

**An Evaluation of the 'Draft Recovery Plan for the Sacramento River Winter-Run and Central Valley Spring-Run Chinook Salmon Evolutionarily Significant Units (ESUs) and Central Valley Steelhead Distinct Population Segment (DPS)'
Oct 7-20, 2008**

By

**T.L. Marshall
CIE Reviewer
Pictou, NS Canada
November 17, 2008**

Table of Contents

Table of Contents	2
Executive Summary	3
Background	5
Description of Review Activities	6
Summary of Findings (ToRs and responses)	6
ToR 1. Fundamental Questions for the CIE Reviewers	6
ToR 2. Question Regarding Use and Application of the Technical Recovery Team Reports	9
ToR 3. Question Regarding the Threats Assessment Process	10
ToR 4. Question Regarding the Conservation Assessment Process	14
ToR 5. Question Regarding the Recovery Strategy	14
ToR 6. Question Regarding Monitoring and Adaptive Management	17
Conclusions/ Recommendations	18
Appendix A: Bibliography of Materials Reviewed	20
Appendix B: Statement of Work for Dr. Larry Marshall	22

Executive Summary

An Evaluation of the ‘Draft Recovery Plan for the Sacramento River Winter-Run and Central Valley Spring-Run Chinook Salmon Evolutionarily Significant Units (ESUs) and Central Valley Steelhead Distinct Population Segment (DPS)’ was conducted from October 7-20, 2008. Supporting documents included: i) Appendices on each of threats assessment, recovery actions, and cost references; ii) stressor matrices for the ESUs and DPS; iii) three separate supporting documents emanating from the Recovery Team, and iv) the NMFS ‘Interim Endangered and Threatened Species Recovery Planning Guidance, Version 1.2’.

The evaluation involved the development of responses to 22 questions outlined in the Terms of Reference, and summary conclusions and recommendations. For the most part, the ‘Draft Recovery Plan’ conforms to the outline and structure recommended within the ‘Planning Guidance’ document (NMFS 2007).

In addressing the Terms of Reference, the following concerns were noted:

- Two of the three minimum requirements of 4(f)(1)(b) of ESA, i.e., ‘objective measurable criteria’, and ‘time required and costs’ were limited or absent;
- Hook-and-release fishing mortality was not considered a threat;
- The differences between viability and recovery criteria were not extremely clear;
- An explicit analysis of threats is not well discussed in terms of the five listing factors;
- The recovery actions are largely contained in Appendix A and are mostly without explicit measurable outcomes;
- The threats assessment methodology lacks a discussion on the potential implications of uncertainty in the estimates of the ‘Overall stressor categories’;
- Uncertainties related to the threat assessment, i.e., probability that various recovery actions would be effective, are not provided;
- The ‘Draft Recovery Plan’ does not provide a clear assessment of the effectiveness of conservation measures taken to date;
- There is need to bring forward more of the discussion re: large-scale environmental perturbations and the possibility that climate change has the potential to marginalize persistence efforts;
- The links between human activities, effects on habitat, effects on individual fish and expected response of populations (admittedly a monumental task) are not clearly described; and,
- Monitoring for assessment of progress/ evaluation of the Recovery Strategy is discussed in general rather than specific terms.

Recommendations include:

- Review the potential for providing better measurability for objective recovery criteria;

- Ensure that the time required and cost forecasts are transparent and linked to both the near term and long-term ‘directional’ approaches;
- Include a statement justifying the absence of hook-and-release fishing as a stressor;
- Be more generous in the inclusion of Lindley et al. (2004, 2006, and 2007) in all aspects of the ‘Draft Recovery Plan’;
- Consider the inclusion of a ‘Glossary’, given that the report is complex and needs to be written in ‘Plain language’ that clearly explains to the public what the government requires or recommends (NMFS 2007). Many terms by nature must be technical, but a glossary can be an efficient de-coder;
- Ensure that the ‘threats assessment’ in the ‘Background’ section is linked to the five Listing Factors;
- Consider greater inclusion of excerpts from Lindley et al. (2007) regarding uncertainties of the effects of climate change and possibly, interject observations on recent perturbations that may have already impacted recovery actions;
- Indicate why gene banking is not considered as a potential recovery action;
- Indicate why ‘juvenile rearing’ and ‘out-migration’ needn’t be separate life stages (esp. for steelhead) and why one wouldn’t consider separately, sub adult (post smolt) and adult ocean life stages;
- Consider including a statement regarding the absence of concern about uncertainty in the derivation of the normalized weights used in determining ‘Overall stressor categories’;
- Consider the development of a framework (if not already in the Implementation Plan) that summarizes the effectiveness of recovery actions (see ToR 4A for headers);
- Consider the inclusion of an ‘Expected response’ (to recovery action) column in the tables of Appendix B; and,
- Consider the affixing of the stressor category(s) to the ‘species’ listed in the first column of Tables 2-1 to 2-8.

Background

There are 10 Evolutionarily Significant Units/Distinct Population Segments (ESUs/DPSs) of salmon and steelhead in California listed as Federally endangered or threatened under the ESA. They are organized into four geographic recovery domains. Each recovery domain contains one or more salmon and steelhead ESU/DPS, and (1) a Science Center led Technical Recovery Team responsible for developing historical population structure and population viability goals for the recovery plan, and identifying research and monitoring needs; and (2) a recovery coordinator responsible for facilitating the development of a recovery plan for the domain.

The Sacramento River winter-run and Central Valley spring-run Chinook salmon ESUs and the Central Valley steelhead DPS are located within California's Central Valley Recovery Domain. One multi-species plan for this domain is being developed for these three salmonid species. The final plan will be a multi-species recovery plan that will be a compendium of data and information that can be utilized on a watershed basis where species ranges overlap. The rationale for developing a multi-species recovery plan is that, although some research suggests that multi-species plans may lack the species specific information needed for delisting, in California's Central Valley, water management operations and habitat restoration efforts must be responsive to multiple species' requirements that over-lap in time and space. Individual species specific information is being developed for compilation into the multi-species plan to ensure species specific needs are adequately addressed in terms of the viability criteria and habitat needs, but also to identify potential conflicts between salmonid species as well as areas of over-lap or cross-species benefits.

The California Central Valley Domain Recovery Plan builds from the NMFS Southwest Fisheries Science Center Technical Recovery Team (TRT) ESU/DPS reports and a threats assessment (included as an appendix in the draft recovery plan). The TRT reports outline the historical population structure and draft viability criteria to be considered in recovery planning.

The purpose of this review is to evaluate and comment on the Draft Recovery Plan for the Sacramento River Winter-Run and Central Valley Spring-Run Chinook Salmon Evolutionarily Significant Units (ESUs) and Central Valley Steelhead Distinct Population Segment (DPS) with a focus on the principal elements required in a recovery plan. These principal elements have been defined in section 4(f)(1) of the federal Endangered Species Act (ESA) and sections 1.1 and 1.2 of the National Marine Fisheries Service Interim Recovery Planning Guidance (NMFS 2006)

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

- a description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species;
- objective, measurable criteria which, when met, would result in a determination...that the species be removed from the list; and,

- estimates of the time required and the cost to carry out those measures needed to achieve the plan’s goal and to achieve intermediate steps toward that goal.”

From section 1.1, a recovery plan should:

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

Description of Review Activities

The ‘Draft Recovery Plan for the Sacramento River Winter-Run and Central Valley Spring-Run Chinook Salmon Evolutionarily Significant Units (ESUs) and Central Valley Steelhead Distinct Population Segment (DPS)’ (NMFS 2008) was reviewed in accordance with the ToRs. Reading of the ‘Draft Recovery Plan’ began with the ‘Literature Cited’ section in the belief that the attention to detail, or lack thereof, in this area of a report (see critique ToR 1D) sometimes reflects the quality of the report itself. A general familiarization with hard copies of the framework, contents and eventually, inclusion of spot sampling of the various appendices, attachments and background information ensued. This process took place over the course of the first week. A casual purview of the ToRs and difficulty in finding simple responses to many questions did suggest however, that the review would be challenging.

The framing of this report and consideration of the actual ToRs began on Oct 13 and continued until submission.

Summary of Findings (ToRs and responses)

ToR 1. Fundamental Questions for the CIE Reviewers

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

Site-specific recovery actions addressing important threats to each of the listed species are included in Appendix B. As part of the recovery planning process, the Central Valley Domain Technical Recovery Team developed objective measurable delisting criteria, which are included and described in the Draft Recovery Plan starting on page 70. Information related to the time and cost of species recovery is included in the Draft Recovery Plan starting on page 96. Additionally, an implementation schedule with specific details regarding the cost and time frames associated with recovery actions is in development and will be included in the a subsequent draft of the Recovery Plan.

Response: The current offering does not meet the minimum requirements of section 4(f)(1)(b) of ESA, i.e., “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."

'**Site-specific management actions**' are well described in Appendix B, Tables 2.1 through 2.8. The tables appear well organized/ prioritized, i.e., focusing on: the 'Very High' and 'High' threats/ stressor quartiles; benefit to multiple species/ populations; an ascending order of geographic prioritization beginning with the Delta and progressing up river; ascending species priority number etc. The information is cross referenced so that the relationship between prioritized threats, recovery actions, threat abatement recovery criteria (VSP parameters A, P, S, D, p. 54) and specific threat abatement (biological recovery) criteria goals addressed by the recovery actions can be tracked.

'**Objective measurable recovery criteria**' are described in pp. 73-77. The 'Draft Recovery Plan' 'establishes some objective, measurable criteria specific to both population demographics and threat abatement' but contends that it is 'not possible to provide measurable criteria for *all* demographic and threat based factors'. Hence, for immediate de-listing purposes the authors propose the use of some qualitative criteria. However, the authors do suggest that with implementation of the Draft Recovery Plan, 'additional information will become available that will increase certainty about whether the threats have been abated', and additionally, the criteria will be reviewed during the proposed 5- and 10- year status reviews. Based on cases appended to NMFS (2007), it is suggested that the absence of some measurable criteria may provide grounds for opponents of the 'Plan' to oppose it before the Courts.

The '**time required and the cost**' are not as yet included in the Plan (p. 97). 'An implementation schedule describing time frames and costs (presumably based on Appendix C) associated with individual recovery actions is under development and will be included in the public 'Draft Recovery Plan'. Estimates of near-term (1-5 years) total costs associated with recovery will be available once the implementation schedule is completed'. The authors further suggest that recovery could take '50-100 years' and that costs beyond a five or 10 year window 'becomes increasingly imprecise', i.e., they are reluctant to provide guidance re: costs to "achieve the goal'. In light of the potential adverse impacts of climate change and the increasing competition for water over the next 50-100 years, it is hoped that the Plan will be as transparent as possible regarding the spending of potentially large sums of public resources with little certainty that recovery will be achieved. Hence it might be prudent to indicate what realistic objectives can be met near term (prevent extinction and lead to persistence) and long term (actions to reclassify the listing/ de-list) at what range of present day costs.

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

The biology and life history of all three listed species are described in both the Background section of the Draft Recovery Plan and in the Life History and Biological Requirements section of Appendix A. The threats to each listed species are described in detail in Appendix A, and prioritized lists of life stage-specific threats to the winter-run Chinook salmon ESU, the spring-run Chinook salmon ESU, and the steelhead DPS are presented in Attachments A, B, and C, respectively.

Response: The recovery plan does delineate those aspects of the species biology, life history, and threats that are pertinent to its endangerment and recovery. The biology and life history of the Chinook ESUs and steelhead DPS are well delineated in both the ‘Background’ section of the ‘Draft Recovery Plan’ and in the ‘Life History and Biological Requirements’ section of Appendix A. The listed threats are numerous, broad ranging and should be relatively complete given the summed depth of the broadly based Recovery Teams, their grass roots constituents, a dozen or more ecosystem and/ or anadromous fish enhancement plans for the Central Valley and two recent recovery planning workshops. (Interestingly, I did not find inclusion of hook-and-release fishing among the stressors). It is undoubtedly the breadth of threats, and the fact that steelhead and winter- and spring-run Chinook salmon at various life stages are exposed to many of the same threats that led to the development/ application of a prioritized strategy (ToR 1C below) intended to maximize recovery advantage for the Chinook ESUs and steelhead DPS in the Central Valley.

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

The recovery strategy has a foundation based on the hierarchical organization presented in Figure 1. Threats (see Appendix A and Attachments A,B, and C) to specific life stages and associated habitats were identified and prioritized at the population and diversity group (population groupings based on climatological, hydrological, and geological characteristics) scales. Recovery actions which link to specific threats were developed and are presented in Appendix B. The recovery strategy also includes biological recovery criteria for the population, diversity group, and ESU/DPS scale. ...

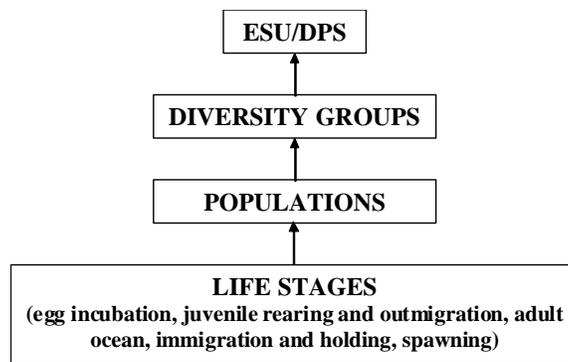


Figure 1. Conceptual model of the hierarchical structure of organizational levels used in the recovery plan.

Response: The strategy to achieve recovery, Figure 1 (above), is logical and relevant to habitats, life stages, populations, diversity groups and the overall ESU/DPS. The equally noteworthy strategy is the prioritization of the threats/ stressors within each ESU or DPS and the effort to prioritize threats/ recovery actions by geographic location for delineation of benefits to multiple species and populations. I found it surprising that this hierarchical structure and approach to prioritization of threats appears to be unique and for this the authors deserve credit.

D. Is the recovery plan grounded in a clearly articulated and biologically meaningful conceptual framework? Does the plan use best available scientific information? If better data or analyses are available, please identify. The recovery plan framework utilizes the viable salmonid populations concept (McElhany et al. 2000) to help guide the recovery process, including the development of recovery actions and recovery criteria.

Response: The ‘Draft Recovery Plan’ appears to be grounded in a clearly articulated and biologically meaningful conceptual framework. The use of ‘best available scientific information’, at least to a reviewer at arms length, was difficult to evaluate. However it was noted that almost one-half of the Literature Cited within the ‘Review Draft Recovery Plan’ was comprised of CALFED, CDFG, DWR, Federal Register, NMFS and Lindley et al. documents, most of which have high relevance to the status of biological, chemical and physical components of the Central Valley. These and a good proportion of the remaining references presumably provide the best and most up-to-date scientific information available although it is noted that of the individually authored articles only one in three were published in 2003 or later.

The analytical evaluation of viable populations is dependent on the method of McElhany et al. 2000 (Appendix A) with no reference to possible shifts in the approach, e.g., McElhany et al. 2006. However, the contribution by Lindley to the recent article comparing the viability criteria developed for management of ESA-listed Pacific salmon and steelhead (Busch et al. 2008) suggested that the best available analyses had been considered.

During the above analyses, shortcomings and inconsistencies were noted in the ‘Literature Cited’ section of the ‘Draft Recovery Plan’. Foremost and possibly germane to the use of McElhany et al. (2000) was the absence of the NMFS 2005a and 2005b (p. 68) citations. Additional items of note were the somewhat unconventional style (capitalization of all words in titles and use of ‘in’), inconsistencies in abbreviated journal names, reports and volumes, lower/upper case beginnings for species and subspecies names, punctuation, incomplete citations and errors in citation (e.g., Kjelson et al. 2006 is about ‘fall run’ Chinook salmon). Absence of attention to detail was less obvious in the remainder of the report.

ToR 2. Question Regarding Use and Application of the Technical Recovery Team Reports

A. Are the outputs from the historical population structure and population viability criteria described, and applied, appropriately? Information for the Technical Recovery

Team reports regarding historical population structure (Lindley et al. 2004; 2006) and population viability criteria (Lindley et al. 2007) was included in the Draft Recovery Plan.

Response: The outputs from the historical population structure and population viability criteria Lindley et al. (2004; 2006 and 2007) are the corner stones of the ‘Draft Recovery Plan’. Text for the historical population structure and population viability criteria were taken directly from those reports and applied, appropriately. All too frequently, however, I found myself retuning to the original reports to gain full understanding from the text that had been omitted.

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

Response: I did not find the plan to be clear about the differences between viability criteria and recovery criteria. A ‘word search’ of the document (not totally reliable within pdf files) revealed one usage of ‘population viability criteria’ and only a few references explicitly to the term ‘recovery criteria’ e.g., p. 73. I cannot find where the term ‘biological recovery criteria’ is identified as being synonymous to ‘viability criteria’ (?). “Criteria” are defined (NMFS 2007) (more simply than in the text of the ‘Draft Recovery Plan’) as values by which it is determined that an objective has been reached. Outside of the biological recovery criteria, Tables 6 and 7, there are few quantitative ‘values’ that relate to threat abatement in the ‘Recovery Goals, Objectives and Criteria’ section.

A practical solution (which I had earlier sought with respect to the terms ‘threat’ and ‘stressor’) which I recognize is not mandatory in a Recovery Document (NMFS 2007) could be the inclusion of a ‘glossary’ such as the NMFWS ‘ESA Recovery Planning for Salmon and Steelhead in the Willamette and Lower Columbia River Basins – Status of Planning Effort and Strategy for Completing Plans’ (Dec 2005). Therein, are definitions of terms including those for ‘viability criteria’ ‘viable salmonid population (VSP)’ [and their linkage] and as well, ‘threat’.

ToR 3. Question Regarding the Threats Assessment Process

A. Is there an explicit analysis of threats discussed in terms of the five listing factors (e.g., threats)? Does the plan provide continuity between new threats and changes to threats identified in the listing rule since publication? Species specific descriptions of threats related to the five listing factors are provided in the Background section of the Draft Recovery Plan.

Response: An explicit analysis of threats discussed in terms of the five listing factors does not occur per se in the ‘Draft Recovery Plan’. The elements for the discussion however are contained in the ‘Background’-‘Reasons for Listing/Threats Assessment’ section where discussion refers to ‘factors that have contributed to the decline’ (starting p. 19, 34, and 49 for each of winter- and spring-run Chinook and steelhead). The caption on each of pp. 19, 34, and 49, suggests that the ‘factors’ are “listing factors” but are rather I think, ‘criterion’ within each of the five listing factors (p. 77 onwards). The issue could be readily addressed by organizing the existing text around the five Listing factors.

The text itself, (p. 19, 34, and 49) with Appendix A, provides both a fair discussion of threats, and continuity between new threats and changes to threats identified in the listing rule since publication. The text in Appendix A is appropriately headed by the ESA listing factors.

B. Does the plan contain a fair assessment, and prioritization, of conditions, stresses and sources of stresses? The threats assessment methodology and results are presented in Appendix A.

Response: Yes, the plan would appear to contain a fair assessment, and prioritization, of conditions, stresses and sources of stresses. It is based on information garnered from 360 literature citations, most of which relate to biological physical and chemical characteristics of the Central Valley and its water courses, salmonid approaches to and from the Pacific, patterns of marine migration, public workshops and available technical expertise. The organization of the text for each ESU/ DPS is hierarchical, dealing first with non-life stage-specific threats and stressors, followed by life-stage threats and stressors relevant from the Bays to the headwaters/ individual rivers and finally, threats and stressors during sub-adult and adult ocean residence. The threat assessment matrices also follow a hierarchical arrangement such that stressors within each diversity group and population in an ESU/DPS are prioritized on the basis of diversity group (equal weight), population, life stage, primary and specific stressors. The approach, if weighted appropriately by the expert opinions, appears well fit to identifying stressors common to the Chinook ESUs and steelhead DPS, and identification of those stressors which when addressed will maximize benefits across ESUs/DPS and populations.

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

Response: Yes, other factors are considered for each threat and its source such as scope, severity, frequency, magnitude, etc. per NMFS (2007). The literature, workshops and local expertise provided many qualifiers to the threats/stressors which are included in the text (Appendix A). Qualifiers include 'effort is negligible', 'majority of salmon have already migrated' (prior to high water temperature), 'not well understood', 'not substantially affected' etc. These qualitative indices were considered within the context of scope, severity, magnitude, frequency, immediacy and persistence in the development of 'weights' applied to primary and specific stressors (Appendix A).

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

Response: The threats assessment appears to be reasonably objective in so far as it deals with current threats. The less quantifiable future events, e.g., climate change in the Central Valley and at sea, water extractions, and urbanization (and associated ancillary threats), are not prominent in the assessment although considered (climate change) to some extent in the text. As previously mentioned hook-and-release fishing was not included in the stressor matrices.

E. Does the plan explicitly identify threats and track, through objective measurable criteria, how each threat will be reduced or ameliorated, through site-specific management actions? Are these final threats linked to the five listing factors for this ESU? Threats abatement criteria were developed and are described in the Recovery Goals, Objectives and Criteria section of the Draft Recovery Plan. The relationship between recovery actions and threat abatement goals and criteria is described in Appendix B.

Response: Yes, the plan explicitly identifies threats and tracks how each threat will be reduced or ameliorated, through site-specific management actions, i.e., threats identified in Appendix A and prioritized in attachments A, B, and C are tracked into the Recovery Actions (Appendix B) where they are cross referenced to ‘viability parameters addressed’, ‘biological recovery criteria addressed’, ‘threat abatement recovery criteria addressed’ and in turn linked back to the five listing factors and criterion and sub criterion proposed to address the listing factors pp 77-82 in the ‘Draft Recovery Document’.

The recovery actions proposed in Appendix B do have measurable, but not always meaningful objectives, and are certainly without explicit near-term measurable outcomes. Some objectives can be more meaningfully measured than others, e.g., “reduce the export/ inflow ratio water control standard in the Delta from 65 percent to 35 percent in January in order...”, “curtail further development” (did/ did not?), ‘restore a continuous 85-mile stretch of riparian habitat of an appropriate width to maintain...’ (did/ did not?), increase monitoring and enforcement (did/ did not, but by how much to have an affect?), ‘promote native riparian species’ (did/ did not, but by how much to have an affect?), ‘improve near-shore refuge cover’ (did/did not, but by how much to have an affect, etc.

One management action that did not appear to be considered (a seemingly routine topic of discussion on the Pacific coast) was that of gene banking/ live gene banking O’Reilly and Doyle (2007). Such an action based in one or more of the existing hatcheries could address concerns re: adverse effects of existing hatchery practices and preservation of genetic diversity.

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

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

Response: Except for the absence of a measure of uncertainty in the ‘Normalized composite weight’, the ‘Threats Assessment’ protocol/methodology employed for assessing salmonid threats is effective in reducing population, life stage, primary and

specific stressor parameters to ‘normalized weights’ and ultimately, one of four ranked ‘stressor categories’.

The scoring and rankings in the matrices appear to be logical (albeit with weights based on informed opinion), and the habitat types appear to be mostly inclusive although I’m not sure that ‘Ocean’ gets full credit as habitat. The linkages between habitat types and life stages do on the surface appear to be correct and relatively complete, although within life stages I wonder about the possibility of separating ‘juvenile rearing’ and ‘out-migration’ - most important for steelhead, and the addition of the sub adult (post smolt?) and adult ocean stage to account for changes in marine survival. The protocol for threats assessment would seem to have a good likelihood of correctly identifying the dominant stressors for each population. The ‘correct’ identification of dominant stressors however has been aided by the reduction of the composite normalized weights into quartiles, only the top two of which are carried forward. I don’t know if a simple Bayes algorithm, frequently incorporated into Excel routines for expressing probabilities would in the end have contributed to a much different fall-out of stressors in the ‘Very High’ or ‘High’ categories....perhaps this is of minor consequence. However, what might be important with respect to eventual implementation of the ‘Plan’, are estimates of the relative probabilities that the various recovery actions addressing the stressors would be effective in contributing to the objectives and goals of the ‘Draft Recovery Plan’.

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

Response: Threat abatement criteria are, described and listed pp. 75-82. ‘Uncertainties’ are expressed with respect to only climate change, foremost in Lindley et al. (2007), somewhat in Appendix A, pp. 2-21 – 2-22, and to a lesser extent in the ‘Draft Recovery Strategy’ and ‘Recovery Actions’. I could find no acknowledgment in the ‘Threats Assessment’ section of the ‘Draft Recovery Plan’ that an ‘untoward’ climate event could trump any or all of the abatement efforts. Rather, ‘Criterion 5.2’ (p. 81) assigns the concern to research that would aid in predicting the effects of climate change. I believe there is a strong case in Lindley et al. (2007; pp. 15-20) for bringing forth now, not after recovery has theoretically begun in earnest, a range of possibilities that may very well impact recovery of the central Valley ESUs/ DPS over the projected 50-100 year time frame. As Lindley et al. (2007) note “it would be a costly mistake to invest heavily in restoring habitat that will become too warm to support salmonids”. To the same extent, it would seem important to bring forth concerns (science based opinions) re: probabilities of volcanic disruptions, human population growth and domestic water needs within the Central Valley, and possible impacts of climate on the marine habitat over the same 50-100 year time frame. As mentioned in ‘F’ above, no probabilities of success are provided for any of the recovery actions, i.e., the presumed most essential actions may have a low/ no probability of success! Hopefully such considerations would at least be considered in the development of the ‘Implementation Plan’.

ToR 4. Question Regarding the Conservation Assessment Process

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

Response: Conservation measures are addressed within the ‘Background’ (p. 23, 37, and 51) in the ‘Recovery Strategy’ (pp. 61-62) of the ‘Draft Recovery Plan’, and in Appendix App. 2-12, 3-13, and 4-14. Text in the ‘Draft Recovery Plan’ does not provide a clear assessment of the effectiveness of whatever measures were taken, e.g. “likely contributed”, “provided substantial benefits”, “potentially benefiting”, “made efforts to” etc. and is not substantially specific as to the time frame within which the efforts were begun or the adequacy of the measures imposed or conducted.

Although perhaps already addressed within the ‘Implementation Plan’ an assessment of the effectiveness of past measures and effort remaining could be summarized by the Recovery Team in the form of a table. The table (progress summary) could be updated annually, be used for adaptive management purposes, and ultimately, as the agenda for the 5- or 10-year review. The table might include ‘starting date’ ‘action item’, ‘threat(s) addressed’, ‘measurable objective’, ‘facilitator’, ‘date targeted for completion’, ‘progress to date’ ‘date/ revised date of completion’. The text within Appendix A suggests that this information is/could be available.

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

Response: Per ToR 4A above, threats are being addressed through conservation efforts; threats remaining are largely provided in Appendix A, (less so in the ‘Draft Recovery Plan’) but could be presented in a more organized fashion.

ToR 5. Question Regarding the Recovery Strategy

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

Response: Lindley et al. (2007), citing Scott et al. (2005) suggests that one “accept the notion that listed salmonid ESUs are likely to be conservation reliant”. The statement by Scot et al. (op cit) is broad ranging and without regard to the potential for differences in the capacity to persist of those salmonid ESUs in the Pacific Northwest (including only northern California?) and those such as the Central Valley which border on southern extremities of the species geographic range. Nevertheless, Lindley et al. (op cit) is supportive of the view that it may be possible to restore enough habitats such that salmonid ESUs of the Central Valley could persist with appropriate management of ecological processes at the landscape level.

This reviewer has no basis to refute the prognosis of persistence by Lindley et al. (2007) but is influenced by the many contributors to “*Salmon 2100: The future of wild Pacific Salmon*” (Lackey et al. 2006a). Lackey et al. (op cit) cites several “political

realities” working against recovery, and I would venture to extend that to persistence of salmonids in the Central Valley. Simply stated, and possibly most applicable to the Central Valley, they include i) rules of commerce and economic growth work against salmon recovery, ii) increasing scarcity of key natural resources, especially high water quality, will constrain ecological options; iii) the current trajectory for the region’s (Northwest Pacific although unlikely to be exclusive of the Central Valley) human population precludes some frequently stated recovery goals; and iv) individual and collective life style preferences demonstrate that recovery is less important than many advocates assert (Lackey et al. 2006b). Given the likely increasing demand for a potentially diminishing water supply, this reviewer suggests that even the persistence of Central Valley anadromous salmonids into the foreseeable future will be a challenge.

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

Response: Given the potential enormity of the effort that would be required to de-list the salmonids in question it would seem prudent in the ‘Draft Recovery Strategy’ to be as transparent as possible about the uncertainties of large scale environmental perturbations such as climate change and ocean variability. One of the recovery actions highlighted is to take climate change (water temperatures, amount and distribution of precipitation) and uncertainty of impact into account when prioritizing restoration actions. The competition for freshwater in Californian is undoubtedly huge e.g., a May 2008 article out of Redding¹, indicated that Lake Shasta was at two-thirds of capacity and that the city’s intake was to be reduced by 25%, and a somewhat removed but relevant article out of San Diego² indicated that there was a 10% probability that the functional storage of the Colorado River’s Mead and Powell reservoirs will be gone by 2013 and a 50% probability that it will disappear by 2021. Under these circumstances it seems highly probable that the merits of a 50-100 year recovery plan will be challenged by the general public, if not by stewards and partners attempting to effect recovery. Hence this reviewer suggests that minimally much of the text, pp. 15-20 in Lindley et al. (2007) be brought forward in the ‘Draft Recovery Plan’.

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

Response: The links between human activities, effects on habitat, effects on individual fish, and expected responses of fish populations are provided but not entirely clear in the text of the ‘Draft Recovery Plan’. Summary threat abatement criterion, actions and/ or general goals related to eliminating or minimizing the threat are described pp.77-82 and infer or explicitly link human activities and their effects on habitat. The impacts of stressors on individual fish and their life stages are addressed in Appendix A and reflected in the Attachments A, B, and C (stressor matrices); the responses of fish to recovery actions are inferred but not explicit. A condensate of these materials for text

¹ www.redding.com/news/2008/May/06/dry-californicas

² www.signonsandiego.com/news/metro/200820/3-9999-1n13mead.html

entry into the 'Draft Recovery Plan' would be a considerable challenge and possibly voluminous. The linkages of expected responses by fish populations and life stage to recovery actions could be included in an additional column in Appendix B (now 8.5"x 14"), something to the effect of 'Expected response'. Such an addition in tandem with the table proposed in ToR 4A might enhance the collective memories of the Recovery Team as they pursue presumed annual updates and 5- or 10-year reviews and updates.

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

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

Response: The recovery plan does contain a logical framework for prioritizing recovery efforts at multiple spatial scales. The methodology is related in the introductory text of Appendix B and summarized in the 'Recovery Actions' of the 'Draft Recovery Plan'. Therein the threats assessment framework and subsequently the recovery actions for each ESU or DPS were organized by diversity groups and populations (Tables 2-1 to 2-8). A cross referencing procedure allows tracking between prioritized threats (determined by semi-quantitative means), recovery actions, threat abatement criteria, and specific threat abatement criteria goals addressed by recovery actions. The organization of 'Very High' and 'High' stressor categories by geographic locations, proceeding upriver from the Delta/ ocean, and common to multiple species and populations for some part of their life history, (e.g., juvenile rearing, juvenile emigration, and adult upstream migration), permits selection of recovery actions that potentially maximize benefits to a number of populations in any of the eight geographic areas.

As mentioned previously, I assume that the considerable input to the Recovery Team has resulted in the identification of the primary stressors. However, I have no means of assessing the likelihood of recovery actions achieving measurable results. As identified earlier, objectives/ targets or even interim targets against which to measure success or lack thereof are missing/ unclear.

The framework in question does have a logical link between stressors, populations and prioritized recovery actions that should have the highest likelihood for success (success towards persistence/recovery but not necessarily success in carrying out the task). The framework simplifies the task of determining what recovery actions are pertinent to the near-term strategic approach of e.g., 'securing all extant populations' (e.g., steelhead) through projects in each of eight delineated geographic areas (Tables 2-1 to 2-8). The determination at the same time informs on the number of populations of other species that would benefit from the same recovery action.

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

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

Response: The proposed recovery actions (Appendix B) are well cross referenced to the threats assessment in the Attachments A, B, and C. The proposed ‘general’ recovery actions ‘in no particular order’ (pp. 85-88, ‘Draft Recovery Plan’) are not linked to anything and a challenge to the reader to determine the reason for listing and their linkage to threats, threat abatement criterion under Factors 1-5, or whatever.

On the basis of a sample cross referencing between the Winter-run Chinook salmon stressor matrix (Attachment A) and the ‘Sacramento-San Joaquin Delta Threats and Associated Recovery Actions’ (Table 2-1; Appendix B) all ‘VH’ and ‘H’ Delta/Ocean primary/specific stressors were included in Table 2-1. Two Delta ‘M’ stressors were as well included. To be better informed on the potential impact of the recovery action by population in Tables 2-1 to 2-8 (Appendix B), I would suggest that the overall stressor category (‘VH’, ‘H’, ‘M’ etc) be affixed to the ‘species’ listed in the first column of Tables 2-1 to 2-8.

As well, recovery actions are prioritized, and linked with identified threats (Appendix B, p.1-2).

ToR 6. Question Regarding Monitoring and Adaptive Management

A. Does the plan have a well-defined methodology for adaptive management to evaluate whether recovery measures are producing the intended effects and, if not, for informing mid-course corrections in the recovery plan and its implementation? Information on the need for monitoring and adaptive management is presented in the Recovery Strategy section of the Draft Recovery Plan.

Response: The ‘Adaptive Management and Monitoring’ section (pp. 60-65) of the ‘Draft Recovery Plan’ indicates that ‘there will be a thorough review of the recovery actions implemented and their effectiveness reflected by population and habitat condition responses at the 5- and 10- year status reviews.’ There is as well latitude by NMFS in working with partners, to address problems as they arise so as to obtain appropriate types and amounts of data with which to evaluate the effectiveness of recovery actions. Although not said, I suggest that ‘course changes’ could also be the result of annual updates of individual projects by the Recovery Team.

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

Response: Monitoring programs have been developed and some have been implemented on the system wide, watershed and population scales by a variety of agencies and

organizations. However, it is also noted that i) monitoring activities are generally implemented on a project-by project basis (perhaps not of the highest recovery priority but rather of interest and fundable to a local conservation group); ii) many streams and populations are not being surveyed; iii) adult escapement programs are lacking or statistically inadequate; iv) hatchery marking programs whether inadequate or newly started are dependent on escapement surveys which are only now beginning; and v) watershed-level monitoring of population and/ or life stage attributes etc. is needed, etc. Hence the 'Draft Recovery Plan' acknowledges the monitoring that will allow for (a) assessment of progress toward recovery goals, and (b) ongoing evaluation of the recovery strategy in the adaptive management framework, but projects an uncertainty that progress toward recovery goals will be 'doable' in the near term.

Conclusions/ Recommendations

For the most part, the 'Draft Recovery Plan' conforms to the outline and structure recommended within the 'Planning Guidance' document offered by NMFS. The challenge has been to incorporate enough of the complex and important text from Appendix A (and B) and the three Lindley et al. backgrounders without overburdening the document. My preference would have been to have brought more embellishments forward to the text of the 'Draft Recovery Plan'. The 'Background' was reasonably insightful, the text of the remaining sections required considerable referencing to Appendix A and the Lindley et al. documents.

The 'Recovery Strategy' section was for the most challenging of the sections. Prior to jumping into 'Strategic Framework' and 'Population Viability', consideration might have been given to a few introductory paragraphs pointing out the species' current situation, the logic of the recommended approach to recovery, the key facts and assumptions, the primary focus (es)/objectives of the recovery effort, and the overarching objectives and recovery actions of the plan and their relative priorities (NMFS 2007). Perhaps the 'Population Viability' material could have been better addressed in the Background (?). Within the 'Recovery Goals, Objectives and Criteria', the actual PVA, starting p. 73, might also have warranted a sub-header. The 'Literature Cited' section was found to have considerable deficiencies.

In addressing the Terms of Reference, the following concerns were noted:

- Two of the three minimum requirements of 4(f)(1)(b) of ESA, i.e., 'objective measurable criteria', and 'time required and costs' were limited or absent;
- Hook-and-release fishing mortality was not considered a threat;
- The differences between viability and recovery criteria were not extremely clear;
- An explicit analysis of threats is not well discussed in terms of the five listing factors;
- The recovery actions are largely contained in Appendix A and are mostly without explicit measurable outcomes;
- The threats assessment methodology lacks a discussion on the potential implications of uncertainty in the estimates of the 'Overall stressor categories';

- Uncertainties related to the threat assessment, i.e., probability that various recovery actions would be effective, are not provided;
- The 'Draft Recovery Plan' does not provide a clear assessment of the effectiveness of conservation measures taken to date;
- There is need to bring forward more of the discussion re: large-scale environmental perturbations and the possibility that climate change has the potential to marginalize persistence efforts;
- The links between human activities, effects on habitat, effects on individual fish and expected response of populations (a monumental task) are not clearly described, and
- Monitoring for assessment of progress/ evaluation of the Recovery Strategy is discussed in general rather than specific terms.

Recommendations include:

- Review the potential for providing better measurability for objective recovery criteria;
- Ensure that the time required and cost forecasts are transparent and linked to both the near term and long-term 'directional' approaches;
- Include a statement justifying the absence of hook-and-release fishing as a stressor;
- Be more generous in the inclusion of Lindley et al. (2004, 2006, and 2007) in all aspects of the 'Draft Recovery Plan';
- Consider the inclusion of a 'Glossary', given that the report is complex and needs to be written in 'Plain language' that clearly explains to the public what the government requires or recommends (NMFS 2007). Many terms by nature must be technical, but a glossary can be an efficient de-coder;
- Ensure that the 'threats assessment' in the 'Background' section is linked to the five Listing Factors;
- Consider greater inclusion of excerpts from Lindley et al. (2007) regarding uncertainties of the effects of climate change and possibly, interject observations on recent perturbations that may have already impacted recovery actions;
- Indicate why gene banking is not considered as a potential recovery action;
- Indicate why 'juvenile rearing' and 'out-migration' needn't be separate life stages (esp. for steelhead) and why one wouldn't consider separately, sub adult (post smolt) and adult ocean life stages;
- Consider including a statement regarding the absence of concern about uncertainty in the derivation of the normalized weights used in determining 'Overall stressor categories';
- Consider the development of a framework (if not already in the Implementation Plan) that summarizes the effectiveness of recovery actions (see ToR 4A for headers);
- Consider the inclusion of an 'Expected response' (to recovery action) column in the tables of Appendix B, and
- Consider the affixing of the stressor category(s) to the 'species' listed in the first column of Tables 2-1 to 2-8.

Appendix A: Bibliography of Materials Reviewed

- Busch, S., P. McElhany, and M. Ruckelshaus. 2008. A comparison of the viability criteria developed for management of ESA-listed Pacific salmon and steelhead. Northwest Fisheries Science Center. Sept 2008.
http://www.nwfsc.noaa.gov/trt/trt_documents/viability_criteria_comparison_essay_Sept_9.pdf
- Lackey, R.T., D.H. Latch, and S.L. Duncan. 2006a. *Salmon 2100: The Future of Wild Pacific Salmon*. American Fisheries Society, Bethesda, Maryland.
- Lackey, R.T., D.H. Latch, and S.L. Duncan. 2006b. Wild salmon in western North America: Forecasting the most likely status in 2100. pp. 57-70. In: Lackey, R.T., D.H. Latch, and S.L. Duncan. 2006a. [eds] *Salmon 2100: The Future of Wild Pacific Salmon*. American Fisheries Society, Bethesda, Maryland.
- Lindley, S.T., R. Schick, B.P. May, J.J. Anderson, S. Greene, C. Hanson, A. Low, D. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2004. Population structure of threatened and endangered Chinook salmon ESUs in California's Central Valley Basin. NOAA-TM-NMFS-SWFSC-360. April 2004. 56 p.
- Lindley, S.T., R.S. Schick, A. Agrawal, M. Goslin, T.E. Pearson, E. Mora, J.J. Anderson, B.P. May, S. Greene, C. Hanson, A. Low, D. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2006. Historical population structure of Central Valley steelhead and its alteration by dams. *San Francisco Estuary & Watershed Science* 4(1), [February 2006] Art 3, 21p.
<http://repositories.cdlib.org/jmie/sfews/vol4/iss1/art3/>
- Lindley, S.T., R.S. Schick, E. Mora, P.B. Adams, J.J. Anderson, S. Greene, C. Hanson, B.P. May, D.R. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2007. Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin. *San Francisco Estuary & Watershed Science*. Vol. 5(1) [February 2007] Art. 4, 26 p.
<http://repositories.cdlib.org/jmie/sfews/vol5/iss1/art4/>
- McElhany, P., C. Busack, M. Chilcote, S. Kolmes, B. McIntosh, J. Myers, D. Rawdind, A. Steel, C. Steward, D. Ward, T. Whitesel, and C. Willis. 2006. Revised Viability Criteria for salmon and steelhead in the Willamette and Lower Columbia Basins. Review Draft April 1, 2006. Willamette/ Lower Columbia Technical Recovery Team and Oregon Department of Fish and Wildlife.
http://www.nwfsc.noaa.gov/trt/wlc_docs/Revised_WLC_Viability_Criteria_Draft_Apr_2006.pdf
- NMFS 2007. Interim endangered and threatened species recovery planning guidance. Version 1.2, Sept 2007. 121 p. <http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf>.

Marshall: Review of California Central Valley Domain Recovery Plan for Winter-Run and Spring-Run Chinook Salmon ESUs and Central Valley DPS

NMFS. 2008. Recovery Plan for the evolutionarily significant units of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the Distinct Population Segment of Central Valley steelhead. Review draft. Oct 2008. Southwest Regional Office NMFS, Sacramento CA. v + 97p + Apps + Attch. (following).

Appendix A. Threats assessment for the Evolutionary Significant Units of winter-run Chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley spring-run Chinook salmon (*O. tshawytscha*), and the Distinct Population Segment of Central Valley steelhead (*O. mykiss*). 351 p.

Appendix B. Recovery actions. 175 p.

Appendix C. Thomson, C.J. and C. Pinkerton. 2008. Habitat restoration cost references for salmon recovery planning. US Dep. Commer., NOAA Tech Memo. NMFS-SWFSC-425, 75 p.

Attachment A. Winter-run Chinook salmon stressor matrix (draft). May 2008, 5 p.

Attachment B. Central Valley spring-run Chinook salmon (draft stressor matrix). May 2008, 119 p.

Attachment C. Central Valley Steelhead (draft stressor matrix). May 2008, 196 p.

O'Reilly, P. and R. Doyle. 2007. Live gene banking of endangered populations of Atlantic salmon. pp. 425-469. In Verspoor, E., L. Stradmeyer, and J.L. Nielson.[eds]. *The Atlantic Salmon Genetics, Conservation and Management*. 2007, Blackwell Publishing.

Appendix B: Statement of Work for Dr. Larry Marshall

External Independent Peer Review by the Center for Independent Experts

Assessment of the Draft Central Valley Domain Recovery Plan for the Sacramento River Winter-Run and Central Valley Spring-Run Chinook Salmon Evolutionarily Significant Units and Central Valley Steelhead Distinct Population Segment

Introduction

The purpose of this independent review is to evaluate and comment on the Draft Recovery Plan for the Sacramento River Winter-Run and Central Valley Spring-Run Chinook Salmon Evolutionarily Significant Units (ESUs) and Central Valley Steelhead Distinct Population Segment (DPS). The scope of work should focus on the principal elements required in a recovery plan. These principal elements have been defined in section 4(f)(1) of the federal Endangered Species Act (ESA) and sections 1.1 and 1.2 of the National Marine Fisheries Service Interim Recovery Planning Guidance (NMFS 2006)

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

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

From section 1.1, a recovery plan should:

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

Background

There are 10 Evolutionarily Significant Units/Distinct Population Segments (ESUs/DPSs) of salmon and steelhead in California listed as Federally endangered or threatened under the ESA. They are organized into four geographic recovery domains. Each recovery

domain contains one or more salmon and steelhead ESU/DPS, and (1) a Science Center led Technical Recovery Team responsible for developing historical population structure and population viability goals for the recovery plan, and identifying research and monitoring needs; and (2) a recovery coordinator responsible for facilitating the development of a recovery plan for the domain.

The Sacramento River winter-run and Central Valley spring-run Chinook salmon ESUs and the Central Valley steelhead DPS are located within California's Central Valley Recovery Domain. One multi-species plan for this domain is being developed for these three salmonid species. The final plan will be a multi-species recovery plan that will be a compendium of data and information that can be utilized on a watershed basis where species ranges overlap. The rationale for developing a multi-species recovery plan is that, although some research suggests that multi-species plans may lack the species specific information needed for delisting, in California's Central Valley, water management operations and habitat restoration efforts must be responsive to multiple species' requirements that over-lap in time and space. Individual species specific information is being developed for compilation into the multi-species plan to ensure species specific needs are adequately addressed in terms of the viability criteria and habitat needs, but also to identify potential conflicts between salmonid species as well as areas of over-lap or cross-species benefits.

The California Central Valley Domain Recovery Plan builds from the NMFS Southwest Fisheries Science Center Technical Recovery Team (TRT) ESU/DPS reports and a threats assessment (included as an appendix in the draft recovery plan). The TRT reports outline the historical population structure and draft viability criteria to be considered in recovery planning.

These reports can be found at the following website:

<http://swfsc.noaa.gov/textblock.aspx?Division=FED&id=2260>

CIE Peer Review Process:

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

The NMFS Office of Science and Technology serves as the liaison between the NMFS Project Contact and CIE to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and

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

Requirements for CIE Reviewers:

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

Statement of Tasks for CIE Reviewers:

CIE reviewers shall conduct an independent peer review of the draft of the California Central Valley Domain Recovery Plan. Reviews and comments are to focus upon: (1) the use of the best available scientific and commercial information; (2) interpretation and application of the National Marine Fisheries Service Southwest Fisheries Science Center Technical Recovery Team (TRT) recovery planning supporting documents and (3) determination on whether methods employed provide adequate linkages between TRT criteria, habitat-based threats and recovery actions and strategies. Reviewers are not expected to evaluate or comment upon the TRT documents or the Threats Assessment template.

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

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

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

CIE reviewers shall be familiar with the following which are supporting information to the Draft California Central Valley Domain Recovery Plan:

- Technical Recovery Team Reports: Historical Structure and Draft Population Viability (<http://swfsc.noaa.gov/textblock.aspx?Division=FED&id=2260>)
- 2006 Interim Recovery Planning Guidance (<http://www.nmfs.noaa.gov/pr/recovery/>)
- Endangered Species Act (<http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf>)

Each reviewer's duties shall not exceed a maximum total of 7 days for literature review, peer review, and producing a written report in accordance with the ToR. Each reviewer may conduct their analyses and writing duties from their primary work location. Each report is to be based on the individual reviewer's findings, and no consensus report shall be required.

The itemized tasks of each reviewer consist of the following.

1. Read and review the draft California Central Valley Domain Recovery Plan.
2. Review and consider background documents and additional scientific information as necessary.
3. Each CIE reviewer shall submit their independent peer-review report in accordance to the Term of reference and Schedule of Milestones and Deliverables herein to the CIE lead coordinator Mr. Manoj Shivilani at mshivilani@ntvifederal.com and CIE regional coordinator Dr. David Die at ddie@rsmas.miami.edu. Each report is to be based on the individual reviewer's findings, and no consensus report shall be required.

Terms of Reference:

The CIE reviewer's peer review shall address each of the following questions;

Fundamental Questions for the CIE reviewers

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

Site-specific recovery actions addressing important threats to each of the listed species are included in Appendix B. As part of the recovery planning process, the Central Valley Domain Technical Recovery Team developed objective measurable delisting criteria, which are included and described in the Draft Recovery Plan starting on page 70. Information related to the time and cost of species recovery is included in the Draft Recovery Plan starting on page 96. Additionally, an implementation schedule with specific details regarding the cost and time frames associated with recovery actions is in development and will be included in the a subsequent draft of the Recovery Plan.

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

The biology and life history of all three listed species are described in both the *Background* section of the Draft Recovery Plan and in the *Life History and Biological Requirements* section of Appendix A. The threats to each listed species are described in detail in Appendix A, and prioritized lists of life stage-specific threats to the winter-run Chinook salmon ESU, the spring-run Chinook salmon ESU, and the steelhead DPS are presented in Attachments A, B, and C, respectively.

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

The recovery strategy has a foundation based on the hierarchical organization presented in Figure 1. Threats (see Appendix A and Attachments A,B, and C) to specific life stages and associated habitats were identified and prioritized at the population and diversity group (population groupings based on climatological, hydrological, and geological characteristics) scales. Recovery actions which link to specific threats were developed and are presented in Appendix B. The recovery strategy also includes biological recovery criteria for the population, diversity group, and ESU/DPS scale. ...

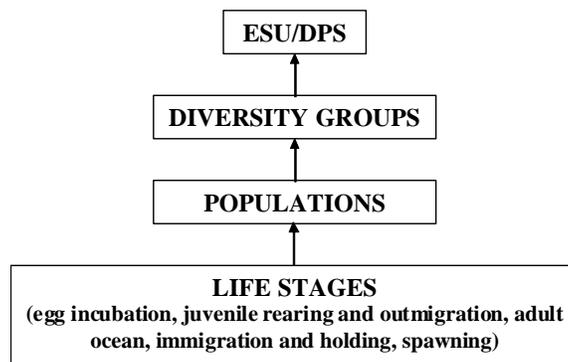


Figure 1. Conceptual model of the hierarchical structure of organizational levels used in the recovery plan.

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

viable salmonid populations concept (McElhany *et al.* 2000) to help guide the recovery process, including the development of recovery actions and recovery criteria.

Question Regarding Use and Application of the Technical Recovery Team Reports

Are the outputs from the historical population structure and population viability criteria described, and applied, appropriately? Information for the Technical Recovery Team reports regarding historical population structure (Lindley *et al.* 2004; 2006) and population viability criteria (Lindley *et al.* 2007) was included in the Draft Recovery Plan.

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

Question Regarding the Threats Assessment Process

Is there an explicit analysis of threats discussed in terms of the five listing factors (e.g., threats)? Does the plan provide continuity between new threats and changes to threats identified in the listing rule since publication? Species specific descriptions of threats related to the five listing factors are provided in the *Background* section of the Draft Recovery Plan.

Does the plan contain a fair assessment, and prioritization, of conditions, stresses and sources of stresses? The threats assessment methodology and results are presented in Appendix A.

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

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

Does the plan explicitly identify threats and track, through objective measurable criteria, how each threat will be reduced or ameliorated, through site-specific management actions? Are these final threats linked to the five listing factors for this ESU? Threats abatement criteria were developed and are described in the *Recovery Goals, Objectives and Criteria* section of the Draft Recovery Plan. The relationship between recovery actions and threat abatement goals and criteria is described in Appendix B.

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

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

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

Question Regarding the Conservation Assessment Process

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

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

Question Regarding the Recovery Strategy

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

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

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

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

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

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

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

Question Regarding Monitoring and Adaptive Management

Does the plan have a well-defined methodology for adaptive management to evaluate whether recovery measures are producing the intended effects and, if not, for informing mid-course corrections in the recovery plan and its implementation? Information on the need for monitoring and adaptive management is presented in the Recovery Strategy section of the Draft Recovery Plan.

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

Schedule of Milestones and Deliverables:

September 23, 2008	CIE shall provide the COTR with the CIE reviewers contact information, which will then be sent to the Project Contact
October 6, 2008	The Project Contact shall send the CIE Reviewers the pre-review documents
October 7-10	Each CIE reviewer shall conduct the independent peer review
October 20	Each CIE reviewer shall submit an independent peer review report to the CIE
October 31	CIE Steering Committee shall review and accept reports, and the reports shall be sent to the COTRs
November 7	COTRs will review reports for compliance, and CIE shall submit final CIE independent peer review reports to the COTRs
November 14	The COTRs shall distribute the final CIE reports to the Project Contact

Submission and Acceptance of CIE Reports:

Upon review and acceptance of the CIE reports by the CIE Coordination and Steering Committees, CIE shall send via e-mail the CIE reports to the COTRs (William Michaels William.Michaels@noaa.gov and Stephen K. Brown Stephen.K.Brown@noaa.gov) at the NMFS Office of Science and Technology by the date in the Schedule of Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility of approval and acceptance of the deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE report in *.PDF format to the COTRs. The COTRs at the Office of Science and Technology have the responsibility for the distribution of the final CIE reports to the Project Contacts.

Request for Changes:

Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated

Marshall: Review of California Central Valley Domain Recovery Plan for Winter-Run and Spring-Run Chinook Salmon ESUs and Central Valley DPS

without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

Key Personnel:

Contracting Officer's Technical Representative (COTR):

William Michaels
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov Phone: 301-713-2363 ext 136

Stephen K. Brown
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
Stephen.K.Brown@noaa.gov Phone: 301-713-2363 ext 133

Contractor Contacts:

Manoj Shivlani, CIE Lead Coordinator
10600 SW 131st Court, Miami, FL 33186
mshivlani@ntvifederal.com Phone: 305-383-4229

Project Contact:

Maria Rea, Central Valley Recovery Supervisor
NMFS, Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814
maria.rea@noaa.gov Phone: 916-930-3623

Brian Ellrott, Central Valley Recovery Coordinator
NMFS, Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814
brian.ellrott@noaa.gov Phone: 916-930-3612

Howard Brown, Central Valley Recovery Team Supervisor
NMFS, Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814
howard.brown@noaa.gov Phone: 916-930-3608

ANNEX I:

REPORT GENERATION AND PROCEDURAL ITEMS

1. Each reviewer's report shall be prefaced with an executive summary of findings, comments and/or recommendations.
2. The main body of the report shall consist of a background, description of review activities, summary of analyses and comments in accordance with the ToR, and conclusions/recommendations.
3. The CIE reviewer's report shall also include as separate appendices the bibliography of materials reviewed and a copy of the statement of work.

Please refer to the following website for additional information on report generation:
http://www.rsmas.miami.edu/groups/cimas/report_Standard_Format.html