

## White Papers

### Background

The CALFED Ecosystem Restoration Program (ERP) has recruited agency, stakeholder, and independent scientists to develop scientific white papers for the principal ecological processes, habitats, species, and stressors that are the focus of the ERP. The white papers will be "living documents," revised in light of new information.

### General Purpose

The white papers will draw upon existing information and professional judgment to describe what we know (or think we know) and don't know about the major ecological processes, habitats, species, and stressors that are the focus of the CALFED ERP.

### White Paper Topics and Lead Authors

- Fluvial Geomorphology: Matt Kondolf, UC Berkeley
- Riparian Habitat and Avifauna: Tom Griggs, Chico State
- Tidal Wetlands: Larry Brown, USGS
- Aquatic Contaminants: Bob Spies, consultant
- Open Water Processes: Wim Kimmerer, SFSU
- Salmonids: Chuck Hanson, consultant
- Delta Smelt: Bill Bennett, Bodega Marine Lab
- Splittail: Bud Abbott (consultant), Peter Moyle (UC Davis)
- DEF/EWA: Bruce Herbold (EPA), Pete Rhoads (MWD), Frank Ligon (consultant), Dave Fullerton (CALFED)

### White Paper Process

1. Develop an initial draft of the white paper.
2. Circulate the initial draft for collegial review to identify any critical information omitted and to ensure the white papers cover the range of opinion.
3. Revise the initial drafts.
4. Submit revised drafts for peer review.
5. Revise peer reviewed drafts.
6. Convene public workshops based upon the white papers.

### White Paper Components

The white papers will be composed of three principal types of information.

- Conceptual models
- Uncertainties and scientific disagreements, and means for addressing them
- Opportunities and constraints

## Conceptual Models

The white papers will develop conceptual models that describe the key inter-relationships among ecosystem components, system dynamics, and limiting factors relevant to the white paper topic. The white papers will also indicate the degree of confidence and consensus about our understanding of the inter-relationships, dynamics, and limiting factors. These conceptual models will be composed of both written description and diagrams.

For the species-based white papers, the conceptual model will essentially be a life history model specific to the Bay-Delta system, describing the habitat conditions required for each life history stage, as well as a description of limiting factors for each life history stage. The species-based white papers will also assess historical data to discuss natural variability and trends in population dynamics, thereby providing a context for evaluating human-induced impacts.

The conceptual models for the ecological process and habitat white papers will focus on describing process-habitat-species relationships and dynamics (concentrating principally on the process-habitat linkages), including the role of disturbance and natural variability. The ecological process and habitat white papers will also describe limiting factors, emphasizing historical, current, and projected human activities that constrain the restoration/rehabilitation of ecological processes and the creation and maintenance of habitats.

## Uncertainties and Scientific Disagreements

In the process of developing conceptual models, the white papers will identify uncertainties or scientific disagreements that prevent us from defining or selecting management actions with sufficient confidence or consensus of being effective. The white papers will highlight these gaps in knowledge about relationships among ecosystem components, system dynamics, or the relative importance of individual limiting factors, and suggest a means for addressing the uncertainties. In addition to the uncertainties exposed by the conceptual modeling efforts, the Strategic Plan identifies twelve general issues/uncertainties that need to be addressed as part of Stage 1 of CALFED ERP implementation. The white papers can also add value by addressing and refining these twelve issues as they relate to the individual white paper topics.

There are three principal means the white papers can suggest to tackle an uncertainty: adaptive management interventions, targeted research, and expanded regional monitoring. Adaptive management interventions are opportunities where the application of the general ERP restoration/management strategies can be staged, designed and monitored as experiments. To the extent possible, suggested adaptive management interventions should include:

- general locations for implementing the general ERP restoration/management strategies to optimize information value;
- a general sense of scale of management intervention required for experimental purposes;
- guidelines for staging actions to reduce confounding variables;
- potential indicators to monitor to measure the effect of management actions; and
- a description of what can be learned within what timeframe.

In cases where it is not possible to define adaptive management interventions—perhaps because of large implementation costs or lack of experimental control—the white papers can suggest

targeted research or expanded regional monitoring as a wise investment to precede implementation projects. For most of the ecological processes, habitats, and species that serve as the topics for the white papers, the CMARP technical appendices have already begun to identify targeted research and expanded monitoring needs. White paper authors should use the CMARP technical appendices, as well as the scientists who actively contributed to their development, as resources for identifying needed targeted research and expanded monitoring.

### **Opportunities and Constraints**

The white papers will identify general opportunities for, and constraints to, applying restoration/management strategies. Some examples of opportunities can include:

- Areas of scientific consensus—when there is broad agreement that the application of a restoration/management strategy in a general location and/or at a general time will yield significant ecological benefits, benefits for sensitive species, or benefits for multiple species.
- General locations that optimize information value of management actions—locations that allow for relatively greater experimental control by limiting confounding variables or providing reference sites/conditions, and/or locations rich in baseline data.
- General locations or operational changes that minimize conflict with human activities, thereby providing greater flexibility for experimental management or larger scale restoration (e.g., public ownership of lands, re-operation of flood reservation releases).

Examples of potential constraints to experimental management can include:

- Where there is little experimental control, making it difficult to tease apart the effects of a management action from background noise/confounding variables;
- Where there are potential monitoring limits, such as regulatory limits on research take; and
- Where there are significant conflicts with high-value human activities, reducing the flexibility for experimental management.

### **White Paper Guidelines**

- **Focus on general restoration/management strategies, not individual programmatic actions.**
- **Emphasize information specific to the Bay-Delta system.**
- **Focus the discussion of Bay-Delta ecology on management implications.**
- **For scientific disagreements, capture the broad range of opinion.**

A more detailed description of each guideline follows.

**Focus on general restoration/management strategies, not individual programmatic actions.**

Volume II of the ERPP identifies more than 600 programmatic actions that are proposed for implementation as part of CALFED's efforts to restore/rehabilitate the Bay-Delta ecosystem. These individual actions can be grouped into **classes of actions--similar types of actions--that constitute the general ERP restoration/management strategies**. Such general restoration/management strategies include the inundation of floodplains, the restoration of tidal wetland habitat, the injection and routing of coarse sediment on regulated tributaries, the control/eradication of exotic species, the reduction of predator habitat, the elimination of passage barriers, etc.. The white papers should focus on explaining the ecological and biological relationships underlying these general restoration/management strategies. While the white papers are free to discuss specific programmatic actions as examples or potential opportunities, the white papers are NOT intended to evaluate methodically the 600+ individual programmatic actions listed in Volume II of the ERPP. Focus more on the general restoration/management strategies.

**Emphasize information specific to the Bay-Delta system.**

The white papers will emphasize information specific to the Bay-Delta system to enhance the relevance and applicability of the discussion to CALFED management needs. However, the white papers can draw upon the general literature or examples outside of the Bay-Delta system as far as they are illustrative or compensate for information gaps.

**Focus the discussion of Bay-Delta ecology on management implications.**

To help keep the white papers concise and enhance their utility, they will focus upon ecosystem components, relationships, and dynamics that have implications for management decisions; the white papers are not intended to compose a general ecology textbook or to comprehensively describe Bay-Delta ecology. An important proviso: While the white papers will focus on management implications, they can also discuss relevant ecological factors that are less amenable to management control (such as estuarine foodweb productivity) that may not be captured or accounted for distinctly by the general ERP restoration/management strategies. Discussion of such factors will help place the general ERP restoration/management strategies within the larger context of natural system variability and complexity.

**For scientific disagreements, capture the broad range of opinion.**

The conceptual modeling exercise is likely to identify scientific disagreements about key inter-relationships, system dynamics, and the relative importance of individual limiting factors. Rather than capturing every difference of opinion, the white papers should articulate alternative conceptual models that capture the broad range of opinion.