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

Assessment of the Draft 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

by

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EXECUTIVE SUMMARY

Purpose

The purpose of this independent review is to evaluate and comment on 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. The scope of work focused on the principal elements required in a recovery plan as defined by the federal Endangered Species Act (ESA) and by the National Marine Fisheries Service (NMFS) Interim Recovery Planning Guidance.

Comments and Recommendations

1. The Draft Recovery Plan meets the requirements of a recovery plan as defined in section 4(f)(1) of the ESA, and sections 1.1 and 1.2 of the NMFS Interim Recovery Planning Guidance (NMFS 2006).

2. Although the Draft Recovery Plan does not require major revision, I would recommend the following:

- Consideration could be given to the inclusion of some recovery cost estimates, *summed* at the population or Diversity Group level, over the next 5 to 10 years (accepting that estimates of full recovery over the next 50 to 100 years will be unduly fraught with uncertainty).
- Notwithstanding the inherent difficulties in establishing firm population targets for recovery, there is considerable merit, importantly from a communications perspective, in identifying *some* quantitative targets for variables such as minimum number of spawners. It illustrates to those reading the recovery plan that quantitative targets *can* be specified, while acknowledging that data deficiencies may prevent the establishment of such targets for all populations at present.
- The text pertaining to the identity of the Diversity Groups (DGs) and their inclusion/exclusion in the recovery plan requires greater clarification, notably in regard to the spring-run Chinook salmon DGs.
- Strengthen the outreach component by including a public outreach program on climate change and by underscoring the success that can, and has, been achieved by appropriately identified recovery actions.

3. I recommend that, following minor revisions, the Draft 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 be accepted as a core contribution to the multi-species recovery plan for the California Central Valley Recovery Domain.

REVIEWER REPORT

I. 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.

II. DESCRIPTION OF REVIEW ACTIVITIES

I received the Recovery Plan and associated appendices on 6 October 2008 from Howard Brown, Central Valley Recovery Team Supervisor, Sacramento Office. I began my review on 10 October 2008 and completed it on 17 October 2008. On Monday, 6 October, I requested and received clarification concerning updated documents from Brian Ellrott, Central Valley Recovery Coordinator, Sacramento Office. The report was submitted to the Center for Independent

Experts (CIE) on Monday, 20 October 2008, in accordance with the deadline stipulated in the Statement of Work (Appendix B of the present document).

III. Summary of Analyses and Comments in Accordance with the Terms of Reference

1. Fundamental Questions for the CIE reviewers

1.1 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?

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."**

Site-specific management plans: The recovery plan provided details on recovery strategies developed for salmonid ecoregions termed Diversity Groups (DGs). The Basalt and Porous Lava DG comprises streams that historically supported winter-run Chinook salmon. The Basalt and Porous Lava DG, Northern Sierra Nevada DG, the Northwestern California DG, and the Southern Sierra Nevada DG historically supported dependent or independent populations of spring-run Chinook salmon. In addition to these four Diversity Groups, steelhead were also historically supported in the Central Western DG and the Suisan Bay DG.

The Recovery Plan makes the appropriate argument that recovery of the salmon ESUs and steelhead DPS will require that a minimum of two viable populations be present with the single winter-run Chinook Diversity Group, 3 of the 4 spring-run Chinook Diversity Groups, and in each of the 6 steelhead Diversity Groups (although one might make the argument that "two" populations might be too few to achieve the redundancy desired).

However, there seems to be some confusion (at least I am confused) in the identity of the Diversity Groups identified for site-specific management plans. Figure 16 identifies the Southern Sierra Nevada Diversity Group as one of the four inhabited by spring-run Chinook salmon. However, there are no site-specific management plans identified for rivers within this DG for spring-sun Chinook in

Appendix B of the Recovery Plan. Furthermore, Attachment B does not contain a Threats Stressor Matrix for the Southern Sierra Nevada DG.

By contrast, page 71 of the Recovery Plan seems to identify the Northwest California DG as a Diversity Group for which the recovery objective of achieving a minimum of two viable populations of spring-run Chinook within each DG will not be attempted (although the text acknowledges here, and elsewhere, that the DG did not historically contain *independent* spring-run Chinook salmon populations). Despite this, there are site-specific management plans for the Northwest California DG in Appendices A and B (which is not entirely inappropriate, although it seems inconsistent with the caveat on page 71) and there is a Threats Stressor Matrix for this DG in Attachment B.

Watershed- and site-specific recovery strategies are limited to those threats that have been identified as "Very High" and "High". In general, the detail of the site-specific management actions is impressive. For each watershed, the recovery action plans begin with summaries of the (a) *Population*, (b) *Threat*, (c) *Recovery Action(s)*, (d) *Primary Population Viability Parameters Address*, (e) *Biological Recovery Criteria Addressed*, and (f) *Threat Abatement Recovery Criteria Addressed.* Thereafter follow extremely specific management actions for ***Restoring Habitats*** and ***Threat Abatement Strategies***. Presenting these assessment results in tabular form is extremely important from a communications perspective, given that the tables provide the reader with a means of rapidly examining, and evaluating, the empirical basis for the site-specific management actions.

Objective, measurable criteria: The Recovery Plan identifies Objectives and Criteria designed to achieve ultimately the goal of having the Chinook salmon ESUs and steelhead DPS de-listed from the ESA.

Recovery objectives

Recovery Objectives are initially specified at the ESU/DPS Diversity Group. A necessary condition for recovery to be achieved at the ESU/DPS level is the attainment of recovery by each of the Diversity Groups. In this regard, the primary Recovery Objective is to obtain a minimum of two viable populations of winter-run Chinook salmon in it single DG, two viable populations in each of 3 of 4 spring-run Chinook salmon DGs, and in each of the six steelhead DGs. Additional Recovery Objectives at the DG level include:

1. Attainment of sufficient amounts and productivity of freshwater, estuarine and marine habitats to maintain the viable populations;

2. A recovery of a diversity of habitats to historic conditions to increase the probability that the populations possess sufficient resistance and resilience to natural environmental change; and

3. Restoration, maintenance and protection of freshwater, estuarine and marine habitats at a large scale in a non-deteriorating state.

The 3 Population Recovery Objectives provide generic goals for achieving population viability. These goals pertain to (a) productivity and abundance; (b) within-population spatial structure (habitat quantity and quality), and (c) within-population diversity (e.g., life-history traits, genetic variability).

However, the Population Recovery Objectives are qualitative, not quantitative. Although qualitative objectives are not, in and of themselves, inappropriate, they can lack utility in some respects. For example, the second of the "Productivity and Abundance" objectives (p. 72) states that "an average abundance equivalent to estimated historic average abundance [levels] should be considered to be in the highest persistence category". This must, of course, be trivially true! The objective, as stated, seems to leave little room for the possibility that abundance levels lower than average historic levels (which may *not* be achievable, given the loss of historic habitat) might also place populations in the highest persistence category.

Similarly, a lack of quantitative rigor reduces the potential utility of the second of four "Within-Population Diversity" objectives, namely that "gene flow and genetic diversity should be similar to historic (natural) levels and origins". Admirable as this objective may be, it is highly improbable that one will be able to quantify historic levels of gene flow and genetic variability for either the populations comprising the salmon ESUs or the steelhead DPS.

Recovery criteria

The Recovery Plan identifies two types of Recovery Criteria: Biological Recovery Criteria and Threat Abatement Criteria. The former are based on demographic parameters such as total population size, population structure (age, life-history, genetic), and geographic distribution. The latter pertain specifically to the mitigation or control of threats to the Chinook ESUs and steelhead DPS that correspond to the listing factors and to the stressors identified in the Threats Stressor Matrix for each ESU/DPS.

As with the Recovery Objectives, the Recovery Criteria are qualitative rather than quantitative. The Recovery Plan justifies this by stating, "it is not possible to provide measurable criteria for all demographic and threat-based factors at this time". This means that the delisting criteria are also qualitative, not quantitative. As a consequence, I am uncertain as to whether these appropriately constitute "measurable criteria" as demanded under the ESA. How does one unambiguously measure a non-quantitative value?

The Recovery Plan states that the "goal of recovery activities should be to achieve at least a low risk of extinction for focal populations". Consulting Table 6 on page 74, this would suggest that each population would be considered viable when it had achieved: (1) a minimum average population size of 2500 spawners; (2) no ongoing or projected population decline; (3) no catastrophic reduction in abundance/distribution in the past 10 years; and (4) a low level of interactions with hatchery-reared members of the same species (in this regard, the recovery plan might take note of a review of the fitness consequences resulting from genetic interactions between wild salmonids and their cultured/hatchery counterparts by Hutchings & Fraser 2008).

In addition to these quantitative criteria, one might have also thought that population viability analyses might have informed, or provided for, quantitative recovery targets (i.e., the identification of combinations of demographic parameters, etc., required to achieve a < 5% probability of extinction within 100 years). Incidentally, one might argue that a 5% extinction probability target is too high. For example, the IUCN criteria stipulate that a species is to be assigned a status of Vulnerable (essentially the same as 'Threatened' in the U.S.) if the probability of extinction over the next 100 years exceeds 10% (IUCN 2006).

Unlike the Biological Recovery Criteria, the Threat Abatement Criteria generally include more readily measurable targets or objectives (e.g., installation of fish screens at water diversion [criterion SR-5.3]; control or elimination of deleterious stormwater runoffs [criterion SR-1.2]).

From the perspective of being able to eventually downlist or delist the ESUs/DPS, the most objectively measured and readily quantifiable of the criteria may be the Biological Recovery Criteria, although this may be hindered by the lack of specific (rather than generic) quantitative targets for each population or watershed. Amongst the recovery criteria, it will ultimately be demographically-based metrics on which decisions to downlist or delist will be made. These should be the most biologically defensible, being based on sound scientific principles associated with conservation biology and salmon population dynamics. In this regard, I was surprised not see targets for spawner abundance for some of the populations (acknowledging the absence of empirical data on which such estimates could be made for most of the steelhead populations). These could have been in the form of either absolute spawner escapement targets, or number of spawners per unit area, that exceed the minimum required spawner escapement or density estimated for each river.

For example, perhaps the recovery plan might include information such as that presented in Table 3 (and possibly Figure 4) in Lindley et al.'s (2007) population viability analyses. I personally found these modeling results to be valuable and informative. Information such as this would also provide readers of the recovery plan that (a) such analyses are possible (when appropriate data are available)

and that (b) the huge costs that will be expended on the recovery plans have the potential to be guided by firm population targets at the river/watershed levels.

Estimated time to, and cost of, recovery: The Recovery Plan makes note of a 50- to 100-year time frame estimated by NMFS for the full recovery of the Sacramento River winter-run Chinook salmon ESU and for the Central Valley spring-run Chinook salmon ESU and steelhead DPS. The Recovery Plan appropriately draws attention to the high level of uncertainty associated with any estimates of the costs associated with such recovery actions. In this regard, the recovery plan suggests that it is impracticable to estimate all projected actions and costs over 50 and 100 years. Rather, it argues that it is appropriate to focus qualitatively on the first 5 to 10 years of implementation, after which costs estimates will be made available.

Appendix C of the Recovery Plan does provide cost estimates for various Restoration Activities (e.g., fish ladder installation, stream habitat restoration and stabilization). However, from a communications perspective, these estimates are not presented in a helpful manner. In addition to not being summed either by population (river or creek) or by Diversity Group, there are no sum totals of estimated costs provided. Notwithstanding the argument that there are inherent uncertainties in such costs, it would be helpful for planners to have some idea as to what the financial requirements of full recovery will entail.

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

The recovery plan has delineated those aspects of the biology, life history and threats pertinent to the endangerment and recovery of the winter-run and spring-run Chinook salmon ESUs and of the steelhead DPS. Anadromy figures into the life cycle of both species. All Chinook salmon are anadromous fish, meaning that they breed and spend their early life in fresh water before undertaking a feeding migration to the ocean and returning thereafter to fresh water to spawn once before death (semelparity). For *Oncorhynchus mykiss*, the term 'steelhead' identifies fish that undergo anadromy, whereas 'rainbow trout' identifies *O. mykiss* that undergo their entire life cycle in fresh water. All *O. mykss* are capable of spawning more than once in their lives (iteroparity). These salmonids, thus, exhibit complex life cycles, and the recovery plan appropriately considers all elements of the biology and life history associated with this complexity in assessing the threats faced by the ESU, although the plan does acknowledge that lack of empirical demographic information on resident *O. mykiss* (indeed on many/most of the anadromous populations of steelhead) is a deficiency that needs to be rectified.

The threats assessment undertaken on the salmonid ESUs/DPS is detailed in Appendix A. The links between these threats and specific recovery actions are

detailed in Appendix B. The overall intent was to assess current habitat conditions and future threats that affect the viability of the Chinook salmon ESUs and steelhead DPS and to develop recovery strategies that address these conditions and threats. This protocol involved the assessment of site-specific watershed conditions for multiple life stages. I could discern no deficiencies in the biological or life-historical knowledge base on which the threat assessments were undertaken.

Across the Central Valley, the primary threats to the winter-run and Spring-run Chinook salmon ESUs, and to the steelhead DPS, are: (1) loss of historic spawning habitat; (2) degradation of remaining habitat; and (3) genetic threats resulting from interactions between hatchery-reared fish and their wild counterparts. The threats identified for ESUs and DPS in the Central Valley are not dissimilar to those affecting Salmonidae at risk through the family's geographical range.

1.3 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 plan does have a logical strategy for achieving recovery that is relevant to habitats, life stages, populations, diversity groups and the overall ESUs/DPS. Recovery actions are detailed in Appendix B of the Recovery Plan at the watershed- and site-specific levels. The recovery actions are comprehensive, detailed and, in some respects, exhaustive in the details provided.

1.4 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.

To the best of my knowledge, the recovery plan uses the best available scientific information in what I deem to be a clearly articulated and biologically meaningful conceptual framework. In particular, the plan makes reference to, and relies considerably upon, the analysis of historical population/ESU structure by Lindley et al. (2004, 2006) and Lindley et al.'s (2007) framework for assessing the viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin. Appendix A of the recovery plan and Attachments A through C describe the process for the threats assessment analysis and the basis for recovery strategy development.

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

The plan can serve as a very important outreach tool and I think that this is one of its considerable strengths. Indeed, the recovery plan emphasizes that the

numerous changes in policy and practice demanded of successful recovery plans "can only be accomplished with effective outreach and education" (p. 195). Several of the recovery actions make implicit or explicit mention of public participation, e.g., the establishment of programs to support educational outreach and local involvement in habitat restoration, and educating the public on issues pertaining to the effects of poaching on population viability and persistence (p. 92). In addition to the public, the recovery plan is also intended as an outreach tool to other federal partners (p. 98). Several ongoing and proposed outreach activities are identified on pages 101 and 102 of the recovery plan. The recovery plan, by unambiguously identifying the necessity of outreach, serves as a clear invitation to the public to participate in the recovery process.

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

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

The recovery plan makes use of the outputs from NOAA Technical Memoranda and additional reports prepared by members of the Central Valley Technical Recovery Team.

One NOAA Memorandum (Lindley et al. 2004) dealt with historical population structure of the winter- and spring-run Chinook salmon ESUs. The historical population structure of steelhead (and the effects of dams thereon) was analyzed by Lindley et al. (2006). The viability of the salmon ESUs and the steelhead DPS was assessed with the use of a framework described by Lindley et al. (2006), whereas Williams et al. (2007) identified research needs in addition to determining the adequacy of existing monitoring programs to determine whether biological recovery goals are likely to be met or not. The fifth paper (Schick and Lindley 2007) applied graph theory to examine the spatial structure and demographic connectivity amongst the populations encompassed by the spring-run Chinook salmon ESU.

The outputs from these analyses of historical population structure and population viability criteria have been described and applied appropriately in the recovery plan, with one possible exception. As mention previously, the recovery plan makes no mention of measurable viability criteria expressed in terms of target numbers of spawners for those populations for which empirical estimates can be justifiably made. Based on information provided in the TRT report by Lindley et al. (2007), it would seem that some estimates of this type could have been made and included, with appropriate caveats and estimates of uncertainty, in the recovery plan.

2.2 Is the plan clear about the differences been [*sic*] viability criteria and recovery criteria?

The Recovery Plan is reasonably clear about the differences between viability and recovery criteria, although by necessity the two types of criteria are not independent of one another. Some of the viability criteria (Table 6), for example, form the basis for the recovery criteria, e.g., qualitative targets pertaining to minimum effective and absolute population size. The plan also distinguishes these criteria, to greater or lesser degrees, at the ESU/DPS level, the Diversity Group level, and at the level of population. These viability criteria have a sound scientific basis and are widely recognized as such in the primary scientific literature. Having said that, the plan could have better distinguished the differences between viability and recovery criteria.

3. Question regarding the Threats Assessment Process

3.1 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?

Appendix A of the recovery plan provides an explicit analysis of the threats facing the winter-run and spring run Chinook salmon ESUs and the steelhead DPS in the Central Valley at the times of their listing. Details are provided in terms of each of the five listing factors. These are discussed in terms of the magnitude of the threats at the time of listing and within the context of how/whether these threats have changed since listing. Thus, the plan does provide continuity between new threats and changes to threats indentified in the listing rule since publication.

3.2 Does the plan contain a fair assessment, and prioritization, of conditions, stresses and sources of stresses? Are other factors considered for each threat and its' source such as scope, severity, frequency, magnitude, etc. as suggested in the Recovery Guidance? Is the threats assessment objective and are all realistic threats identified (even if it may not be feasible to address it in the recovery plan)? Does the plan explicitly identify threats and track, through objective measurable criteria, how each threat will be reduced or ameliorated, through site-specific management actions? Are these final threats linked to the five listing factors for this ESU?

The plan prioritizes the stresses faced by the ESUs/DPS, identifies the sources of stresses in detail, and fairly assesses the importance of each to the probability of persistence of winter- and spring-run Chinook salmon and steelhead. In addition to identifying the source of each threat, other factors, such as the scope,

severity, frequency and magnitude of each threat, are discussed in the recovery plan. It would appear that all realistic threats have been identified in the recovery plan. There is nothing in the discussion of threat identification, the threat stressor matrices, or threat abatement to suggest that the assessment of threats faced by the ESUs/DPS was not objective.

Using objective measurable criteria, the plan details how threats will be ameliorated for watersheds in each of the Diversity Groups. The detail provided here is not inappropriate. The required site-specific management actions are clearly identified. Appendices A and B detail the current status of threats faced by the salmon ESUs and the steelhead DPS. Links between threats and each listing factor are provided in Appendix A. Specific links between recovery actions and population viability parameters, biological recovery criteria, and threat abatement criteria are provided in Appendix B.

3.3 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?**

Noting that there is some redundancy in the nature of the questions being asked of the reviewer, these questions have been addressed previously to greater or lesser degrees, and my responses here to each of these four questions is, "yes". The threats stressor matrices appropriately and extremely usefully summarize the threats by life stage and habitat type.

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

The Recovery Plan underscores the importance of adaptive management and a monitoring component that will allow recovery practitioners to address uncertainties associated with specific restoration and threat abatement actions. Indeed, one of the reasons given for the absence of an estimate of the total cost of recovery is uncertainty in the biological response of many of the recovery actions.

The Threats Assessment Document (Appendix A) does acknowledge uncertainties related to the threats assessment in a few places, identifying, for example, uncertainties in (a) whether ongoing efforts to restore habitat and passage to Battle Creek (off Sacramento River) will lead to the successful

establishment of a second winter-run Chinook salmon population; (b) how climate change will affect the Chinook salmon ESUs and steelhead DPS; and (c) how contaminants in San Francisco Bay and San Francisco-San Joaquin Delta might affect Chinook salmon. It is perhaps noteworthy that the recovery plan makes explicit the fact that implementation of restorative actions will, by necessity, fill many gaps that currently exist with the empirical framework and reduce uncertainties as a consequence.

However, while the plan acknowledges potential uncertainties related to threats assessment in some instances, these uncertainties do not always appear to have been made explicit. Having said that, the primary threats have almost certainly been correctly identified for these ESUs and DPS, and the significance of these threats has been appropriately assessed. Additional uncertainties related to threats assessment are likely to be few.

4. Question regarding the Conservation Assessment Process

4.1 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?

The recovery plan acknowledges the existence of locally-led restoration efforts and recognizes the importance of building upon these efforts to find common ground in identifying recovery goals and in agreeing to the threats to population persistence posed by various threats.

In particular, the recovery plan makes mention of two large conservation programs in the Central Valley. The CALFED Bay/ Delta Program is a cooperative effort of more than 20 federal and state agencies working with local communities to improve water quality and to restore the Delta. The Central Valley Project Improvement Act, or CVPIA, represents an ongoing attempt to balance the water needs of fish and wildlife with those required for irrigation, domestic water use, and power augmentation.

The effectiveness, or lack thereof, of some conservation actions to date, and the extent to which these were in place at the time of listing, are described in the recovery plan, although this discussion is perhaps not as comprehensive as it might be. Of considerable importance in this regard is the recent increase in numbers of winter-run Chinook salmon to 20000 individuals (p. 16), an increase that can be attributable, in part, to existing conservation efforts. From a communications/outreach perspective, this is important because it underscores the point that recovery efforts can yield positive results.

Nonetheless, the recovery plan does acknowledge the conservation efforts that have been made over the years by various agencies, groups, and individuals. The recovery plan includes an analysis of conservation efforts ranging in scope from regional conservation strategies to local watershed initiatives. The plan (Appendices A, B) makes it clear which threats are being addressed through existing conservation efforts and which threats remain to be addressed.

Some potential conservation efforts appear to have been hampered by inadequate regulatory mechanisms and a failure to implement the mechanisms that do exist.

5. Question regarding the Recovery Strategy

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

Based on the information provided in the recovery plan, and based on my knowledge of salmonid ecology, behavior, and life history, it is my opinion that the Chinook salmon ESUs and steelhead DPS would likely persist in the foreseeable future if the ESU met all of the recovery criteria, subject to the uncertainty associated with the potential effects of climate change on salmon habitat quality and quantity.

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

Climate change does figure in the recovery plan. For both ESUs and the DPS, mention is made of the need to expand research and monitoring to better predict the effects of climate change on salmonid recovery. The recovery plan also notes that by mitigating most existing anthropogenic effects on habitat quantity and quality, one is increasing the likelihood that the ESUs/DPS will have the resilience required to respond to unanticipated changes in the environment.

However, it is somewhat difficult to assess the degree to which the recovery strategy and recovery criteria adequately consider large-scale environmental perturbations such as climate change and ocean variability. Beyond acknowledging the simple fact that changing ocean conditions can affect salmonid productivity (e.g., by influencing ocean habitat, feeding opportunities, predator-prey relationships), the recovery plan makes relatively little mention of the potential threat posed by ocean variability. The Recovery Actions specified in Appendix B do make mention of the threat posed by climate change. This appears, however, to only be acknowledged as a factor that might affect water temperature. One would have thought that climate change could change stream/river hydrography as well, thus affecting water flow.

There is one recovery action missing (as far as I can tell) that merits consideration from a climate-change perspective. The recovery plan could draw attention to the importance of public outreach and education on the effects of climate change. The recovery plan could also underscore the importance of having the public and various regulatory agencies become familiar with and implement the lifestyle and policy changes that have been recommended by the Intergovernmental Panel on Climate Change.

5.3 Are the links between human activities, effects on habitat, effects on individual fish, and expected responses of populations clearly described? Does the recovery plan contain a logical framework for prioritizing recovery efforts at multiple spatial scales? i.e.,

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

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

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

Notwithstanding the considerable redundancy in these questions (the answers having been provided implicitly or explicitly previously in this document), the answers to these questions are all, "yes". The recovery plan prioritizes recovery actions; it links human activities (e.g., alterations in flow regimes, production of hatchery fish, angling, water diversion) with the effects on salmonid habitat and the population consequences resulting therefrom; it identifies the threat stressors for each of the focal watersheds for each ESU/DPS:

- Winter-Run Chinook (Sacramento River);
- Spring-Run Chinook (*Northern Sierra***:** Deer Ck, Mill Ck, Antelope Ck, Butte Ck, Big Chico Ck, Feather R., Yuba R.; *Basalt and Porous Lava*: Battle Ck, Sacramento R.; *Northwestern California*: Beegum Ck, Clear Ck, Thomes Ck)
- Steelhead (*Basalt and Porous Lava*: Cow Ck, Upper Sacramento R. tributaries, Sacramento R.; *Northern Sierra Nevada*: Auburn Ravine and Cook Ck drainage, Deer Ck, Mill Ck, Antelope Ck, Bear R., Butte Ck, Big Chico Ck, Feather R., Yuba R.; Dry Ck drainage, American R.; *Southern Sierra Nevada*: San Joaquin R., Calaveras R., Tuolumne R., Stanislaus R., Merced R., Mokelumne R.; *Northwestern California*: Stick Ck, Thomes Ck, Beegum Ck, Putah Ck, Clear Ck)

The proposed recovery actions link logically to the threats identified in the threats assessment.

The plan contains an internal consistency by prioritizing recovery actions at the watershed- and site-specific levels identified by the Threats Stressor Matrices to be High or Very High for each Diversity Group within each ESU/DPS. The tables in Appendix B specify for each river/creek the stressor identified by the Stressor Matrices, the site-specific Recovery Action, and the Viability Parameters and Biological/Threat Abatement Recovery Criteria addressed by each Recovery Action.

Although it is certainly appropriate that recovery actions be concentrated on the stressors rated High or Very High, the possibility exists that recovery actions taken to address Moderate and Low stressors might have the benefits of reducing the threat level of the High and Very stressors and of being less expensive in some cases.

6. Question regarding Monitoring and Adaptive Management

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

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

The recovery plan underscores the necessity of having an adaptive management and monitoring component in order for the recovery plan to be implemented appropriately and for the uncertainties associated with specific restoration and threat abatement actions to be identified and addressed.

The chapter entitled Recovery Strategy has a separate section on adaptive management, noting that the recovery plan "includes an adaptive management and monitoring component to increase the effectiveness of and to address the scientific uncertainty associated with, specific restoration actions". This monitoring aspect of the adaptive management component will be particularly important when the 5- and 10-year status reviews of the ESUs and DPS are undertaken. The recovery plan draws attention to existing monitoring programs implemented on various scales (system-wide, population, watershed) by various agencies and organizations, some of which date back to the 1940s. Among other benefits, monitoring priorities include the need to enhance significantly the currently poor empirical database on steelhead populations and the need to properly mark/tag/identify hatchery fish.

There was one element of this section that I personally found unnecessary, but I accept the possibility that the writers of the recovery plan feel that there is an intrinsic need for it. The text in question is found on pages 64 and 65. The text provides common-sense, basic information that should be part of any meaningful monitoring program. Perhaps the inclusion of such 'basics' in a recovery plan implies an absence of adherence to such basics in the past.

However, while the recovery plan is very clear about the benefit of adaptive management, the need for it, and of the necessity of implementing appropriate monitoring programs that would allow for adaptive management, it is not clear to me that the recovery plan contains a 'well-defined methodology for adaptive management'. To be fair though, it is not entirely clear what would comprise a 'well-defined methodology', other than underscoring the necessity of implementing monitoring programs of sufficient breadth that would permit adaptive management and associated mid-term changes in the recovery plan. And this is something that the recovery plan has done.

IV. CONCLUSIONS AND RECOMMENDATIONS

1. The Draft Recovery Plan meets the requirements of a recovery plan as defined in section 4(f)(1) of the ESA, and sections 1.1 and 1.2 of the NMFS Interim Recovery Planning Guidance (NMFS 2006).

2. Although the Draft Recovery Plan does not require major revisions, I would suggest that the inclusion of additional information be considered.

Firstly, I would suggest that consideration be given to the inclusion of recovery cost estimates, even if only for some populations/watersheds/Diversity Groups, over the next 5 to 10 years (accepting that estimates of full recovery over the next 50 to 100 years will be unduly fraught with uncertainty).

Secondly, although I am fully cognizant of the inherent difficulties in establishing firm population/watershed targets for viability/recovery, there is considerable merit, importantly from a communications perspective, in identifying *some* quantitative targets for variables such as minimum number of spawners. It illustrates to those reading the recovery plan that quantitative targets *can* be specified, while acknowledging that data deficiencies prevent the establishment of such targets for all populations at present.

Thirdly, the text pertaining to the identity of the Diversity Groups (DGs) and their inclusion/exclusion in the recovery plan requires greater clarification. This is particularly problematic for the spring-run Chinook salmon DGs.

Fourthly, the review contains some additional suggestions to strengthen the recovery plan from an outreach perspective, such as inclusion of a public

outreach program on climate change (response to 5.2 above) and mention of the success that recovery actions can make (response to 4.1 above).

3. I recommend that, following minor revisions, the Draft 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 be accepted as a core contribution to the multi-species recovery plan for the California Central Valley Recovery Domain.

APPENDIX A: BIBLIOGRAPHY OF MATERIALS REVIEWED

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NMFS (2008) Threats assessment for the evolutionarily significant units of winter-run Chinook salmon (*Oncoryhnchus tshawytscha*) and Central Valley spring-run Chinook salmon (*O. tshawytscha*), and the distinct population segment of Central Valley steelhead (*O. mykiss*). Appendix A. Draft 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.

NMFS (2008) Recovery actions. Appendix B. Draft 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.

Schick, R.S., and S.T. Lindley (2007) Directed connectivity among fish populations in a riverine network. *Journal of Applied Ecology* 44: 1116-1126.

Thomson, C.J., and C. Pinkerton (2008) Habitat restoration cost references for salmon recovery planning. NOAA-TM-NMFS-SWFSC-425. Appendix C. Draft 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.

Williams, J.G., Anderson, J.J., Greene, S., Hanson, C., Lindley, S.T., Low, A., May, B.P., McEwan, D., Mohr, M.S., MacFarlane, R.B., and C. Swanson (2007) Monitoring and research needed to manage the recovery of threatened and endangered Chinook and steelhead in the Sacramento-San Joaquin basin. NOAA-TM-NMFS-SWFSC-399.

APPENDIX B:
STATEMENT OF WORK FOR DR. JEFFREY HUTCHINGS

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 Shivlani at mshivlani@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. …

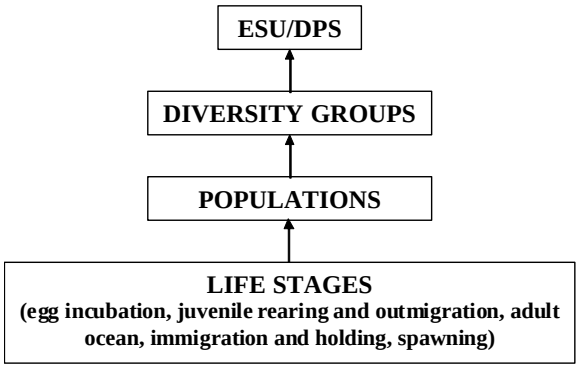

Figure 1. Conceptual model of the hierarchical structure of organizational levels used in the recovery plan.

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 been 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

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.

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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