

REVISED DRAFT OUTLINE

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Ecosystem Restoration Strategy of the CALFED Bay-Delta Program

INTRODUCTION

This outline presents the CALFED vision and strategy for restoring a healthy Bay-Delta system by restoring ecosystem elements (habitats and plant and animal populations and communities) and natural processes (functions) that support the elements. A healthy ecosystem is one that exhibits a natural array, quantity, and quality of habitats and associated populations and communities of desirable species of plants and animals. A healthy ecosystem also has natural processes that meet the basic needs of the desirable plants and animals.

Need for an Ecosystem Restoration Strategy

The CALFED Bay-Delta Program needs an agreed upon and articulated Ecosystem Restoration Strategy (strategy) to provide an overall plan and direction toward the development of an ecosystem restoration program. In addition an articulated strategy is needed to obtain understanding and support from all stakeholders for a restoration program.

Purpose of this Document

This strategy document is designed to achieve the following three purposes:

- to describe CALFED's vision of a restored ecosystem and strategy to restore the ecosystem;
- to demonstrate that the strategy is based on an ecosystem approach and adaptive management; and
- to build understanding and support from interested stakeholders and the public for the strategy.

PROBLEMS

The Bay-Delta and its watershed are not healthy ecosystems. The overall health and functioning of the Bay-Delta ecosystem has declined because of degraded habitat, impaired ecological function, and reductions in population abundance of individual species. Important habitats of many native plants and animals are in short supply and remnant natural habitats are threatened with further loss or degradation. Populations of many native plants and animals have declined to very low levels from loss of habitat,

direct losses to water diversions, poor water quality, poor nutrient supply, competition and predation by non-native species, and from direct harvest by people.

CALFED has documented the problems in previous workshop information packages and in its "Problem/Objective Definition" paper dated March 1996.

MISSION

The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system.

ECOSYSTEM QUALITY OBJECTIVES

The CALFED Bay-Delta Program has developed an extensive set of ecosystem quality objectives. These are reproduced in the Problem/Objective Definition Report dated March 1996. The primary ecosystem quality objective and the first two levels of subobjectives are listed below.

Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species.

- A. **Improve and Increase Aquatic Habitats** so that they can support the sustainable production and survival of native and other desirable estuarine and anadromous fish in the estuary.
 - 1. **Increase Amount of High Quality Shallow Riverine Habitat** to allow sustainable fish spawning and early rearing.
 - 2. **Increase Amount of High Quality Shaded Riverine Habitat** to allow the growth and survival of sustainable populations of estuarine resident and anadromous fish in the estuary.
 - 3. **Increase Amount of Quality Tidal Slough Habitat** containing emergent and submerged vegetation to support the fish production capacity of the Delta.
 - 4. **Increase Amount of High Quality Estuary Entrapment/Null Zone Habitat** to support sustainable fish populations in the Bay-Delta system.
 - 5. **Provide Sufficient Transport Flows** at the proper times to move eggs, larvae, and juvenile fish from spawning habitats to nursery habitats in the Delta and Bay.

6. **Reestablish Appropriate upstream and downstream movement of anadromous and estuarine fish.**
7. **Improve the Productivity of the Bay-Delta Aquatic Habitat Food Web to support sustainable populations of desirable fish (and other) species.**
8. **Reduce Concentrations of Toxic Constituents and Their Bioaccumulation to eliminate their adverse effects on populations of fish and wildlife species.**

B. Improve and Increase Important Wetland Habitats so that they can support the sustainable production and survival of wildlife species.

1. **Increase the Amount of High Quality Brackish Tidal Marsh Habitat in the Bay-Delta system to better support sustainable populations of native wildlife species.**
2. **Increase the Amount of High Quality Freshwater Marsh Habitat to better support sustainable populations of native wildlife species in the Delta.**
3. **Increase the Amount of High Quality Riparian Woodland Habitat in the Delta to better support sustainable populations of native wildlife populations.**
4. **Increase the Amount of Breeding Waterfowl Habitat to better support sustainable populations of dabbling ducks.**
5. **Increase the Amount of Wintering Wildlife Habitat for foraging and resting to better support sustainable populations of wintering waterfowl.**
6. **Increase the Amount of Managed Permanent Pasture Habitat for better support wintering crane populations.**
7. **Increase Flood Plains and Associated Riparian Habitat to improve diversity and sizes of fish and wildlife populations.**

C. Increase population health and population size of Delta species to levels that assure sustained survival.

1. **Contribute to the recovery of threatened, endangered or species of special concern.**
2. **Increase populations of economically important species.**
3. **Increase populations of prey or food species.**

VISION STATEMENT

CALFED is working to achieve a healthy Bay-Delta ecosystem that provides for the needs of plants, animals, and people using the system. This healthy ecosystem will include a range of sustainable habitat types, providing environmental, recreational, and aesthetic benefits. It will support an abundance of resident and anadromous fish, including viable recreational and commercial fisheries. A healthy ecosystem will also support sustainable production and survival of plant and wildlife species, including resident species as well as migrants such as the waterfowl that use the Pacific Flyway each winter. These qualities are the benefits or ecosystem services that a healthy Bay-Delta ecosystem will provide.

These sustainable fish, wildlife, and plant populations depend on an ecosystem that provides all the natural processes and features, called ecosystem functions, that they need. The Bay-Delta system will never be returned to the conditions that existed prior to human disturbance, but Bay-Delta ecosystem functions will be restored. A healthy functioning ecosystem will include all the habitats necessary for survival of species that use the system, including freshwater and brackish tidal marsh, shallow water, riparian woodlands, and shaded riverine areas. These habitats will be large enough in area to support sustainable populations of Bay-Delta species, and will be interconnected to allow movement and prevent isolation of plant or animal populations. To the extent possible, natural processes of the system will be restored, including proper water flow to ensure appropriate salinity levels, meander belts that create necessary habitat and generate sediments that are important to the system, and nutrients that support the food web of the system. Uses of the system will be complement ecosystem health, maintaining water that is free of toxic contaminants, and agricultural land uses that are compatible with wildlife.

PROGRAM STRATEGY

The vision is the picture of what we want the Bay-Delta ecosystem to look like when we've achieved our mission. The strategy is how we will get to and accomplish the vision.

The Program's strategy to achieve the mission and objectives is to reverse the decline in ecosystem health by reducing or eliminating factors which degrade habitat, impair ecological functions, or reduce the population size or health of species. These factors may cause direct mortality of plants and animals in the system, but more often they result in indirect mortality by degrading habitat conditions or functions. For this reason, the Program objectives emphasize the improvement of habitats and ecological functions.

When there is a single factor limiting an ecological function or the population size or health of a species, remedial actions to restore functions or populations are clear. Often, however, there are many factors that reduce ecological functions or cause mortality of

species at different stages in the life cycle. In the Bay-Delta system, some of these include inadequate physical habitat that fails to provide areas for reproduction, foraging, or escaping from predators; inadequate water quality including temperature and toxic contaminants; fragmented habitat that impedes migration; inadequate or altered water flow regimes; direct and indirect mortality caused by water diversions from the system; presence of undesirable introduced species that compete with or prey upon other species; and recreational and commercial harvest. In cases where there are multiple factors affecting species, the strategy of the program is to take a broad ecosystem approach, thus making incremental improvements in all the significant identified factors that affect important species and their habitats. This effort must start by addressing factors most likely to be limiting, particularly for species of special concern. Subsequent efforts will work to protect or restore broader ecosystem functions. Actions may be guided by pre-disturbance conditions, but must recognize competing uses of the system, and irreversible changes that have occurred.

Several criteria will help to focus efforts aimed at maintaining and restoring ecosystem functions and achieving ecosystem quality objectives:

Address Limiting Factors Restoration of ecosystem functions must begin with the greatest needs or deficiencies in the system.

Use Natural Processes Selection of actions will favor those that take advantage of natural processes to achieve desired results. This will reduce the amount of effort to carry out and maintain our actions, and increase the likelihood of long-term sustainability of the Bay-Delta system.

Increase Resilience Actions will be selected so that some of the system's natural resilience to disturbance is restored. Restoration of particular habitat types will be undertaken at appropriate sites distributed throughout the system, and genetic diversity will be protected so that species maintain the ability to respond to gradual changes in conditions. Genetic diversity is most at risk in species or races that are endangered, threatened, or of special concern.

Achieve Multiple Benefits Efforts will be made to increase benefits by selecting or designing actions that improve habitat conditions or ecological functions for multiple species. Actions will also be favored if they improve other resource areas including water quality, vulnerability of system functions, and water supply reliability as well as improving ecosystem quality.

Measure Results Program results will be measured on two different levels. First, actions will be structured so that the effectiveness of each one is measurable. At a

broader scale, the program will include monitoring to assess the overall success of the many actions. This will allow adaptive management of the restoration effort; adjustment of our actions to make them more effective, and changes in emphasis as the condition of the ecosystem improves.

Make up for Unavoidable Losses Finally, where competing uses of Bay-Delta resources make it impossible to avoid specific impacts on species, habitats, or ecological functions, efforts will be made to compensate by reducing other causes of mortality or improving habitats and functions elsewhere in the system.

Specific

Sacramento River: Habitat restoration in the upper Sacramento River would include the following:

- protection and enhancement of the remnant natural meander belt from Redding downstream to Chico Landing,
- restoration of spawning gravel habitat for salmon and steelhead from Keswick Dam downstream to below the Red Bluff Diversion Dam,
- reductions in the amount of toxins released into Spring Creek and the upper Sacramento River from the Iron Mountain Mine,
- improvement in water temperatures below Keswick Dam through installation of temperature control devices on Whiskeytown and Shasta Dams,
- improvements in riparian habitat through setback levees from Chico Landing to Verona, and
- improvement in riparian and aquatic habitat in the Yolo and Sutter bypasses and Steamboat Slough.

Sacramento River Tributaries: Habitat restoration in the upper Sacramento River tributaries would include the following:

- comprehensive improvement in riparian and aquatic habitat, removal of barriers, and improvement in flow conditions.

San Joaquin River: Habitat restoration in the San Joaquin River would involve improvement in channel habitat conditions upstream of the Delta.

San Joaquin River Tributaries: Habitat restoration in the San Joaquin River tributaries would include:

- better management of flows and pulse flows,
- improvements in riparian habitat and vegetation,

- restoration of natural processes or artificial maintenance of physical habitat such as spawning gravels.

Bay-Delta: Habitat restoration in the Bay-Delta would include the following:

- Conversion of leveed lands to tidal wetlands and shallow aquatic habitat in Suisun Marsh and the Delta
- Restoration of Delta riparian and shallow water habitat along levees
- Protection and enhancement of riverine habitats on channel islands
- Protection and enhancement of existing tidal wetlands.

The specific CALFED strategy can be described by geographic subunit of the Bay-Delta and its watershed as presented in Table 1. The table presents actions related to function and limiting factors being addressed, species benefitted, indicators and target levels, and how the action would be implemented.

The CALFED restoration program would also be coordinated with other long-term restoration programs in the Central Valley including the following:

- Comprehensive Conservation Management Plan - EPA/SFEP
- Central Valley Fish and Wildlife Restoration Program - FWS
- Anadromous Fish Recovery Plan - AFRP
- Recovery Plans For ESA (Delta Native Fishes, Winter-Run Chinook Salmon, Salt Marsh Harvest Mouse, Swainsons Hawk, Giant Garter Snake, etc.)
- Battle Creek, Deer, Mill Creek Restoration Plans (MOU's)
- Corps Sacramento River Bank Protection Project Comprehensive Corridor Management Plan
- Upper Sacramento River Fisheries And Riparian Habitat Management Plan - SB 1086
 - Riparian Habitat Restoration Plan
 - Fisheries Restoration Plan
- San Joaquin River Habitat Restoration Plan
- State Water Project - Interim North and South Delta Programs

The CALFED Ecosystem Restoration Program would also be implemented in a watershed and species/race specific basis. For example, winter-run chinook salmon would be the focus of restoration efforts in the upper Sacramento River and the Bay-Delta.

INDICATORS AND TARGETS

Indicators are factors to be measured in a monitoring program to provide a measure of progress. Benchmarks that indicate performance (i.e. good or bad) will help establish specific target levels. The following is a list of potential indicators and targets. Additional indicators may be taken from the report of an Indicators Workshop convened to provide input on this topic. Indicators and targets will be a focus of discussions by the BDAC Ecosystem Restoration Workgroup.

Water Quality: nutrients (phosphorous, nitrogen/nitrate, carbon [TOC, DOC, POC]), wastewater discharge, water temperature, salinity, toxics (heavy metals, organic pesticides, hydrocarbons-petrochemicals, noxious algal blooms, BOD, water clarity, etc.

Wetland habitat quantity/quality:

Riparian habitat quantity/quality:

Shallow water aquatic habitat:

Other aquatic habitat indicators: location of X2, salinity gradient, net freshwater inflow and outflow, San Joaquin River flow, Sacramento River flow, Delta outflow, water depth, velocity, and substrate.

Food Web Indicators: chlorophyll a, phytoplankton (marine neritic diatoms, Melosira), rotifers, copepods (Eurytemora, Acartia), cladocera (Daphnia, Bosmina), and shrimp (Crangon, Neomysis).

Inhibitors: BOD, water hyacinth, Asian clams, boat traffic, agricultural drains, water diversions/intakes, fish predators, wildlife predators.

Community assemblage: healthy assemblage of native fishes, lack of many exotics species.

Population indicators: species presence/absence; density, birthrate, growth rate, mortality rates, productivity/ reproductive rate; age distribution, population dispersion/distribution, population size.

Individual indicators: growth rates, disease/parasites factors, fecundity, condition, diet and food uptake.

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