editorial recommendations that may help to improve the readability of the Plan, each cited by page and line number.

1. Some text apparently has been carried over from the draft Southern California Steelhead Recovery Plan:

    a. The title "Status of Southern California Coast Steelhead" in the heading on page iii.

    b. On page 23, lines 23-31, because it refers to streams in that SCS DPS rather than in the SCCS geographic area.

    c. The percentage value of remaining estuarine habitat should in that same passage should also be verified as applicable to the SCCS area.

    d. First page in Appendix D, lines 15-16.

2. On p. 2, and again on p. 21, of the SCCSRP, there is mention of the fact that much of the upper watersheds remain intact because they are within Los Padres NF. Perhaps mention should also be made of the protection opportunities provided by the presence of 165,000 acres of un-encroached mountains, valleys, rivers, plains, and forests provided by the U.S. Army Fort Hunter-Liggett.

3. P. 10, line 17-18, the term alevin is incorrectly applied "…with a layer of gravel, where the embryos (alevins) incubate within the gravel." Alevin is a salmonid larvae that has hatched but has not absorbed its yolk sac. Pre-hatch, fertilized eggs are also embryos incubating in the gravel. This would more correctly read "…embryos and alevins incubate…".

4. A typo needs revision on p. 15, line 4: "breaks into fivfoure Biogeographic Population Groups (BPGs)".

5. Footnote text for Table 2-2 appears to be missing.

6. On page 18, line 27, delete "and" in the phrase "…1) and updated…".

7. On page 19, line 7, there is an error in the phrase "…with minimum size bag limits." That should probably read "…with minimum size and bag limits."

8. Is this statement correct: "All four of the largest watersheds (*i.e.*, Pajaro, Salinas, Nacimiento/Arroyo Seco, and Carmel rivers)…." (P. 19, lines 14-14)? According to the map in Figure 2-5, it looks like Nacimiento/Arroyo Seco are two separate watersheds within the Salinas.

9. The reference for Pearse and Garza (2008) noted on p. 21, line 10, does not appear in the Literature Cited list.

10. The language in the following passage does not make complete sense: "Pearse and Garza (2008) found that … while there was a strong and highly significant correlation

between genetic and geographic isolation of historical populations; thus, there was no significant correlation between genetic and geographic distance among the modern populations." (P. 21, lines 17-21)

11. A footnote is indicated in Table 4-2, in the section on the Interior Coast Range, but there is no associated footnote text.

12. On page 49, Table 5-1, the language in the bottom cell "Viable populations exhibit all three life-history types (fluvial-anadromous, lagoon-anadromous, freshwater resident)" is somewhat confusing. Does this apply to every population or just some of the populations among all of them?

13. Section 5.3.1.1 (SCCSRP, p. 50, lines 8-21) should cite Boughton et al. (2007), especially regarding the methods for derivation of the 4,150 mean population size for viability.

14. The references for Holmes (2001), Lindley (2003), and Dennis et al. (2006) noted on p. 50, line 36, do not appear in the Literature Cited list.

15. The decision tree described on p. 51, lines 1-3, and referenced in Boughton et al. (2007) should be incorporated into the SCCSRP as an important figure for understanding the proposed population-level recovery criteria.

16. Statements about the effects of ocean conditions, under the section on "Criterion P-2 – Ocean conditions", (p. 51, lines 4-19), while agreed to be true, should have citations to supporting research literature.

17. On page 58 lines 27-28, the statement: "The original inland populations were small in number,…." Is a little confusing. Does this mean there were few populations, the populations were small, or both? Clarifying this has implications for the subsequent text. Further, depending on the intent of the quoted text, it could contradict the language in line 33 of p. 58, that size these populations were the largest at times.

18. The discussion of studies that have demonstrated high growth rates in some seasonal lagoons, and possibly other freshwater habitats which provide suitable over-summering habitat, (p. 61, lines 26-27) should have references for the studies.

19. Section 6.3 should more logically be a subsection of 6.2. Most of section 6.2 is about the importance of breaching dams and getting additional water into the steelhead streams. Section 6.3 is about the benefits of steelhead access to and from the areas upstream of dams, so more logically fits as a subsection. Furthermore, there are currently subsections on other critical habitat needs and on conservation hatcheries between these two subsections that address the effects of dams and the benefits of passage.

20. The key word “barriers” may be lacking in the following statement: “This component encompasses such restoration activities as removing passage to prime upstream spawning and rearing habitats” (p. 68, lines 43-44).

21. The first paragraph in Chapter 7, “Summary of DPS-wide Recovery Actions” focuses on the restoration activities that are need along the lower mainstem of the subject rivers and streams. The topic of dams, diversions, water removal, etc. should also be included in that same paragraph, since those threats have been identified as critical to recovery in the previous chapter and head the list of recovery actions on the following page.

22. There is a typo in the top box of Table 7-1 on page 75: “….from selected Dams necessary to necessary to support all….”.

23. There is an apparent typo in the text on page 108, lines 6-9, which is about the Carmel River. In two places, there is reference to the Salinas River, which should be the Carmel River: “Black Rock Creek Dam, San Clemente Dam, and Los Padres Dam. Black Rock Creek Dam, constructed in 1925 on a tributary to the Salinas River, is used for recreational purposes. The San Clemente and Los Padres dams, constructed on the mainstem Salinas River in 1921 and 1949, respectively, are used for municipal and agricultural water supply.”

24. On Page 148, lines 36-37, there is a small typo that should be checked in the phrase: “…non‐point pollution roads as well as nutrient….”

25. Since nothing is permanent, the term “permanent” in lines 11-14, p. 188 might more appropriately be replaced with “long-term”.

26. The citation to Ward et al. (1989) (line 3, p. 190) and Ward (2000) (line 7, p. 190) are not listed in the references section.

27. The citations for de Kroon et al. (2000), Hodgson and Townley (2004), and Fujiwara (2007) referred to on p. 216, lines 1, 22, and 36, respectively, are missing from the references list.

28. In the reference list (P. 243 lines 38-39 and p. 244, lines 3-4), the citations for National Marine Fisheries Service. 2007e and 2007g appear to be redundant.

29. The rankings illustrated by Appendix B are unclear. A definition of the ranking would be very helpful. What is ranked? Is it viability, or strictly amount of habitat? The caption says rankings are <u>based on</u> the amount of habitat available, but does not say what is actually ranked.

30. The table in Appendix C has footnote text, but there is no footnote designation in the caption or table.

4a. DPS considerations: Populations, Habitats and Threats

The remainder of the review is focused on the SCCSRP content in light of the Terms of Reference.

Definition of the DPS and its Populations and Habitats

I do not agree that the DPS should only include habitats downstream of artificial barriers (p. 3, lines 6-8) because, in some cases, those habitats and populations upstream of artificial barriers may be critical for recovery. For example, Deiner et al. (2007) found that *O. mykiss* above artificial barriers were not different from those below the barriers, Docker and Heath (2004) found no genetic differentiation between sympatric resident and anadromous *O. mykiss*, Girman and Garza (2006, as cited in NMFS 2009) determined that above-barrier *O. mykiss* were more closely associated with their below-barrier populations than to populations from other watersheds, and Pearsons et al. (2007) found many instances of interbreeding between resident and steelhead trout. Furthermore, "rainbow trout" which have completed their life‐history cycle entirely in freshwater sometimes produce progeny which become anadromous and emigrate to the ocean and return as adults to spawn in freshwater (NMFS 2009, p.10). This evidence leads one to conclude that rainbow trout upstream of dams can serve as a remnant source of steelhead genetics for future reproduction in downstream populations, as was suggested by Nielsen (2003) for Alameda Creek steelhead. This is similar to the source-sink phenomenon described in Boughton et al. (2006), where a struggling population can be supported by a nearby population. It is positive to note that the recovery planning area is designated to include stream reaches upstream of artificial barriers (p. 4, line 24). Further on in the SCCSRP (p.13), the authors cite 77 cases in south-central and southern California where rainbow trout can be found upstream of barriers, downstream of which steelhead have been extirpated. These resident populations can potentially serve as the source for future steelhead rebuilding in the downstream reaches. Therefore, the habitats upstream of barriers should be included in the DPS.

I question a part of the discussion about Critical Habitat designation on page 4, line 8. What is the basis for the statement on Critical Habitat that, for the SCCS, "Critical habitat includes most, but not all occupied habitat….." What are the habitats that are not included and why not? Furthermore, why are Critical Habitats designated only on the basis of current occupation? There are clearly some useful unoccupied habitats to which the DPS could expand occupation if rebuilding is successful, as recognized later in the SCCSRP.

The conclusion that steelhead are no longer present because a stream was dry in 2002 is somewhat questionable (Table 2-1, p. 14). The table footnote states that '"Dry" indicates the stream had no discharge in anadromous reaches during the summer of 2002." If the stream were flowing in other years, would there be potential for steelhead presence? The high degree of life-history plasticity described by Boughton et al. (2006) makes it reasonable to think that steelhead in this southernmost part of their range have adapted to the varying effects of wet and dry years. Perhaps in dry years, there is no migration through, or presence in, the anadromous reaches whereas in wet years, fish from upstream, adults able to access the stream from the ocean, or strays from neighboring streams can fill available habitat.

Relying on only one year of observation (2002), and not considering these other potential sources of steelhead, may be missing the true picture of presence/absence.

In Table 2-1 of the SCCSRP, there is one stream for which the classification is "negative observation" which, according to the footnote means "juveniles were not observed during a spot-check of best-occurring summer habitat in 2002". Although the methods for those spot checks are not described in the SCCSRP, they are described in Boughton et al. (2005). In that report, the spot checks were described as performed by snorkeling the best-occurring habitat to observe steelhead (Boughton et al. 2005, p. 6). The methods included accounting for the likelihoods of not observing fish that were actually present and included comparison to a less rigorous method. The best-occurring habitat method appears to be sound. However, the possibility still remains that steelhead actually do occur in the stream with negative observations, or that they occur in other years (most surveys were done in one year only).

It is also important to note that Section 2.2 (p. 13, lines 12-13) does not specify how the surveys were conducted; whether the target of snorkeling surveys are adults or juveniles, or both. Because the occurrence of adults is seasonally ephemeral, it is important that such surveys be targeted to both juveniles and adults. (The fact that the surveys targeted juveniles is clear in Boughton et al (2005), but should also be stated in the SCCSRP.)

Watersheds/Populations Subject to Analysis

As it stands, it is difficult to follow all the steelhead populations through the various background reports and chapters of SCCSRP. The listing of watersheds, streams, and populations is somewhat inconsistent in places. For example, Boughton et al., (2005) Appendix B, indicates a number of documented steelhead occurrences (e.g., Corralitos, Paso Robles, Pacheco Creek and others), but then are either never mentioned in the SCCSRP or are only mentioned in the detailed SCCSRP BPG chapters or only shown on the maps. Since every present and former habitat is important in recovery, these streams should be given full consideration of how they will contribute to recovery (or not).

I recommend that there be one master table of all populations considered in the SCCSRP, perhaps in Chapter 2, Section 2.2. It should theoretically emanate from Boughton et al. (2005, 2006), although several streams never mentioned in Boughton et al, (2006) are mentioned in the SCCSRP (e.g., several tributaries to the Pajaro and Salinas rivers).
In the proposed table, the columns would include, left to right:

- All streams ever thought to have steelhead,
- Streams found to have juvenile steelhead during 2002 reconnaissance,
- BPG membership,
- Population membership (for so-called sub-watersheds (e.g., Table 8-1)).
- Core ranking (or none), and
- Whether included in the CAP process (currently in Table D-1).

Streams (rows) without occurrences in any given column would be blank.

This same nomenclature pattern should then be followed into the individual chapters for consistency.

For one example of the confusion raised due to the current inconsistency in naming and tracking streams/populations, compare the treatment of Uvas and Pacheco Creeks in the Pajarro basin. They are both listed in Boughton et al. (2005, 2006) as having steelhead present, but neither is shown in Table 2-1, nor mentioned as a core population in the SCCSRP. In Chapter 8, Uvas Creek is singled out as a stream with special emphasis, but Pacheco Creek is not (although some restoration activities are indentified for Pacheco). Why is there a difference in treatment?

Likewise, some additional confusion is raised by the mention of certain streams in the individual chapters that have never been previously identified in the background documents or the SCCSRP. Their mention implies their possible suitability for, or history of, steelhead use. For example Bodifsh and Picachos creeks are mentioned in Chapter 8, but they are not previously listed or mentioned (except Picachos is mentioned as a footnote to Table 5 in Boughton et al. 2005). Where do they fit into the scheme of past use and/or restoration? This is another case where a comprehensive table could help to track what the role of each stream/populations is going to play in restoration and recovery.

In addition, I note that a number of other streams that were formerly known to be steelhead habitat, are not considered at all as part of the recovery process. For example, Chalome, San Lorenzo, El Toro, Big Sandy, Estrella, Chualar, Pancho Rico, San Marcos, and Huehuero creeks are listed in Boughton et al. (2005, 2006) as currently dry. While steelhead obviously cannot live in dry streams, those streams have potential as future steelhead habitat, if the dewatering issues can be rectified. Dry streams should be included in the recovery strategy. The SCCSRP even supports the notion that these streams should be included in the statement: “The available information demonstrates that unoccupied areas are essential for the conservation and recovery of the species.” (p. 65, lines 3-4). The restoration potential that could be realized from resolving these water issues appears to be overlooked for the Coast Range BPG (Chapter 8). There may be similar issues in the other BPGs as well.

To help reduce confusion, the Coast Range core assignments should be designated in Table 6-1 by specific population. As it now reads (“all populations”), it is difficult to readily assess how an unknown number of populations will support each other as independent populations during recovery.

As further evidence of the potential confusion in Chapter 8, Table 8-3 refers to Core 1 populations, and lists Pajaro, Salinas, San Antonio, and Nacimiento rivers. However, other tables and figures in Chapter 8 show somewhat different populations. Because the Coast Range BPG’s core populations (1, 2, or 3) were never identified in chapters 6 or 8 (as they were for the other BPGs), and because proposed recovery activities are limited to only certain streams in the BPG, it is difficult to tell what the relative role of these and other streams are.

Existing Abundance of SCC Steelhead

The data used to make the two following statements about Carmel steelhead is now outdated.

> "Data collected since the last BRT status review indicates that the abundance of anadromous *O. mykiss* spawners in the Carmel River has increased." (p. 18, lines 32-33)
>
> "Thereafter, counts increased from a single adult reported in 1991, to 775 adults reported in 1997, with a maximum of 881 reported in 2002." (p. 18, lines 36-38)

In fact, a web search quickly found a letter from the Monterey Water Management District (http://www.mpwmd.dst.ca.us/gmletters/2009/20090508/20090508.pdf) , dated May 8, 2009 that cited San Clemente Dam counts of steelhead for 2009, and noting that "To date, there have been 95 fish counted in the San Clemente dam ladder and 21 fish counted in the Los Padres Dam trap. These counts compare to average counts of 429 and 129 fish at San Clemente Dam and Los Padres Dam, respectively, since the end of the last drought in 1991." The gist of this statement is that the counts are not increasing, as stated in the SCCSRP, but in fact are more recently decreasing again. I suggest that a more thorough and updated dam count summary would be very helpful in the SCCSRP.

Geographic Distribution

I suggest the method for assessing the geographic distribution, described on p. 18, lines 18-22, be more thoroughly described in the SCCSRP. Although the method of "field reconnaissance and spot checks (snorkel surveys)." can be determined by tracking back to (Boughton et al. 2005), it would greatly help readers of the SCCSRP if the methods were specified. Understanding whether the geographic distribution was determined via adult spawner surveys or juvenile surveys is important. (Further, Boughton et al. (2005) should be cited in that paragraph).

Threats Assessment

The conclusions represented by Table 4-1 appear to be lopsided for several reasons. First, since the Carmel watershed was treated as one stream/one population, the fact that at least one threat in every category occurred somewhere in the watershed, resulted in 100% threats throughout the Carmel, making the Carmel appear much worse than it is, relative to other watersheds. Second, the fact that some streams have been left out of the analysis in some watersheds (e.g., Pacheco Creek in the Pajarro, and numerous dry creeks in the Salinas), results in an underestimate of the extent of threats in the other three BPGs.

The CAP Workbook Process

The CAP workbook process, cited as the basis for developing threats analysis and recovery actions (p. 30-31, and described in Appendix D), could be better elucidated if Appendix D contained a complete example workbook for one watershed. Currently the reader needs to refer to separate documents to see the results, but it would be helpful to see an example of how the process worked (or not). A link to the Kier Associates and NMFS (2008) document

and the watershed workbook tables would be valuable for all reviewers and readers of the SCCSRP.

The threats assessment may be missing a valuable opportunity to rank specific threats for recovery action by not utilizing the full information obtained about threats as indicated in the following statement: "Functionally; however, we assumed that there are essentially two states for an indicator as it relates to the target: 1) "poor-fair", in which the indicator exceeds or minimally meets the requirements for species survival and the population is in danger of extirpation, and 2) "good - very good", where habitat conditions are favorable for species persistence." (Appendix D, 3rd page). Why force the process to only allow a binomial choice when, first of all it was measured in four categories, not two, and secondly the use of information in the four categories gives a better result on a gradient of outcomes that, when combined with results from all factors, actually provivdes a more realistic picture of the likelihood of survival or extirpation? This combining of information is essentially discarding good information. Furthermore, depending on where the biological, life-cycle bottlenecks are for each life history stage, the indicators may be more or less important, i.e., they should be weighted for their relative importance.

The use of landscape-scale metrics to assess the relative habitat quality, while an efficient approach that captures much of the negative influence on salmonid populations, is not always the best surrogate for all potential impacts, as implied in this excerpt: "These landscape - scale metrics were used in this threat assessment to overcome logistical and analytical problems inherent in local scale metrics of *O. mykiss* habitat quality (*e.g.*, water temperature), that exhibit extreme spatial and temporal variation, which can lead to misinterpretations." (Appendix D, 4th page, lines 4-7). If the focus of the analysis is water temperature, it is, in fact, the extremes that are important. Therefore, gauging water temperature in a number of locations (relatively easy to accomplish) would have been the preferred method to obtain empirical data on the effects of temperature on steelhead.

Overall, the CAP workbook process, as described in Appendix D, lacks sufficient detail to assess its ability to fully identify threats and the resultant recovery actions. While the basic explanation sounds reasonable, the explanation is not sufficiently thorough for this reviewer to evaluate whether the process was rigorous enough to completely elucidate threats and then support proposed recovery actions. For just one example, the abbreviated list of Key Ecological Attributes (KEAs), e.g., degraded hydrologic function, increased turbidity, presence of non - native predators, increased substrate embeddedness (Appendix D, 4th page, lines 22-31), is missing a number of other factors that have negative impacts on SCCS. There is no way to tell whether other critical factors, such as blocked access, degraded riparian areas, competitors, unstable hillsides, paved impervious surfaces, disease, and pollution are being accounted for in the CAP watershed workbooks.

As one example, it was surprising to see little reference to the effects of increased flood intensity and frequency due to increased impervious surfaces accounted for, either in the CAP workbook methods, or in the main SCCSRP text about threats to recovery. In comparison, these factors were rated as very important in the draft Central California Recovery Plan and, in fact, one of the key metrics used in that CAP workbook process was

the amount of impervious surface in watersheds, as estimated from the National Landcover Database for 23 central California watersheds (NMFS 2008).

It is difficult to track the explanation given in Appendix D (4th and 5th pages) for the workbook process and how that was used in the chapters for each BPG (Chapters 8-11). Appendix D refers to three levels of CAP workbook tables: a first "Summary of Threats" table; a second table ("Stress Matrix") that shows the rank of each stress on each life‐history stage; and a third table entitled, "Overall Viability Summary", that ranks the viability of each life‐history stage and KEA category. Appendix D goes on to describe the third table as having a composite rank of the current habitat indicators from the "Viability" table of the workbook, as well as an overall "Project Biodiversity Health Rank". However, the only four tables in each BPG chapter are the Physical and land-use characteristics, the Threat source rankings in each watershed, the Critical recovery actions for Core 1 populations, and the recovery action matrix for each watershed. There is no apparent description or discussion of how the threats, stresses and viability results from the CAP workbook tables translate into the tables seen in the BPG chapters. It would be preferable if the Workbook process described in Appendix D was easy to follow into the findings and action recommendations.

Likewise, it is difficult to track back the workbooks from within the BPG chapters. For example, the caption for **Table 8-2** says "The top five sources of stress in each watershed in the Interior Coast Range BPG (see CAP Workbooks for details)." (p. 87, lines 14-15), but there is no reference for where to actually view the CAP workbooks.

Furthermore, without a description of the CAP workbook process, the term "top five" does not make sense as used in tables 8-2, 9-2, 10-2, and 11-2. Taken literally, those tables show significantly more than five sources of stress.

The Carmel BPG, Chapter 9, seems to be under-analyzed in terms of its potential contribution to recovery. To begin with, there is very little discussion about the actual or potential use of tributaries for steelhead production, except to say that they are perennial. That fact indicates that they may have important potential for steelhead. In figure 9-1, Tularcitos Creek shows up as a potentially important tributary downstream of the lower mainstem dam (San Clemente). Yet, there is no mention of the relative importance of Tularcitos Creek. Additionally, Black Rock Creek Dam is mentioned in the text on p. 108, lines 5-6, but is never again mention, in terms of its impact on steelhead or relative to potential restoration.

Threats from Hatchery Programs

The potential threat from hatchery stocking of non-anadromous rainbow trout and other, non-game, species may be underestimated in the SCCSRP. For example, in two separate SCCSRP references there are indications that hatchery programs and/or non-native species stocking may be negatively affecting SCCS, but the effects seem to be minimized or overlooked in the SCCSRP. First are the statements from p. 28, lines 40-44: "CDFG maintains a stocking program of hatchery‐derived non-anadromous *O. mykiss* in order to support

put ‐ and ‐ take fisheries. These stockings are now generally conducted in non ‐ anadromous waters. Other non ‐ native game species, such as smallmouth bass and bullhead catfish, are often stocked into anadromous waters by a variety of public and private entities." The second statements are found on p. 36, lines 18-24: "Additionally, CDFG maintains a stocking program of hatchery ‐ derived non anadromous *O. mykiss* in order to support put ‐ and ‐ take fisheries. These stockings are now generally conducted in non ‐ anadromous waters. Other non ‐ native game species, such as smallmouth bass and bullhead catfish, are often stocked into anadromous waters by a variety of public and private entities. While some of these programs have succeeded in providing seasonal fishing opportunities, the impacts of these programs on native, naturally ‐ reproducing *O. mykiss* stocks are not well understood."

These statements raise three general, but important, concerns. First, the use of the term "generally" indicates there are some exceptions wherein non-anadromous rainbow trout are still being stocked into waters of the SCCS DPS. Furthermore, "CDFG has eliminated the stocking of hatchery cultured and reared fish in most coastal streams where steelhead have direct access from the ocean." (p. 36, lines 39-41). The specifics of these stockings should be elucidated in the SCCSRP or at least referenced to other documents.

Second, the put-and-take stocking of non-anadromous rainbow trout into waters upstream of barriers, but within the watersheds of the DPS, raises concerns about the fitness of any remaining resident rainbow trout. If these resident rainbow trout are to serve as a potential source of future steelhead, as described above, and in the SCCSRP, then they must be free of introgression from the hatchery fish, which are often less well-adapted than wild fish and which, when spawning with wild fish, can sometimes reduce the fitness of the progeny (e.g., Araki et al. 2007). Although Clemento et al. (2008) found little introgression of hatchery reared genetic signal into upstream wild *O. mykiss*, continued or increased stocking can increase the likelihood of this occurring. The SCCSRP further implies that non-anadromous "fish" (does not specify rainbow trout), are still stocked in areas above anadromous barriers: "Additionally, CDFG has eliminated the stocking of hatchery cultured and reared fish in most coastal streams where steelhead have direct access from the ocean." (P. 36, lines 39-41).

Third, and perhaps more importantly, the stocking of predators and competitors, as referred to on p. 26, lines 26-27; p. 28, line 42-44, and p. 33, lines 23-24 should also be more fully specified in the SCCSRP. Bass are well-documented to be heavy predators of juvemnile salmonids (e,g., Bonar et al. 2005). Government-sponsored programs resulting in direct mortality of steelhead, such as stocking predators, provide an excellent opportunity to make changes that can benefit SCCS recovery. For example, a search for the word "bass" only revealed five "hits" in the SCCSRP, and the only reference to bass as possible predators in a specific BPG summary was in the Chorro Creek watershed. Bass are certainly also predators in the impoundments of the other BPGs as well. In general, the effects of predators and competitors, both native and non-native, should be more fully developed in the SCCSRP.

The SCCSRP cites the practice of broodstock collection (p. 36, lines 26-27), but never describes when or where it occurs. This should be delineated, as it can have an important effect on the population in the areas where broodstock is taken.

Another topic related to the stocking of hatchery fish is the long-time practice of stocking non-native, hatchery-reared steelhead into the streams of California, as described at the top of p. 36, lines 31-41. Although this has apparently been halted, the long-term effects of intermingling hatchery with wild steelhead may still be having a negative influence on the survival rate of the remaining steelhead, as described by Araki et al. (2007). The CDFG Salmon and Steelhead Stock Management Policy directs CDFG to evaluate the stocks of each salmon and steelhead stream and classify it according to its probable genetic source and degree of integrity (McEwan and Jackson 1996, as cited in SCCSRP, P. 36, line 39). Has this been done? If so, the results, or a summary thereof, should be included, or referred to, in the SCCSRP.

Other Threats Assessment Topics

In Section 3.0 of the Factors Leading to Federal Listing, under section 3.2, about overutilization, while there is no directed commercial fishery for steelhead, it is likely that some steelhead are incidentally caught in directed salmon or other fisheries. When the numbers of individuals in a given DPS are extremely low, as they are in some of this DPS' populations, the loss of any fish to human-induced mortality could be significant. This factor needs to be more fully explored in the SCCSRP.

In the Section on Inadequacy of Existing Regulatory Mechanisms (Section 3.4) one other important element could be added to the list of non-federal regulatory mechanisms (section 3.4.2, bottom p. 27) that affect the recovery of steelhead. That is, the lack of a local recovery planning effort. For example, local, state, and tribal governments and organizations joined forces to create the Puget Sound Salmon Recovery Plan for Chinook salmon, chum salmon, and bull trout (see http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Puget-Sound/PS-Recovery-Plan.cfm). This plan was adopted by NOAA Fisheries as its final salmon recovery plan in 2007. Such unified planning at all levels of government could help SCC Steelhead recovery.

Would the percentages of the severity threat by category in Table 4-1, page 32, be different if all the "dry" streams were included, as mentioned above under the section called "Watersheds/Populations Subject to Analysis"? These former steelhead habitats should be included in the recovery strategy, so should therefore be accounted in the severity threats assessment.

In the review discussion under the subheading of Seal Level Rise (page 40, lines 19-40), no allowance is made for the potential improvements in sand barrier access due to the higher sea levels, which might contribute at least a small benefit to steelhead via improved likelihood of ingress and egress through these barriers.

In the section on Climate-Induced California Current Ecosystem Issues, pages 41-43, perhaps a sixth factor should be added: ocean acidification. Ocean acidification was alluded to in a previous section, and has the potential to severely affect biological production of prey and predator species. The effects on steelhead are unknown but should at least be speculated.

The description of the Marine Environment on pages 40-44 is very interesting, thorough, and clearly important to steelhead. However, given the extent of the description, there should be a little more tie-in to steelhead biology, eg., "…therefore steelhead survival is probably mostly related to ….".

4b. Extinction Risk Analysis and Recovery Criteria

A specific risk analysis for the SCCS DPS is not explicitly described in the SCCSRP, probably mainly because there is so little data on the present run sizes. Chapters 3 and 4 serve generally as a basis for the risk analysis, giving an overview of the factors leading to listing and the threats to recovery. However, a summary of the best available demographic information with an analysis of the likely trajectory, with and without recovery actions, would seem more fitting as an "Extinction Risk Analysis". The work in Boughton et al. (2005) apparently is more closely aligned with the idea of an "Extinction Risk Analysis" but that work is not referenced directly as such in the SCCSRP (although it probably should be).

In regard to addressing Recovery Criteria, the SCCSRP depends on "the viability criteria as recovery criteria until such time as sufficient scientific information is available to refine the criteria for assessing population and DPS viability." (p. 48, lines 29-31). The SCCSRP more directly addresses the recovery criteria than it does the extinction risk analysis, by specifying recovery thresholds at the population level for mean annual run size, population numbers under poor ocean conditions, spawner densities, and the anadromous fraction of the population. Further recovery criteria at the DPS level include biogeographic diversity and life history diversity. Details of these recovery criteria are iterated in Chapter 5 of the SCCSRP.

The remaining comments in this section are devoted to specific details about extinction risk and/or recovery criteria in the SCCSRP.

Extinction Risks

The statement that "NMFS concluded that the information available on these impacts to steelhead did not suggest that the DPS was in danger of extinction, or likely to become so in the foreseeable future, because of disease or predation." (p. 26, line 35-37) is questionable. While NMFS may have come to such a conclusion, the facts are that, although disease and predation may not be leading potential threats to extinction, several factors in this category do have negative impact on the DPS and, together with factors in the other categories, have a high potential of synergistically resulting in extinction. Once a population is at extremely low abundance, as is the case for the SCCS populations, disease or predation can have serious implications for continued existence. Since the SCC steelhead are at the southern extent of their range (Boughton et al. 2005), they would be expected to be more susceptible to temperature–related disease (e.g., Belchik et al. 2004, Stocking and Bartholomew, unknown date). Similarly, the top paragraph on page 26 should include a brief discussion of how diseases can be exacerbated by low flows and especially elevated temperatures.

In regard to predators, little is known about marine predators on steelhead, although sea lions are known predators (see . http://wdfw.wa.gov/wlm/sealions/questions.htm). Some invasive

species, such a smallmouth bass, are known freshwater predators of juvenile salmonids (e.g., Fritts and Pearsons 2006, Bonar et al. 2005), as well as kingfishers and herons (Scott and Dill 2008). As these predators increase in abundance, they have the potential to push SCCS populations toward extinction.

The effects of fishing and/or poaching may not be adequately addressed in the SCCSRP. First, in regard to angling, it is clear that there are some issues remaining regarding the effects of incidental or even directed angling on steelhead and/or resident O. mykiss in the SCC fresh waters. An example is seen in the statement: "CDFG… imposes significant angling restrictions within the anadromous waters of the South‐Central California Coast Steelhead DPS (e.g., restrictions on timing, location, and gear used for angling). However, CDFG continues to allow summer trout fishing in significant parts of the Salinas River system (i.e., upper Arroyo Seco, Nacimiento River above barriers, upper Salinas River, Salmon Creek, and the San Benito River in the Pajaro River system), with minimum size bag limits." (p. 19, lines 2-7). However, there is no way to protect juvenile or adult steelhead from possible hooking mortality while angling for resident rainbow or other species. While the SCCSRP acknowledges that action is required to "Close remaining areas currently open to angling below impassible barriers of all anadromous waters; in anadromous watersheds, assess impacts of angling on native O. mykiss above barriers which are currently impassible to upstream‐migrating steelhead", the SCCSRP does not provide any specifics about where and when these impacts are occurring. Perhaps the specifics should be addressed in each of the four BPG chapters.

Furthermore, there is no mention of the negative effects of angling (poaching) and/or harassment of adult migrants or spawners by children and dogs. Although poaching and harassment is difficult to assess, it can generally be correlated to density of urbanization and/or recreational use. In some ways, poaching and harassment is a threat that can be ameliorated, especially through educational programs and increased enforcement.

Recovery Criteria

In Table 5-1, (P. 49), it is unclear why one of the criteria is "Viable populations separated from one another by at least 68 km or as widely dispersed as possible". What is the basis for the 68 km separation? Furthermore, this does not appear to be explained in the text on p. 53, where the criteria for D.2.1, .2, and .3 are explained. I found the explanation in Boughton et al. (2007), but this needs to be clearly referenced in the SCCSRP.

The first element of the population-level recovery criteria, as described in section 5.3.1.1, (p. 50, lines 8-21), raises concerns because the annual number of target spawners per population (4,150), while recognized as precautionary, is quite unrealistic for many of the smaller watersheds, even under the very best of conditions. A review of the basis for that number in Boughton et al. (2007) reveals an admirable attempt to deal with the difficult question of identifying the population viability level in the face of almost no empirical data to estimate the "viable" population, as detailed in their Appendix A. Although the viability target of 4,150 may be unrealistically high for smaller watersheds, it is prudent to set the target high while additional data is sought over the ensuing years that can then be used in the decision tree process described by Boughton et al. (2007).

The link between the conclusions in Boughton et al. (2007) and the SCCSRP needs to be strengthened. For example, there are references in the SCCSRP (2009) to "performance based criteria" (e.g., p. 50, lines 31-32, and p. 52, lines 4-5) that, without at least a citation to Boughton et al. (2007), do not mean much in the context presented. The concepts of prescriptive and performance-based criteria should be briefly described in the opening of Section 5.3.1, or at least the terms should be defined more explicitly.

The SCCSRP states on p. 52, lines 25-26, that "However, the TRT could not find data for deriving a corresponding steelhead criterion." (for steelhead spawners per mile). One citation that may help is Gibbons et al. 1985). In that document, the authors describe the process for estimating an expectation of Puget Sound steelhead spawners based on the perceived density of "potential parr production". They then relate the estimates of parr production to the number of stream miles available. This reference, and its subsequent unpublished WDFW methodologies, may be useful to the TRT. Also, recent work has advanced the idea of assessing aquatic habitat potential for producing fish based on the intrinsic potential method (e.g. Burnett et al. 2007).

It is unclear how or why the following statements are made: "As performance‐based run‐size criteria are developed for populations within this DPS, the methods and data used to develop those values may change the ocean conditions criterion or even preclude the need for such a specific criterion. As discussed above, the magnitude and duration of poor ocean survival on the extinction risk of the population is a key factor to consider when developing the run‐size criterion." (p. 52, lines 4-6). The strategy for monitoring ocean survival described on p. 51, lines 35-42, should take precedence, because all other approaches for determining the effects of ocean survival will depend on monitoring both adult and smolt numbers to calculate respective freshwater and marine survival – there is no other known method that is more effective.

Threats Abatement Criteria

Some of the threats abatement criteria explanation (Section 5.4) is vague and somewhat difficult to follow. For example, the following text "with an additional descriptor: A) if the action addresses the first listing factor regarding the destruction or curtailment of the species' habitat, or B) if the action addresses one of the other four listing factors." (p. 54, lines 21-24) should be cross-referenced with p. 24, lines 17-22. Otherwise, the reader may not track the process because they might not remember what the "five listing factors" are.

Another example is found in the sentence: "Where the recovery action addresses both types of listing factors, the descriptor is based on the principal listing factor addressed." (p.54, lines 24-25). The term "descriptor" has never been previously defined or referred to, so has no meaning in the sentence. This makes it difficult to follow the threat abatement process.

The secondary descriptor for threats assessment does not appear to be applied according to the definition, as described in the following statement: "….with an additional descriptor: A) if the action addresses the first listing factor regarding the destruction or curtailment of the

species' habitat, or B) if the action addresses one of the other four listing factors." (p. 54, lines 21-24). Almost all the threats fall under listing factor 1 (Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range) so should be categorized under descriptor A. None of the proposed actions in the BPG chapters appear to address listing factors B though E. Yet, in the example in Table 5-2, and in all the threats assessment tables in the BPG chapters, many of the habitat-related recovery actions (Listing Factor A) are given the secondary descriptor of B. (This comment probably applies to the formerly reviewed SCSRP as well as the SCCSRP.)

The basic frame of reference for threats abatement criteria for priority 2 and 3 recovery actions is questionable. The statement: "In addition, for watershed threats with recovery actions ranked as either priority 2 or 3, the threat must be abated one level below its current threat ranking based on the analysis methodology used in the threats assessment (e.g. abate from "high" to "medium," or "medium" to "low")". (p. 55, lines 6-8), is an arbitrary criteria that may slow recovery. Abatement from high to medium may not do much good, depending on the nature of the threat.

In regard to the threat abatement rankings of the recovery actions, described in the SCCSRP (p. 55, lines 6-8), it is unclear how steelhead biology is directly incorporated into the ranking -- it seems like life history survival bottlenecks should be accounted for in the rankings. To use the example cited in the SCCSRP, Table 5-2 shows groundwater extraction rated at the 2B threat level. However, what if groundwater extraction for a given watershed was sufficiently severe, at least in some locations, to eliminate summer rearing in some years? Should not the abatement target level be "low" in cases where, due to steelhead biology, one dewatering event eliminates all possibility of survival? On the other hand, in the Roads threat category, abating the threat to medium will not likely directly kill juveniles, but more likely will contribute to sublethal stresses.

The Role of Core Populations

It is unclear how the supplemental "criteria that are specific to particular conditions NMFS believes are critical to meet the recovery goal for the species." (bottom half p. 55) are incorporated into the basic abatement criteria listed beforehand on page 52-53. The text simply lists the supplemental criteria but does not explain how these additional criteria are integrated with other criteria when recommending specific recovery actions in subsequent watershed-specific chapters. Additional explanation of the integration will be helpful.

The role of Core 2 populations in the attainment of DPS viability is somewhat vague. The tables and text could be improved for clarification. First, it is difficult to reconcile the difference between the minimum number of viable populations listed in Table 5-1 (p. 49) and the number of Core 1 populations shown in Table 6-1 (p. 59). Table 6-1 shows all populations in the Interior Coast BPG are Core 1 (but does not define which populations those are), one Core 1 population for the Carmel River BPG, three Core 1 populations in the Big Sur Coast, and four Core 1 populations for the San Luis Obispo Terrace BPG, but Table 5-1 shows four, one, three, and five minimum viable populations respectively for each of the BPGs. How can the number of minimum viable populations be attained if an insufficient number of populations within a BPG are rated as Core 1 populations, such as for the San Luis

Obispo Terrace, or possibly the Interior Coast BPG? The text on the bottom of p. 61 describes generally how Core 2 populations "must eventually meet the biological recovery criteria for populations set out in Table 5‐1".

Since the number of populations designated as Core 1 may be insufficient to meet the recovery criteria shown in Table 5-1, it would help if some number of Core 2 populations were designated as critical for attainment of full population- and DPS-level recovery (see Table 5-1). As it stands, the text at the bottom p. 61 is unclear about the critical need of, and the number of, viable Core 2 populations for attaining DPS viability. Additional clarifying language to this effect will be helpful to reduce the vagueness about the importance of Core 2 populations to recovery. Further, the unifying table suggested above in the section on *Watersheds/Populations Subject to Analysis* could also be used to clarify the role of Core 2 populations.

Additional clarification of the role of Core 3 populations will also be helpful. The statement "Finally, the complete attainment of DPS‐level biological recovery criteria may also require recovery or stabilization of populations listed as Core 3." (last line p. 55, first two lines, p. 59) should read "will" instead of "may". This is because the Core 3 populations serve as the insurance policy for the recovery of the Core 1 and 2 populations. That is, they serve as back-up for the inevitable lack of recovery of some of the Core 1 and 2 populations by providing spawner numbers and genetic resources to stray into, or to have gametes transferred from, to Core 1 or 2 populations. To support this notion, one recommendation is to reword the sentence on p. 58 (lines 9-10) to read "In the interim, the population‐level recovery criteria are proposed to apply to every core 1, 2, and 3 population." (It is noted that the middle paragraph on p. 58 (lines 12-22) addresses this issue on the role of Core 3 populations as important to recovery but only in a general way. Specific, directive language is needed to ensure action on Core 3 populations.)

The same comments apply to the summaries of critical recovery actions for each BPG (Table 8-3 and similar tables for the other BPGs). The caption specifies these actions should be undertaken for Core 1 populations, but should probably be focused on all core populations, at all three levels. After all, the prescriptions are summarized for all the core streams in the foregoing tables in each section. The same comment applies to the text on p. 88, lines 9-10 and other similar text in the other BPG chapters.

It is noted that the recovery action matrix tables (e.g., Table 8-4 and all similar tables) are incomplete and therefore somewhat difficult to fully evaluate.

4c. Evaluation of Conservation Measures

The perspective of dam modification for the purpose of avoiding extinction under ESA should be reversed from the way it is presently stated in Section 6.2, where it says "If dam modification (including removal or breaching) is determined to be technically or economically infeasible, alternative approaches for providing sustainable volitional passage of steelhead must be implemented. The selected alternative must be expected to provide ecological benefits that are similar to expected benefits from dam removal or

breaching." (p. 60, last line, P 61, lines 1-3). As it reads, decisions depend on technical and economical feasibility of removal. Rather, the focus should be on successful steelhead passage. More appropriate language would be "If passage of adults and juveniles, and associated migration survival rates, cannot mimic natural background conditions with the dams in place, and modified with appropriate passage facilities, then the dams or diversions should be removed or breached".

In the paragraph describing the fact that dams and water withdrawals are the most critical recovery actions (p. 60, lines 17-27), the focus seems to be on dams only. Although dams are the key problem, other sources of water withdrawals, including seasonal surface water diversions in small tributaries and groundwater extraction, are likely also crucial to supplying sufficient water for instream use by steelhead. Therefore, it is suggested that the statements regarding resolution of losses caused by dams be expanded to include all water uses.

Likewise, the Table 7-1section on dams and diversion is relatively silent on determining, or abating, the effects of water withdrawals and surface water diversions. This topic should be given its own line item in Table 7-1.

Black Rock Dam is not mentioned under the Carmel River in table 6-2, although it is mentioned elsewhere in the SCCSRP as a barrier to steelhead in the Carmel system.

In Table 7-1, at the bottom of p. 74 and top p. 75, I recommend addition of a line at the top of the "dams" group that would read "Evaluate all dams for specific threats to recovery" and then specify a process to do so. The reasoning for this is that several of the other "dams" categories refer to taking action on "selected" dams and therefore leave open the question of which dams should be breached, removed, laddered, or otherwise modified.

Why is the caption of Table 6-2, on implementing recovery actions, limited to Core 1 populations only? It is important that those same activities be implemented on Core 2 and 3 populations as well.

The recommendations in Table 6-2 regarding passage at dams should also include the importance of downstream migration of juveniles as well as adult upstream migration. Additionally, Table 8-3, and similar tables for all subsequent BPGs should account for remediating downstream passage where appropriate. There are numerous cases where, regardless of adult passage conditions, juveniles suffer unacceptable mortalities or delays at impoundments or dams of the approximate size as found in the SCCS region (e.g., Wunderlich et al. 1994). Additionally, there is no apparent mention in the SCCSRP of the losses of juveniles being diverted into water diversions as cited, for example, by Kjelson and Brandes (1989).

The description in Section 6.4 of population monitoring research required (p. 67, lines 40-43) should explicitly include smolt enumeration. Also, the list of research topics in lines 5-11, p. 68, should include adult and smolt enumeration. Likewise, in the section on cost-effectiveness (12.5.4), monitoring smolts could be added to annual run-size monitoring as a way to refine the assessment of responsiveness to restoration activities (p. 215, line 12).

Conservation Hatcheries

The paragraph on conservation hatcheries (p. 63, lines 12-23), under the critical recovery actions section, could be greatly improved by citing some the excellent recent work on the use and abuses of hatcheries in salmon and steelhead management and recovery (see, for example Araki et al. 2007, and http://www.hatcheryreform.us/hrp/welcome_show.action). It is also important to include initiation of a research thrust on the potential role of conservation hatcheries in rebuilding the SCCS in the list or research topics in lines 5-11, p. 68.

Recovery actions will not be sufficiently comprehensive without effective involvement from all levels of government. Therefore it is recommended that the DPS-wide recovery actions include specificity about including the various governments that affect policies impinging on the success or failure of recovery. So, for example, suggest rewording the sentence from p. 70, line 36 to read: "(1) development of new and effective implementation of current laws, policies, and regulations within local, state, federal, and tribal governments".

The notion of funding for restoration should include seeking new funding sources, initiatives, etc. to support recovery, not just prioritizing existing funding, as stated on p. 70, line 37.

Water in California is a zero-sum game, so alternative water sources are challenging to find and only create problems elsewhere. Therefore, for example, in Table 7-1, under the topic of "Relocate livestock grazing and water sources", suggest adding the phrase "…..or provide buy-outs to ranchers for their water rights and/or access" to the end of the last sentence in the Description box.

Scientists are increasingly becoming aware of the deleterious effects of pharmaceuticals and personal care products on aquatic life. For example, there is mounting, extensive evidence that sewage effluent can affect reproductive endocrine function in fish and contribute to alteration in reproductive development (e.g., Sumpter and Johnson 2005). Therefore, it is recommended that the language in the Description box, under Urban Effluents in Table 7-1, p. 78, be amended to include consideration of these presently untreated effluent constituents.

4d. Research and Monitoring Recommendations

In Section 6.4, top of page 68, there is a list of eight research needs. I suggest adding to that list the need for evaluation of the effects of groundwater extraction and off-channel diversions on instream flows.

SCCSRP Chapter 12 describes the research and monitoring in four sections: The first section reviews the viability criteria from Boughton *et al.*, (2007), the second section gives an overview of relevant research questions, which can be grouped into three distinct areas: learning how to enhance anadromy in existing *O. mykiss* populations; clarifying key uncertainties about population structure; and planning for climate change; the third section describes a framework for monitoring populations; and the fourth section describes a conceptual framework for integrating monitoring with ongoing management of the species. (pp. 184-217). Overall, the research and monitoring chapter is excellent. Only a few additional comments follow.

In regard to research on the reliability of migratory corridors, mortality at sea, and juvenile competition, as mentioned in lines 1-7, p. 190, and then discussed further on the several following pages, one suggestion is, in the short run prior to obtaining monitoring data, to create heuristic models of the likely population trajectories under various migration and mortality scenarios. The factors of migration success and at-sea mortality are, from a modeling perspective, essentially the same thing: loss of adults before spawning. However, they can be treated separately in the models to test for the separate effects. The suggested heuristic, deterministic models can be used to evaluate the relative impacts of seasonal and interannual losses caused by mortality at sea, blocked migratory access, losses due to floods, losses due to competition and/or predation on juveniles, and other factors. As additional monitoring data is gathered, the models can be refined to more accurately portray reality. Some examples of this kind of modeling are Knudsen et al. (2003) and Hamazaki (In press – presently available as a galley at http://www.fisheries.org/proofs/pse/pse.html).

Regarding the discussion of research on the role of estuarine nurseries and mainstem rearing habitats, it is likely important to include consideration of the anthropogenic impacts to these habitats. Various sources of pollution flowing into and through these systems, especially at first run-off, can have rapid deleterious effects and interact with other sources of stress to result in lethal or sublethal effects. For example, see Casillas et al. (1996).

Another approach that may help to address the issue of resident/anadromy phenotypic crossovers, as posed on p 197, would be to analyze monitoring data. Comparisons of relative abundance of resident *O. mykiss* with observed abundance of steelhead would give clues about the importance of the residents as a source for anadromy. The basic question is: Do watersheds with greater densities (numbers per area of habitat) of resident rainbows also have greater densities of steelhead in the lower watersheds. If the answer is yes, then there is likely a strong tendency for resident *O.mykiss* to feed the anadromous steelhead populations. This hypothesis would need to be controlled for other factors, such as the degree of seasonal/annual access of steelhead, presence of dams, or extent of urban development, for example, in the watershed.

In Section 12.4, another possible enumeration method is the use of a fish collection or counting facility such as a fence or weir, used extensively in Alaska, wherein all or most of the upstream migrants are counted. A floating panel weir is especially useful in streams subject to flash floods. Weirs can also be used to enhance the effectiveness of acoustic telemetry by concentrating the migrants into a smaller opening as they pass upstream. Mark and recapture methods can also be used in conjunction with weirs where flash floods may temporarily incapacitate the weir.

In addition to the research and monitoring described in Chapter 12, and discussed above, the following items should also be considered:

1) Consistent and ongoing monitoring of adult escapements and smolt emigration at semi-permanent weirs or other enumeration facilities, on as many streams as possible, are the backbone of an assessment program. Reliable adult escapement and smolt numbers allow calculation of survival rates for both the marine and freshwater components of the life

cycle. Non-lethal scale samples taken from these enumeration projects may also support age structure which will reveal life history details, and perhaps crossover rates.

2) An effort should be made to compile and summarize any existing escapement data or indices for any populations in the SCCS. For example, there is apparently some amount of enumeration data that has been collected at the San Clemente Dam, but it is not presented in the SCCSRP.

3) An important question to explore is: where do SCCS adults go in the ocean, and what do they do if their home stream is blocked? Are they subject to high mortality in the ocean, especially off California, if blocked from stream access? (Tagging and/or scale analysis could be used to study these patterns of migration and related survival rates.)

4) Further marine questions are: What are the predators on steelhead in the ocean? What are the preferred oceanic foods of California steelhead? How will potential changes in the CCE affect their growth and survival (see discussion on pages 41-43 SCCSRP (2009)? How many steelhead are being caught incidentally in salmonid or other fisheries?

5) Additional documentation of the prevalence of iteoparity (repeat spawning) in wild SCC steelhead is another research need. Most steelhead populations exhibit some amount of repeat spawning as mentioned in the life history section of the SCCSRP. This fact may be important in the estimation of the required mean annual run size for viability as discussed by Boughton et al. (2007). Accommodation of downstream migrating adult steelhead (called kelts) should also be accounted for in restoration planning, especially at dams and at the beach barriers.

6) Obtain adult carcasses wherever possible to collect genetic samples and retrieve otoliths for further age analysis and otolith microchemistry studies.

7) The effects of freshwater and estuarine predators and competitors, both native and non-native, should be more thoroughly researched, including the effects of stocking non-native predators, such as bass and bullhead.

8) Section 12.5.4 on Assessing Cost Effectiveness of Recovery Actions is excellent and should be pursued in further detail for the SCCS. Such advancements could also be applied to other salmon and steelhead recovery efforts throughout the range.

5. Summary of findings made by the CIE peer reviewer

By way of summary, I will address the question: how well did the Plan meet its own recovery objectives (p.47)? I have also inserted major recommendations where appropriate in this summary.

1. Prevent steelhead extinction by protecting existing populations and their habitats;

The SCCSRP does a good job of laying out the biological, scientific, and strategic background for protecting existing populations and their habitats, with the exceptions noted above. However, in my opinion, insufficient attention was paid to specific strategies for how the Plan will be implemented in cooperation with existing agencies and landowners, especially local governments which control so many of the land-use actions that impinge on steelhead habitat.

> ***Recommendation***: Provide specific strategies for how the SCCSRP will be implemented in cooperation with existing agencies and landowners, especially local governments which control so many of the land-use actions that impinge on steelhead habitat.

At the very low population numbers currently exhibited by these populations, it may be critical to establish emergency conservation hatchery programs immediately to begin saving biological gametes for future reintroduction and population rebuilding as habitat is further protected and restored in the future.

> ***Recommendation:*** Prioritize review of and planning for emergency conservation hatchery operations to begin saving biological gametes for future reintroduction and population rebuilding as habitat is further protected and restored in the future.

2. Maintain current distribution of steelhead and restore distribution to previously occupied areas.

The population and DPS-level strategy presented in the SCCSRP is likely to ensure current survival of the SCCS and hopefully restore the SCCS to viability, but only if NOAA Fisheries, working with all concerned agencies and other interests are successful at implementing the Plan as presented. The restoration of SCCS to all previously occupied areas may require revisiting the proposed approach to Core populations for two reasons, as noted in my review above. One, too few Core populations may have been identified for several of the BPGs. Two, the disparate level of recovery actions between Core 1, 2, and 3 populations, especially Core 3, may result in too few populations being restored to many of the previously occupied habitats. These Core 3 populations are important to the overall recovery because they are the “back-up” populations if recovery fails in some of the Core 1 and 2 populations. The recommendation for conservation hatcheries applies to this objective as well.

> ***Recommendation***: Revisit the proposed core population structure to ensure that sufficient Core 1 populations have been designated for each BPG, and that threats to Core 2 and 3 populations are sufficiently ameliorated so that SCCS will be restored to previously occupied habitats.

3. Increase abundance of steelhead to viable population levels, including the expression of all life history forms and strategies.

If all of the major recovery actions in the SCCSRP can be implemented, there is a good chance that SCC steelhead can be restored to viable population levels. However, the outcome for each population will likely depend on the interplay of 1) its current population status and habitat health, 2) the extent of human impacts on its watershed, 3) the willingness of the public and policy leaders to take the difficult and expensive actions necessary to rebuild populations in a given watershed, and 4) the degree to which current climate, and potential climate change, affects the population. Therefore, while individual populations have a good chance of achieving viability, DPS-wide viability is less likely because these four challenges are already pronounced in some portions of the DPS. The overriding question is whether the press of the human population and all its accompanying needs for land, agriculture, water, transportation, and recreation will "win" over choices that will protect and restore the SCCS.

If the recovery actions presented in the SCRP are successfully implemented then, at least in some populations, there is an excellent chance that the expression of all life history forms and strategies will also be restored.

4. Conserve existing genetic diversity and provide opportunities for interchange of genetic material between and within viable populations.

If the recovery actions presented in the SCCSRP are successfully implemented then this objective will be met. However, the dire condition of the populations and their habitats begs the question of whether the implementation will be successful, especially in the watersheds with dams that block access to the upper watersheds. The suggestion above for emergency conservation hatcheries applies to this objective as well. However, there are also risks of conservation hatcheries arising from the various effects of inbreeding and hatchery conformation, as described by Flagg and Nash (1999).

> ***Recommendation***: To conserve genetic diversity and provide opportunities for interchange of genetic material, expeditiously implement two major activities: 1) restore access to important habitats upstream of any large and/or numerous dams that block access (to allow the full expression of genetic diversity), and 2) quickly begin evaluation of the need for, and the implementation of, conservation hatcheries that include full consideration of DPS-wide genetic integrity.

5. Maintain and restore suitable habitat conditions and characteristics to support all life history stages of viable populations.

If the recovery actions presented in the SCCSRP are successfully implemented then this objective will be met. The greatest challenges, however, include whether the proposed actions can or will be implemented. In particular the removal, breaching, or laddering of major dams is essential to restoration. Another very challenging habitat issue relates to the mainstem reaches of the SCCS rivers. These streams flow through

heavily agricultural and/or urbanized areas. The combination of seasonal drying combined with the effects flash run-off, and its constituent pollutants, render these areas extremely inhospitable for steelhead. Whether these habitats can be restored to a more natural state is a major challenge.

6. Conduct research and monitoring necessary to refine and demonstrate attainment of recovery criteria.

The research and monitoring proposed in the SCCSRP will contribute greatly to the restoration of SCCS, especially implementation of routine monitoring of adult escapements and smolt migration. I have added some comments and suggestions to the proposed research which will hopefully be helpful. The biggest question is whether the proposed research will be funded.

6. Conclusions and Recommendations

Overall, the SCCSRP is well-written and contains the necessary elements to support recovery of the SCCS. I especially applaud the precautionary approaches to setting viable population levels pending development of additional information. I have provided a number of specific comments and suggestions for improvement of the SCCSRP, as presented above. The details of those recommendations will not be repeated here. As a way to present my overall conclusions and recommendations, I will address each of the reviewers' questions posed in the Terms of Reference.

Evaluate the adequacy, appropriateness and application of data used in the Plan.
1. In general, does the Plan 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 SCCSRP is based on excellent science as presented in the provided background materials (Boughton et al. 2005, 2006, 2007 and others). Much of the recent previous scientific information has been conducted by NOAA Fisheries personnel and others as cited in those documents. Most other previous science conducted to date on SCCS has been reviewed and included either in the background documents or the SCCSRP itself. However, the SCCSRP lacks citations to the Boughton et al. (2005, 2006, 2007) and other work in many places.

The SCCSRP adequately addresses climate change and ocean conditions, given the dearth of information on either of these broad and developing topics, and the speculative nature of the future effects of climate change on terrestrial, freshwater, and marine habitats.

> ***Recommendation*:** Improve the connection between the SCCSRP and background science by carefully and thoroughly citing all previous work, especially Boughton et al. (2005, 2006, 2007), wherever that work supports statements made in the SCCSRP.

2. *Where available, are opposing scientific studies or theories acknowledged and discussed?*

So little previous research, monitoring, or documentation has been conducted on SCCS, that there are apparently no opposing scientific theories regarding the SCCS.

The only opposing view that may have been missed is the possibility of a different approach for assessing and estimating viability. While I generally support the approach taken by the authors (Boughton et al. 2007), other methods could have been used, or at least discussed, such as those used by LCFRB (2004, Chapter 5 – see http://www.lcfrb.gen.wa.us/December%20Final%20%20Plans/Approved%20Recovery%20Plan/Regional%20Plan/RP%20Vol%20I%20Ch%205%20Recovery%20Goals.pdf).

> ***Recommendation***: Previous work on estimating persistence and viability should be reviewed and discussed in the SCCSRP to set the stage for the process selected for the SCCS. For one example, see the methods used by the Lower Columbia Fish Recovery Board (LCFRB 2004).

3. *Are the scientific conclusions sound and derived logically from the results?*

The work in the background documents is thorough and based on scientifically sound methods. All parts of the SCCSRP that are based on Boughton et al. (2005, 2006, 2007) are sound and follow from their results (except that they need to be more completely cited, as noted above).

One area where the SCCSRP did not follow from the results was that the CAP workbook process results were not sufficiently explained. Although the process was reasonably explained in Appendix D, there were no examples provided, or citations to the basic watershed tables, so that the reader could follow from the preliminary tables to the final action tables in the BPG chapters. There is a lack of connection between the description in Appendix D and the final Action tables in the BPG chapters.

> ***Recommendation***: The CAP workbook process, the basis for developing threats analysis and recovery actions could be better elucidated if Appendix D contained an example workbook set of workbook tables for one watershed. It would be helpful for the reader to see an example of how the process worked from beginning to end, from the Kier and Associates workbooks, to the threats tables, to the recovery action tables in the BPG chapters.

Evaluate the recommendations made in the Plan.

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?

The SCCSRP has sufficient, well-described, site-specific management actions that, when implemented, will lead to population viability and eventual delisting. The objective and measurable criteria, i.e., viability targets, which can be revised as additional information is gathered, are clearly spelled out. The restoration actions required to achieve the recovery viability targets, both at the DPS and population levels, are also listed.

However, the SCCSRP is incomplete in several respects. First, the SCCSRP did not fully estimate persistence with and without management actions, as described further below. Second, parts of the Action Plan are missing. For example, the recovery action matrix tables (e.g., Table 8-4 and all similar tables) are incomplete, therefore somewhat difficult to evaluate. They lack the information on time and costs of actions, as required under section 4(f)(1)(b) of ESA. The SCCSRP states up front, on page vii, that "An implementation schedule describing time frames and costs associated with individual recovery actions is under development. Estimating total cost to recovery is much more challenging, if not impossible to estimate for a variety of reasons". Appendix F, at the end of the SCCSRP, "Habitat Restoration Cost References for Salmon Recovery Planning", describes a basis for estimating costs by project type but does not address the SCCS recovery costs directly at all.

> ***Recommendation***: The missing components of the SCCSRP should be completed, particularly the sections on time and costs of the recovery actions.

2. Is there a clear presentation of the species' extinction risk, the threats facing the species and the necessary actions to remove or reduce those threats such that recovery goals can be achieved?

The threats facing the species and the necessary actions to remove or reduce those threats are clearly described in the SCCSRP such that, if the actions are implemented, the extinction risk will be greatly reduced.

However, the SCCSRP needs additional work on the likelihood of persistence both without and with action. As it stands, the "Extinction Risk Analysis" in the current report is only vaguely identifiable as such. The likelihood (e.g. probability) that this DPS will go extinct, with or without recovery actions, remains unexplored. A good example of evaluating the likelihood of persistence is demonstrated by LCFRB (2004, Chapter 5).

> ***Recommendation***: A more detailed analysis of the SCCS extinction risk should be included in the SCCSRP, so that decision-makers will be apprised of the likelihood of extinction, depending on whether the restoration actions are implemented.

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.

Yes, with the exceptions noted throughout this review.

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

The research and monitoring recommendations made in the SCCSRP were excellent. I have added some additional recommendations under that topic above.

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Appendices

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Appendix 2. Statement of Work

Attachment A: Statement of Work for Dr. Eric Knudsen

External Independent Peer Review by the Center for Independent Experts

South-Central California Coast Steelhead 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 to provide external expertise through the Center for Independent Experts (CIE) to conduct impartial and independent peer reviews of NMFS scientific projects and to participate in resource assessments involving NMFS. The Statement of Work (SoW) described herein was established by the NMFS Contracting Officer's Technical Representative (COTR) and CIE based on the resource assessment requirements submitted by NMFS Project Contact. CIE appointees are selected by the CIE Coordination Team and Steering Committee to conduct the peer review of NMFS science and to participate in resources assessments with project specific Terms of Reference (ToRs). The CIE appointee shall produce a CIE independent report of the appointee's involvement with specific format and content requirements (**Annex 1**). This SoW describes the CIE appointee's work tasks and deliverables related to the following NMFS resource assessment project.

Further information on the CIE peer review process can be obtained at the CIE website via: http://www.iexperts.gogax.com/index.html.

Project Background: The Endangered Species Act (ESA) requires NOAA's National Marine Fisheries Service (NMFS) to develop and implement recovery plans for the conservation of threatened and endangered species. The threatened South-Central California Distinct Population Segment (DPS) of steelhead occur in an area extending from the Pajaro River south to, but not including, the Santa Maria River. The geographic area of this DPS contains a series of large river basins that extend inland considerable distances and short coastal systems, some with within urbanized areas. The draft recovery plan serves as a guideline for achieving recovery goals by describing the watersheds and recovery actions 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 south-central California steelhead is expected to generate substantial interest from outside parties because it: (1) will contain recommendations involving water supplies for a variety of municipalities and agricultural users in an area of low annual rainfall; (2) will prioritize watersheds for targeted restoration actions; (3) could influence local and regional planning efforts and decisions involving land-development patterns; and (4) advise state agencies and local governments on actions necessary to further improve land-use and water-management practices to protect the listed species and its freshwater habitats. The draft recovery plan will include a large geographic area in southern

California and has the potential for wide-ranging implications in the public and private sectors. Stakeholder interest will be high due to the potential impact to millions of south-central Californians and is expected to lead to inquiries from elected representatives at the local, state and Federal levels.

Requirements for CIE Reviewers: CIE shall provide three CIE reviewers to conduct a desk peer review (i.e., without travel requirement) of NMFS Draft South-Central California Coast Steelhead Recovery Plan 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 south-central California. The desk review will be conducted in accordance with the ToRs, SoW tasks, and schedule of milestones and deliverables as described herein. The location of the peer review does not need to occur on site. Draft documents can be mailed to reviewers.

Each reviewer's duties shall not exceed a maximum of ten work days. Each reviewer shall analyze the relevant Technical Memoranda developed by NMFS Technical Review Team (TRT) for the South-Central/Southern California Coast Steelhead Recovery Planning Domain as well as the draft Southern California Coast Steelhead Recovery Plan and develop a detailed report in response to the ToR (Annex 1). The reviewers shall conduct their analyses and writing duties from their primary locations. Each written report is to be based on the individual reviewer's findings. See Annex II for details on the report outline.

CIE reviewers shall have expertise in steelhead management, conservation biology, steelhead restoration practices, steelhead/water management, and steelhead conservation under the ESA. Additionally, because of the many unique physical/hydrological aspects of habitat at the southern extent of the species range and the special adaptations of the species to this habitat, it is important that peer reviewers have familiarity with south-central California steelhead biology and conservation issues. NMFS requests the review be conducted by reviewers with strong credentials in west coast steelhead management activities under the Endangered Species Act.

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 ToR as stated herein (refer to the ToR in Annex 1).

Statement of Tasks for CIE Reviewers: The CIE reviewers shall be required to complete the following four tasks: Task 1 - conduct necessary preparations prior to the peer review; Task 2 - conduct the peer review; Task 3 – prepare independent CIE peer review draft reports in accordance with the ToR and milestone dates as specified in the Schedule section; and, Task 4 – Revise draft reports to produce final reports in accordance with the ToR and milestone dates as specified in the Schedule section. Each task is described more fully below.

<u>Task 1 - Necessary Preparation Prior to the Peer Review</u>: 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.

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 background documents for the actual peer review.

This list of background documents may be updated up to two weeks before the peer review. Any delays in submission of background 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 background documents that are delivered to them in accordance to the SoW scheduled deadlines specified herein.

Task 2 - Conduct the Peer Review: The reviewers shall conduct their analyses and writing duties from their primary locations as a "desk" review. Each written report is to be based on the individual reviewer's findings and no consensus report shall be accepted.

The primary role of the CIE reviewer is to conduct an impartial peer review in accordance to the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service (NMFS) management decisions (refer to the ToR in Annex 1).

The ToR for the CIE peer review is attached to the SoW as Annex 1. Up to two weeks before the peer review, the ToR may be updated with minor modifications 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. Please see Annex 1 attached.

Task 3 - Prepare Independent CIE Peer Review Draft Reports: The primary deliverable of the SoW is each CIE reviewer shall complete and submit an independent CIE peer review report in accordance with the ToR, and this report shall be formatted as specified in the attached Annex 2.

Task 4 - Revise Draft Reports to Produce Final Reports: Following a review of their reports by the CIE technical team, reviewers will revise their draft reports, to produce written final reports. Reviewers will submit their final reports to the CIE.

Schedule of Milestones and Deliverables: The CIE review and milestones shall be conducted in accordance with the dates below.

10 July 2009	CIE shall provide the COTR with the CIE reviewer contact information, which will then be sent to the Project Contact
17 July 2009	The Project Contact will send the CIE Reviewers the pre-review documents
17-31 July 2009	Each reviewer shall conduct an independent peer review

31 July 2009	Each reviewer shall submit an independent peer review report to the CIE
14 August 2009	CIE shall submit draft independent peer review reports to the COTRs
21 August 2009	The COTRs will distribute the final CIE reports to the Project Contact

Acceptance of Deliverables: 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 2. The report shall be sent to Manoj Shivlani, CIE lead coordinator, via shivlanim@bellsouth.net and to Dr. David Die, CIE regional coordinator, via ddie@rsmas.miami.edu . Upon review and acceptance of the CIE reports by the CIE, the CIE shall send via e-mail the CIE reports to the COTR (William Michaels William.Michaels@noaa.gov) at the NMFS Office of Science and Technology by the date in the Schedule of Milestones and 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 any 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:

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ANNEX 1

Terms of Reference

CIE Peer Review of California's South-Central California Coast Steelhead 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 five NMFS Science Center Technical Memoranda that form the biological framework for the recovery plan. 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
- Viability Criteria
- Contraction of the southern range limit for anadromous Oncorhynchus mykiss
- Recent efforts to monitor anadromous Oncorhynchus species in the California coastal region: a compilation of metadata
- Potential steelhead over-summering habitat in the South-Central/Southern California Coast Recovery Domain: maps based on the envelope method

In addition, other important references include
- 2006 (2007 Updates) NMFS Interim Recovery Planning Guidance
- Endangered Species Act (http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf)
- Derek Girman and J. C. Garza. (2006) Population structure and ancestry of O. mykiss populations in South-Central California based on genetic analysis of microsatellite data. 33pp.
- Garza, J. C., and A. C. Clemento. (2008) Population genetic structure of */Oncorhynchus mykiss/* in the Santa Ynez River, California. 55pp.

CIE Peer Reviewer Questions:

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

1. In general, does the Plan 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?
2. Where available, are opposing scientific studies or theories acknowledged and discussed?
3. Are the scientific conclusions sound and derived logically from the results?

Evaluate the recommendations made in the Plan.

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. Is there a clear presentation of the species' extinction risk, the threats facing the species and the necessary actions to remove or reduce those threats such that recovery goals can be achieved?

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

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 Recovery Plan (as outlined in the table of contents in the Recovery Plan)

4. Review of the Findings made in the Recovery Plan
    a. DPS considerations: Populations, Habitats and Threats
    b. Extinction Risk Analysis and Recovery Criteria
    c. Evaluation of Conservation Measures
    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