Attachment 1
Delta Conceptual Models (DRERIP)
Summary of Peer Review

1.0 INTRODUCTION

The CALFED Ecosystem Restoration Program (ERP) Implementing Agencies[1] and the CALFED Science Program initiated a focused effort to develop a suite of ecosystem and species conceptual models for the Delta in 2006. A central component of this initiative has been ensuring the completeness and scientific integrity of the models through implementation of a rigorous peer review process. The following provides a summary of this review process; how the process has been conducted, who has been involved, and what the general outcomes have been to date.

For the Ecosystem conceptual models (including stressor, habitat, and process models), the program has relied on an independent panel review format with two separate panels convened in May and June 2007. For the Species life history conceptual models, the program has relied on a more traditional anonymous peer review process with three to five experts independently reviewing each model. In both cases, the program has assigned independent editors to oversee the process and assist with the compilation of review comments. Dr. Denise Reed is serving as editor for the Ecosystem conceptual models. Drs. James Anderson and James Lichatowich are jointly serving as editors for the Species conceptual models.

2.0 ECOSYSTEM CONCEPTUAL MODELS

Independent peer review panels were convened May 23-25 and June 12-14, 2007 to review the Ecosystem conceptual models. Seven conceptual models were reviewed in May. An additional eight conceptual models were reviewed in June. The expertise represented on the panel was adjusted to account for the nature of the models under review, but six review panel members were specifically asked to participate in both the May and June panel reviews to maintain consistency across the reviews. Models reviewed and panel participants are listed below followed by a summary of the review process.

Models Reviewed

May 2007	June 2007
Aquatic Food Web	Aquatic Vegetation
Mercury	Delta Fish Habitat
Operations	Low Dissolved Oxygen
Organic Carbon	Floodplains
Pyrethroids	Woody Riparian Vegetation
Selenium	Transport
Chemical Stressors	Sedimentation
	Tidal Marsh

[1] California Department of Fish and Game, US Fish and Wildlife Service, and National Marine Fisheries Service

Review Panel Participants

May 2007	June 2007
David Freyberg – Stanford University	David Burdick – U. New Hampshire
Zach Hymanson – Tahoe Science Cons.	David Freyberg – Stanford University
Michael Johnson – UC Davis	Zach Hymanson – Tahoe Science Cons.
John Melack – UC Santa Barbara	John Melack – UC Santa Barbara
Peter Moyle – UC Davis	Peter Moyle – UC Davis
Harry Ohlendorf – CH2MHill	Denise Reed – U. New Orleans - Chair
Denise Reed – U. New Orleans - Chair	Geoff Schladow – UC Davis
Jim Sickman – UC Riverside	Jim Sickman – UC Riverside

Peer Review Process

Each review panel received completed drafts of the conceptual models at least two weeks prior to the panel meeting. Primary and secondary reviewers, and scribes for the panel discussion were identified for each conceptual model (see Attachment A). However, panel members were encouraged to review all models and contribute to the panel discussion. A list of review questions was also developed to help guide the reviews.

Each panel meeting was conducted in four phases:

1. The panel first met in a plenary session to discuss preliminary observations, common weaknesses and strengths, and key issues to be discussed with the model developers. Main points of discussion, including items to be explored with the model developers, were recorded by the scribe. Background information was also presented to introduce the panel to how the models would ultimately be used.
2. The panel discussed their preliminary observations and key issues with each developer in an open group setting. The primary reviewer led the discussion with scribes assigned to document the outcomes of the discussion.
3. The panel met without the developers to discuss the exchange with the model developers and identify key areas where models needed to be modified to ensure completeness and scientific integrity.
4. Primary reviewers met with the developers to discuss specific approaches/modifications that would be needed to address the panel's concerns.

Specific outcomes from the reviews included:

- commentary on the quality of the draft;
- discussion of strengths and weaknesses; and
- specific recommendations for changes.

Following the reviews, model developers were provided with written panel comments reflecting the entirety of the panel meeting. The developers made revisions to the conceptual models and resubmitted them to the program. The peer review editor then reviewed how the developers incorporated panel comments, and evaluated the revised models for completeness, and overall consistency. Where necessary the editor worked directly with the model developer on final adjustments to the model.

To date, ten of the fifteen models reviewed have been submitted to the editor. As of January 21, 2007, six of these models had completed the review process. Two of the fifteen models reviewed have been identified for re-review due to the extent of the recommended changes (Transport and Food Web) and one model (Operations) is being recast based on panel review comments to provide a descriptive report on boundary conditions. The remainder of the models are expected to be completed by mid February. A summary of general comments on the Ecosystem models developed by each of the two peer review panels are provided in Attachment B.

3.0 SPECIES LIFE HISTORY CONCEPTUAL MODELS

Independent peer reviews of several Species conceptual models were initiated in December 2007. Species model editors worked with UC Davis staff to identify and contact potential reviewers. Reviewers were then provided with copies of respective species models and instructions regarding the review process, including a list of questions to guide the review (see Attachment C). Completed reviews will be submitted to UC Davis and reviewed by the editors. The editors will prepare a summary of the reviews for the model developers, including commentary on how to address any conflicting reviews. As necessary the editors may contact individual reviewers to clarify comments submitted. All reviews are anonymous, except to the editors.

A list of the species models being reviewed and the status of the review process is provided below. To date reviews have been completed and compiled for Sacramento splittail. Reviews are underway for the four runs of Chinook salmon and Central Valley steelhead. Additional reviews are expected over the month of February 2008, with all reviews completed by March 2008.

Model	Models Completed	Reviewers Selected	Due Date	Reviews Received	Editor Report
Sacramento Splittail	Yes	Yes	Jan 8	4 of 4	Sent to Author
Longfin Smelt	Yes	Yes	Jan 24	4 of 5	In preparation
Chinook Salmon	Yes	Yes	Jan 15	3 of 5	
Steelhead	Yes	Yes	Jan 15	2 of 3	
Green Sturgeon	Yes	Yes	Jan 24	2 of 3	
White Sturgeon	~Jan 29	--			
Delta Smelt	~Feb 8	--			
Invasive Clams	?	--			
Centrarchids	Jan 31	--			

Questions regarding the peer reviews described herein should be directed to Brad Burkholder, California Department of Fish and Game at (209) 948-7068 or bburkholder@dfg.ca.gov.

ATTACHMENT A
PEER REVIEW ASSIGNMENTS FOR ECOSYSTEM CONCEPTUAL MODELS

May 23-25th	Aquatic Food Web	Operations	Toxicity	Pyrethroids	Hg	Se	DOC
Peter Moyle	Secondary	Scribe		Scribe			Secondary
Dave Freyberg		Primary					Scribe
Mike Johnson			Primary	Primary			
Harry Ohlendorf					Primary	Primary	
Zach Hymanson	Scribe	Secondary	Secondary		Scribe		
John Melack	Primary		Scribe			Secondary	
Jim Sickman				Secondary		Scribe	Primary

June 12-14th	Floodplains	Tidal Wetlands	Sediment	Transport	Aquatic Veg	Riparian	DO	Delta Fish Habitat
Peter Moyle	Secondary				Secondary			Primary
Dave Burdick		Primary			Scribe	Primary		
Dave Freyberg			Primary	Secondary			Secondary	Scribe
Geoff Schladow			Secondary	Primary			Scribe	
Zach Hymanson	Scribe	Secondary			Primary			Secondary
John Melack	Primary		Scribe			Scribe		
Jim Sickman		Scribe		Scribe		Secondary	Primary	

Primary	**Primary reviewer**
Secondary	**Secondary reviewer**
Scribe	**Scribe**

ATTACHMENT B
GENERAL COMMENTS ON ECOSYSTEM CONCEPTUAL MODELS
(Excerpted from Comments provided by May and June Review Panels)

The models represent an impressive compilation of knowledge and, when completed, will provide a strong scientific foundation for planning decisions in the Delta. In addition to our comments on specific models discussed with the developers and our recommendations for revisions, the Panel offers some general comments that we feel will be useful in the collective use of the models during the DRERIP scientific evaluation process:

Focus on the Delta.
Several models provided sound textbook–like summaries of current knowledge about their topic. While such breadth is important for wide application of the models, it is not necessary for their use in evaluating Delta restoration actions and sometimes distracts the user from the information that is more directly applicable. Model developers are encouraged to think about how their subject works within the Delta specifically and evaluate the importance, understanding and predictability of linkages within that context.

Defining Technical Terminology within Models.
The models have been developed by scientists from different disciplines and this leads to slightly differing uses of some technical terms. It is not necessary to make all models conform in their use of terms. However, the Panel recommends that technical terms that occur in more than one model be defined explicitly within each model when appropriate.

Consistent Model Terminology among Models.
Recognizing that the models have been developed independently and that there has been little time for coordination among teams, the Panel recommends that an effort to ensure consistent model terminology would improve the ability of users to apply the models together. For example, standard names for the various models, sub-models, and key drivers that occur in many models, and consistent use of symbology on diagrams would provide real value added to the interpretation of the models' technical content. A glossary may be a helpful tool to support this effort.

Web-Based Format.
The prototype web application demonstrated to the Panel by Science Program staff was extremely promising. Some further development is still needed but the Panel encourages the ERP agencies to actively pursue web application of all of the conceptual models. Using the models for scientific evaluation of restoration action requires continual reference back and forth between the graphic, text and narrative components. The web application facilitates this and also allows for easy revision of individual components of the models as new information becomes available. The Panel frequently found tables and figures helpful in support of the model narratives, and the web application should also allow for such elements to be incorporated within the display framework.

Regional and Temporal scaling.
Several models address topics that have well-recognized patterns of spatial and temporal variability. Finding a common framework to represent this would improve the ability of the models to work together. The Transport model plans to provide a regional view of the Delta, with flow and transport

described for several sub-regions of the Delta. These subdivisions, or subsets of them, may provide a useful context for regional aspects of other models. Similarly, the tidal time scale is used by many models, but the addition of seasonal or event (e.g., flood) scales is important for some models. The Panel has made specific recommendations to the developers but emphasize that a common framework would be especially helpful as revisions are made.

Non-Linearity.
Several models have used symbols to show non-linear relationships for linkages. This is a helpful addition to the graphic components of the models. While it is important that the text support the specific nature of the relationship shown on the graphic, the Panel thought the development of a standard symbology could assist modelers in adding this information, if appropriate, to their models. Such symbols could also include threshold effects that would assist the description of some biogeochemical relationships.

Availability of Models to Developers.
Refinement and revision of the models will be helped by making the draft models available to other developers so they can see different approaches to applying the DLO format and the level of information provided. For instance, the panel was impressed with the format and content of the mercury, floodplain, and woody riparian conceptual models and reviewing these models will provide those leading model revisions with first-hand examples of good approaches to constructing DLO conceptual models. Also reviewing some of the other models (e.g., the dissolved oxygen model or the tidal marsh model) will provide several examples of ways to integrate information in the figures, text, and references into a more cohesive document.

Model Integration
Now that the models are almost complete, integration will be easier than was possible during the early stages of development. The Panel recommends that the DRERIP team provide opportunities for model developers to work together to facilitate such integration and strengthen connections among models.

Summary Points.
Due to the complexity of the issues addressed, the models are necessarily detailed. Access to the text and the key findings would be facilitated by the addition of an overall summary section at the beginning of each document (or as entry points into the web-based application). The summaries should cover why the issue is important in the Delta, how it might influence restoration planning, and key points that are currently dispersed through the text. The summary of key points should help to direct those evaluating restoration actions to the most relevant aspects of the conceptual model.

ATTACHMENT C
SPECIES MODEL PEER REVIEW QUESTIONS
(Excerpted from Instructions for Peer Reviewers)

Review Questions: General Guidelines

Peer reviewers should be advised that not all of the questions below will be relevant or have equal importance for all species. These questions are guidelines that should be used to complete the model evaluation. The focus of your review should be on the accuracy and completeness of the information provided and how well the model developer followed the species model development guidelines. The species life history conceptual model should provide the coverage and utility necessary to plan for all elements of habitat restoration relevant to the recovery of self-sustaining and robust populations of these species in the reasonably foreseeable future of the California Bay/Delta (and tributaries) ecosystem.

Biology and Ecology of the Species

Does the model adequately identify and interpret the relevant literature on the biology and ecology of the species? Is the model's treatment of all aspects driving the population of this species adequate (e.g., survival, fecundity, reproduction, growth, development and distribution, and associated parameters driving these processes)? Does the model describe what is known about the life-stage specific environmental tolerances, environmental indicators, desirable habitat attributes (preferably covering the ranges from optimal through intolerable), trophic habits, competitive interactions, growth and survival? Does the model indicate where the species may have an important ecological function such as the salmon's contribution to nutrient /energy flow in the ecosystem? Is there adequate information reflecting the interaction of this species with the natural environment (through critical process-based, or habitat-based relationships) to allow for appropriate restoration planning (i.e., such that resource managers will be directed to the appropriate variables to address within the adaptive management process to achieve population recovery via manipulation of appropriate environmental drivers and/or funding of directed research according to priority needs)? Is the information reflected in a manner that is consistent with the Model Development Guidelines (see Section "E", part 4.0-4.3)?

Population Dynamics

Does the model's narrative describe what is known about the historical distribution and abundance of the species? Are the nature of cohorts and interannual variability in reproductive success adequately related to long- and short-term changes in abundance of the species? Specifically, is life-stage survivorship addressed as a driver for population structure and dynamics (by age class, if appropriate)? For annual species, are all of the abiotic factors influencing population response included in the model? Are the key limiting factors (for each life stage) identified and documented? Does the conceptual model discuss historic population trends and current status, and is any inference provided to explain observed trends and inherent variability of causal factors? Does the conceptual model allow for evaluation of the nature of long-term population trends and the extent and source of variability in those trends? Is the model robust (comprehensive) enough to

incorporate variability through time and be useful for interpreting data generated in the past, present, and future?

Model Completeness

Does the model adequately identify the drivers that determine the sustainability of the species and are those drivers then linked to outcomes for the species as described in the guidelines? [Note: A "driver" is any causal factor (e.g., physical, chemical, or biological force) that influences the species or system of interest. Definitions of terms are provided in Section E, Model Development Guidelines. Is there a clear correspondence between the model's narrative, graphical display and stressor table? Are all the key factors that will determine population sustainability identified and incorporated into the driver, linkage and outcome approach? Does the model appropriately identify the assumptions, areas of disagreement and gaps in the state of knowledge? Are assumptions reasonable, where those assumptions are used to cover data gaps? Are the areas of disagreement among scientists identified? Does the model identify monitoring and research that can help address uncertainties or data gaps? Are there surrogate species that can be used to make inferences, or reasoned assumptions that would fill data gaps, while delta-specific data is being collected? [Note: Surrogate species are not necessarily sympatric with the model species, but could be species from other estuarine systems.] Identify any shortcomings in the model's documentation. Identify relevant literature not included in the model's documentation.

Organization and Clarity

Does the organization of the model's narrative result in a clear presentation of the information? Is the narrative written in clear and understandable style?